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**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF OREGON**

**OREGON NATURAL DESERT ASS’N and
CENTER FOR BIOLOGICAL DIVERSITY**

Case No. 03-CV-213-KI

Plaintiffs,

v.

**UNITED STATES FOREST SERVICE, and
ROGER W. WILLIAMS, Malheur National
Forest Supervisor,**

**DECLARATION OF
J. BOONE KAUFFMAN, Ph.D.**

Defendants.

I, J. BOONE KAUFFMAN, PhD. declare and state as follows:

1. My name is J. Boone Kauffman. I am a research ecologist with more than 25 years of experience in studies of riparian ecology and management. For informational purposes, I am currently a Full Professor in the Department of Fisheries and Wildlife at Oregon State University. I have been affiliated with this Department since 1995. From 1986 to 1995, I was an Assistant and Associate Professor in the Department of Rangeland Resources. I am also the Lead


Scientist for the small consulting firm, Illahee Sciences Inc. The principle work of Illahee Sciences is education, research, and environmental consulting for municipalities, tribal Governments, the Federal government, and non-government organizations. I have a B.S. in Range Management (Texas Tech University), a M.S. in Rangeland Resources (Oregon State University), and a Ph.D. in Wildland Resource Science (Forestry and Range – University of California).

2. Planning, conducting, and reporting research findings are the core responsibilities that I have as a research/teaching professor at Oregon State University. For almost 17 years at OSU, I have been a successful Principle Investigator on dozens of competitive grants/research projects. I have mentored more than 26 graduate students in planning and conducting their thesis research programs. I have taught a variety of courses at OSU including the development of two original courses on riparian ecology and management and wetlands and riparian ecology. I have been a leader in a diverse number of ecological research projects conducted in South and Central America, Africa, and the USA. Finally, I have reported my findings in thesis, journal articles, book chapters, oral presentations (see resume).

3. My research experience includes both basic and applied studies with both experimental and observational designs. These projects have been planned and conducted in a variety of riparian zones, forests, grasslands, and wetlands. The vast majority of my riparian research has been conducted in Blue Mountain riparian zones of Northeastern Oregon. A major research focus has been to examine how livestock grazing affects riparian zones and native (salmonid) habitats. A great deal of my research in riparian zones also has examined the composition and requirements of establishment of native riparian plant species. I and my colleagues have quantified how riparian communities are affected by livestock grazing as well as

the patterns of riparian/stream recovery when rested from livestock. In addition, I have extensive research experience on the relationships of riparian zone ecological condition to soil and nutrient properties. .


4. I have published over 112 publications including approximately 60 peer reviewed papers, 11 book chapters, and 43 other professional publications (see resume). In addition, I have over 60 published abstracts from professional society meetings and 3 popular articles. I have also written several editorials for the (Portland) Oregonian and Corvallis Gazette Times on issues of ecology and natural resource management. I have provided testimony to congressional subcommittees as well as served as an expert witness in federal and state courts and the California Water Resource Board.

5. Among the most noteworthy of my publications are those that focus on riparian zones found within the  am systems at issue in this case (Kauffman et al. 2002, Kauffman et al. 2003; Li et al 2001). In addition, I have published papers on riparian restoration (Beschta and Kauffman 2000; Elmore and Kauffman 1994; Kauffman et al. 1996; Kauffman et al. 1997). I have also published summaries on the state of our scientific knowledge of livestock impacts on riparian zones (Kauffman and Krueger 1984, Dwire et al. 1999). I was the invited author in the recently published Encyclopedia of Biodiversity on the global impacts of livestock on biological diversity (Kauffman and Pyke 2001). I was also the invited author to write the chapter on wildlife habitats of riparian zones for the recently published book entitled “Wildlife Habitats and Species Associations within Oregon and Washington” (Kauffman et al. 2001).

Interest in the Area

6. I have conducted research studies in eastern Oregon riparian zones for 25 years. For the past 17 years part of my research emphasis as a professor at Oregon State University has

been to examine the basic ecology of riparian zones, the influences of livestock and other land uses on riparian zones structure and function and ecological approaches to their restoration.

7. I have worked extensively in the Malheur National Forest and surrounding lands for many years. This includes research not only in riparian zones but in upland restoration projects as well. Science-related riparian work on the Malheur National Forest includes research beginning in 1987, field reviews as a consulting riparian specialist for the U.S. Bonneville Power Administration (BPA) in 1991, and intensive riparian research projects since 1996. Northeastern Oregon riparian research projects have been funded by the National Science Foundation, The USDA Forest Service, the U.S. Environmental Protection Agency, and the U.S. Bonneville Power Administration. This research includes many streams and riparian zones within the allotments at issue in this lawsuit 



8. All of my research studies in the John Day and Malheur river basins have been interdisciplinary in nature. The research has strongly focused on understanding riparian zone composition and ecological processes, the current status of salmonid habitats, and approaches to the restoration of salmonid habitats. Colleagues include scientists specializing in the fields of fisheries biology, fluvial geomorphology, hydrology, and stream ecology. I have mentored many graduate students, undergraduates, and research assistants conducting research in the John Day and Malheur river basins. This includes students involved in research of soils, riparian vegetation, hydrology, and fisheries sciences.

Information Reviewed

9. I reviewed “Inland Native Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada” (hereafter: “INFISH”). I also reviewed the Malheur National Forest Land and Resource Management Plan

(hereafter: “LRMP”). I also reviewed the NMFS and US Fish and Wildlife Service 1998 Biological Opinion on INFISH (hereafter: “BO”). I also reviewed the forage utilization and bank damage monitoring and photos taken in allotments in watersheds for the North Fork Malheur Wild and Scenic River and Malheur Wild and Scenic River corridors by Christopher Christie. I also reviewed the monitoring photos taken within the Malheur and North Fork Malheur wild and scenic river corridors by Linda Driskill. Finally, I also reviewed the Forest Service’s Malheur Headwaters Watershed Analysis for the Prairie City Ranger District (hereafter: “WA”)

10. Conducting research studies in the Blue Mountains has entailed numerous excursions with the objectives of observing as many riparian zones as possible. This has included countless visits to the riparian zones and streams of headwaters and upper Malheur River. In addition, I have conducted research studies in riparian zones and streams in the upper Malheur, John Day and Silvies River Basins (all part of the Malheur National Forest).

11. I personally surveyed and evaluated stream, fish habitat, and watershed conditions in allotments in watersheds draining into the Malheur River WSR corridor, including the Summit Prairie, and Dollar Basin/Star Glade Allotments,  the Malheur National Forest in April 2003 with Jonathan J. Rhodes. ring these field evaluations I took copious and detailed notes of my observations, and supplemented them with numerous photos, some of which I have attached to this declaration.

12. I also reviewed the results of our past research studies in the Blue Mountains including studies published in Kauffman et al. (In review). Kauffman et al. (2002) and Li et al (2001). I have also reviewed the extensive number of publications that has arisen from my interdisciplinary research in the Blue mountain riparian zones including sites in the Malheur River. I also reviewed my notes, photos, data sheets collected from my many field reviews,

research trips, in the upper Malheur river basin, which date back to 1991. I also reviewed other pertinent scientific literature (see Literature Cited).

Scope of Review

13. I submit this declaration to explain how the current grazing in the grazing allotments along the Malheur and North Fork Malheur wild and scenic rivers is retarding the attainment of INFISH RMOs, and failing to protect river values, via effects on riparian vegetation, soils, water quantity, water quality, bank conditions, channel form, and bull trout habitat conditions. My declaration is not an exhaustive description of the direct, indirect, and cumulative effects of grazing on these resources, but instead focuses on the most significant effects of grazing on watershed elements and processes and anadromous fish habitat conditions.

Discussion Points

A. The current level of livestock utilization is beyond the limits of any current acceptable standards of riparian management for meeting multiple resource objectives, including INFISH RMOs. Clearly the riparian and aquatic resources within the allotments encompassing the Malheur and North Fork Malheur rivers are in decline and this decline is due to the current degree of livestock use. Grazing practices, current levels of livestock grazing, and approaches to grazing management throughout the Malheur and North Fork Malheur rivers are resulting in the continued degradation of riparian/stream ecosystems and thereby preventing attainment of RMOs (rather than just retarding attainment). Suspension of grazing is necessary if RMOs are to be met in these allotments.

14. Based upon 25 years of riparian research in the Pacific Northwest, it is my scientific opinion that historically, the riparian zones of the Malheur and North Fork Malheur rivers were biologically diverse montane riparian zones dominated by mosaics of wet meadow, willow, alder, quaking aspen, and other riparian-obligate communities. Riparian zones are considered the most diverse ecosystems on the montane landscape of the Intermountain west. A century of mismanagement in the Malheur and North Fork Malheur rivers, which continues to present, has had deleterious consequences on the biological diversity of these public resources.

Livestock grazing is the principal cause of this degradation. Roads, logging, and mining, have exacerbated the degree of degradation. Today the meadows continue to be overgrazed, the willows and other riparian shrubs are over-browsed and decadent, and the quaking aspen is all but dead. Drastic changes in riparian management are needed to reverse this degradation. Halting livestock grazing would be the single best management practice to meet RMOs for the sustainability of native fishes and their habitats.


15. The riparian zone of every stream reach I visited on the Malheur River and its headwater tributaries did not meet INFISH standards to attain RMOs, or the grazing standards established by the bull trout biological opinions. In Spring 2003, the stubble heights within the riparian zones of the Malheur Wild and Scenic River corridor were 0.5–2 inches in dry meadows and only 2–4 inches along the greenline. This far exceeds the 6 inch stubble height bull trout standards for these WSR corridor pastures. My observations were in close agreement to the results of monitoring by Chris Christie who quantified, in an acceptable scientific manner, that INFISH and bull trout biological opinion standards were not being met. See, e.g., Attachments 1–2 (exhibits to Declaration of Christopher Christie). I found Christie’s work to be more thorough and definitive than the qualitative/observational data present in the Agency Compliance Monitoring cards of the Malheur National Forest. However, had the USFS hired a seasonal technician with the proper training to collect greenline stubble heights, shrub use, and bank damage, I have no doubt the technician would have arrived at the same conclusion. The measurements of bank damage and residual stubble heights in Christie’s monitoring data are based on the Forest Service’s own protocols for measurement and analysis, and provide detailed information on the measurements, including raw data, monitoring data, thorough information on monitoring locations, and photo annotations with detailed observations from the areas monitored.

B. The shrub and tree component of the riparian zones is in a degraded condition and will not recover without cessation of livestock grazing.

16. In my Spring 2003 field reviews, I paid attention to the level of shrub use in riparian zones. In particular, I examined the number of current season's leaders (stems) that were browsed. Livestock use was particularly severe on willows and quaking aspen within riparian zones of all of the allotments observed within the wild and scenic river corridors. I observed many cases where 100% of leaders had been browsed.

17. In terms of bull trout management, the trigger for livestock use of shrubs is that livestock must be moved before more than one-third of the current season's leaders (stems) are browsed on woody shrubs (willows, alders, etc.). Also, the Forest Plan requires the Forest Service to manage key riparian vegetation to protect or enhance riparian-dependent resources, with an emphasis on reestablishment of hardwood shrub and tree communities. Throughout these allotments willows were severely stunted, sparse in density, and in a decadent condition due to livestock grazing. See, e.g., Attachments 3–6 (exhibits to Declaration of Christopher Christie). Reproduction and establishment of willows (as well as aspen and alder) has been dramatically reduced. Many areas that once supported diverse riparian communities dominated by willows, alder and/or aspen are in a terribly degraded condition and now devoid of any thriving woody vegetation. The willows and quaking aspen in particular are in a declining and unhealthy state due to the effects of grazing. This will affect many aspects of native fish habitats including wood debris recruitment, shade, streambank stability and structure, and nutrient inputs.

18. Again, my observations were in close agreement with the photo monitoring performed by Chris Christie and Linda Driskill, which document severe and widespread degradation of riparian shrub and hardwood species in the Malheur and North Fork Malheur wild and scenic river corridors.

19. Riparian obligate shrubs and trees (willows, alder, and aspen) increase in density and structure following cessation of livestock grazing. The positive influences of cessation of livestock grazing are apparent in the one grazing enclosure we visited in the headwaters of the Malheur River, along Summit Creek e, e.g., Attachments 7–10 (exhibits to Declaration of Linda Driskill, photograph from my Spring 2003 field evaluation with Jonathan J. Rhodes, and exhibit to Declaration of Christopher Christie). We also observed other riparian zones in similar streams on the Malheur National Forest where small livestock enclosures demonstrate the remarkable resilience of riparian ecosystems. In enclosures we noted increases in alder, willow, and/or aspen cover over the channel. Interestingly, many of the bases of the shrubs and trees are inundated during spring flows. This vegetation interaction with flows has greatly increased channel/fish habitat complexity in the enclosed reaches. Similar results have been reported in the scientific literature (Brookshire and Kauffman 2003; Case and Kauffman 1997; Kauffman et al 2002). All of these studies report dramatic increases in riparian shrub growth and reproduction following cessation of livestock use.

20. Livestock have not only affected the structure and density of shrubs and trees but they have altered species composition as well. In grazed areas, we found that shrubs of drier environments predominate compared to similar sites in enclosures. In particular, we observed a shift away from willows, alder, red-osier dogwood, and aspen, with an increase in goosecurrent and roses. This is likely reflective of changes in the hydrological environment brought on by livestock (channel incision and trampling lowering water availability), as well as lower palatability for rose and goosecurrent. Shifts in species adapted to drier environments following stream incision and grazing impacts in Northeastern Oregon has also been quantified by Toledo and Kauffman (2001)

21. In grazed areas throughout the wild and scenic river corridors, there is little establishment of willows even though adequate habitat and hydrologic conditions exist. The few young willows present were quite stunted by grazing, see, e.g. Attachments 11–13 (exhibits to Declaration of Christopher Christie, and exhibit to Declaration of Linda Driskill); but these would recover with cessation from grazing. Utilization of willows at the levels observed throughout the wild and scenic river corridors, as well as the entirety of the Malheur National Forest, will greatly diminish the reproductive abilities of the willows. Heavy use by livestock such as is currently occurring will preclude successful establishment of willow or alder seedlings.

22. When 100% of the leaders of willows are grazed each year, as we observed for practically all willows shorter than the grazing height of cattle, reproduction will be diminished to the point of non-existence. Recent studies have found that even the biological opinion standard of 30% allowable leader use before moving livestock will result in declines in willow reproduction. For example, Brookshire and Kauffman (2003) examined willow growth and reproduction in response to light levels of animal use in a Blue Mountains grazing allotment on the neighboring Wallowa-Whitman National Forest. They found that even when riparian use by animals is at barely detectable levels (no apparent decrease in stubble heights or evidence of use), willow growth and reproduction was significantly reduced.

23. Therefore, it is my conclusion that the biological opinion standard for riparian shrub use is not adequate to facilitate sustainable riparian components of fish habitat. Moreover, the extremely high levels of utilization observed throughout the wild and scenic river corridors is deleterious to the reproduction and establishment of riparian shrubs, as is required by the Forest Plan.

24. Exclosures throughout the Blue Mountains of northeast Oregon provide great examples of riparian potential. For example, along Summit Creek, a headwater stream of the Malheur River that flows into the wild and scenic river corridor, there exists a livestock exclosure (also referred to above) where two separate studies of livestock impacts and patterns of post-grazing recovery in riparian/stream habitats have been conducted (Kauffman et al. 2002; Magilligan and McDowell 1987). Outside the exclosures (in the grazed areas), there was very little overstory riparian cover. In the grazed reaches there was a notable lack of shrub over the channel, and there was a notable increase in raw banks and compacted soils. The channels were wider and there was a separation of the riparian floodplain from the channel. The differences inside the small exclosure were dramatic. See, e.g., Attachments 7–10. The streamside communities were dominated by mesic/hydric riparian-obligate species in exclosures and species adapted to drier environments in grazed areas. Shrub cover was much higher, channels were narrower and streambanks were significantly more stable within the exclosure. Habitat conditions and the environment for salmonids have been much improved by cessation of grazing in exclosures, while conditions continue to decline in grazed reaches. This includes more stream shade, hiding cover, and more allocthonous inputs (i.e., inputs of nutrients and energy to the aquatic biota, which originate from terrestrial sources and constitute a critical function of riparian zones) into the stream by shrubs, sedges, and grasses.

25. All of these factors clearly demonstrate that grazing practices are adversely affecting native fish. The lack of cover and wider channels due to grazing will result in warmer stream temperatures, less nutrient inputs, and lower habitat complexity. The absence of unstable raw banks and the increased frequency and extent of deep undercut banks was quite noticeable in exclosures relative to grazed reaches. In some areas within the Summit Creek exclosure, we

observed sedges growing completely across the channel bottom, indicating the stability of the channel and the strong interactions of healthy vegetation and channels. We did not observe this in grazed areas within the Malheur watersheds.

C. Forage utilization, principally on sedges, grasses and broad-leaved dicots, is far higher than any degree that would allow for attainment of RMOs. Overgrazing by livestock is degrading riparian soils and vegetation, and therefore adversely affecting native fish. In my field review and review of recent studies, I have found:


- a. Overuse by livestock of sedges and grasses predispose stream banks to accelerated erosion and declines in stable bank structure. This is related to the synergistic effects of trampling damage, loss of root mass, and shifts in riparian composition to species adapted to drier environments.
- b. In the Summit Creek livestock enclosure, as well as in other enclosures throughout the Malheur National Forest, there was continuous ground cover of a dense litter layer. The difference in soil compaction (and hence infiltration and soil water holding capacity) is quite dramatic: the soils in the enclosure are light and fluffy (greater porosity) while the soils outside the enclosure are severely compacted (like walking across an airport runway). Soil compaction results in less water available to plants, more water loss via overland flows and less water entering streams via ground water flow. (See Kauffman et al. (2003) for research results on this phenomenon in the Malheur National Forest.)
- c. Stubble heights in grazed riparian zones outside enclosures were well below the bull trout biological opinion standards.

26. Throughout the Malheur National Forest, including the riparian zones within the wild and scenic river corridors, during the 2003 field reviews, we consistently observed stubble heights as low as 0.5 inches on dry meadows and <2 inches on wet meadows. During Spring

2003, the cover of cattle feces on the riparian ground surface was as high as 20%. See, e.g., Attachments 14–15 (exhibits to Declaration of Christopher Christie showing similar conditions within both wild and scenic river corridors in 2001). There were significant quantities of cow feces under standing water associated with the higher flows of spring runoff. This is a significant negative influence on water quality. During the 2003 field reviews throughout the Malheur National Forest, I never observed a riparian area where either shrub or forage utilization standards had been met during the 2002 grazing year.

27. The degree of overgrazing and approaches to grazing management within the wild and scenic river corridors is similar, or worse, than observations I have made in the past years while conducting research in riparian zones in other areas of the Malheur National Forest. We have quantified that grazing at levels much lower in intensity than that observed in the wild and scenic river corridors has many negative effects on native salmonids and their habitats. This includes losses in riparian cover, decreases in riparian-wetland plants, and losses in species diversity. This is closely related to livestock impacts creating wider, narrower channels, unstable streambanks, and simplified aquatic habitats. Forage utilization along stream channels also is a direct loss of energy and nutrients that naturally would function as the basic foundation for aquatic food webs. The allochthonous inputs from meadows and forested riparian reaches in the Blue Mountains are quite significant (Brookshire and Kauffman, *in review*).

28. The excessive livestock grazing observed throughout the Malheur and North Fork Malheur wild and scenic river corridors also affects the belowground structure of riparian ecosystems, which results in many negative effects on important features of bull trout habitat—for example, bank structure and channel width. See, e.g., Attachments 16–18 (exhibits to Declaration of Christopher Christie, and photograph from my Spring 2003 field evaluation with

Jonathan J. Rhodes). Kauffman et al. (2003) conducted a study on the Malheur National Forest comparing riparian meadows excluded from grazing for 9–18 years to grazed riparian meadows where approximately 50% of the forage had been utilized (light compared to 2002 utilization levels observed within the wild and scenic river corridors). They found that root biomass was 50% greater in dry meadows and 62% greater in wet meadows. This is not trivial: the differences in root biomass between grazed and ungrazed meadows were 5,000 to 11,000 kg/ha. This remarkable difference in root biomass will affect numerous aspects of riparian/stream ecosystem structure and function, including ecosystem productivity, streambank structure, bank stability, and fish habitat diversity 

29. In addition to differences in root mass, Kauffman et al. (2003) found that soil bulk density was significantly higher and soil pore space was significantly lower in grazed meadows. This affects the quantity of water available for plant growth and groundwater movement to streams. The effects of grazing on water infiltration rates into soils were alarming. Mean infiltration rates in exclosed dry meadows were over 13 times greater than rates in grazed areas. The results of this study found that in grazed riparian zones, significantly less water will be stored in soils and more water will be lost via surface flows.

30. This study had two important conclusions: (1) livestock grazing at moderate levels affects riparian zones and streams in profound and dramatic ways that are not readily apparent without measurements; and (2) riparian zones demonstrate remarkable degrees of resilience and recovery when livestock grazing is halted. A management strategy accepted by rangeland hydrologists and conservationists is to manage for the “capture store and safe” release of water (Dr. J. Buckhouse, OSU Dept. of Rangeland Resources, personal communication).


Clearly, cessation of livestock grazing is the most prudent approach towards achieving water quality, streambank, and riparian vegetation management objectives (RMOs).

Conclusion

31. There is a high potential for recovery in the riparian zones, and hence bull trout habitat, within the Malheur and North Fork Malheur wild and scenic river corridors. This will require many years of complete rest from livestock grazing. The level of utilization that occurred in 2002 and the decades of grazing management that have resulted in the current ecological and physical conditions of the riparian stream ecosystems are adversely affecting native fish.

32. The LMRP requires the Forest Service to “manage the composition and productivity of key riparian vegetation to protect or enhance riparian-dependent resources, with emphasis on the reestablishment of hardwood shrub and tree communities.” Given the levels of shrub use throughout the Malheur National Forest and in the wild and scenic river corridors in particular, this requirement is not being met. Rather, current livestock grazing management is resulting in the continued degradation of the riparian shrub and tree communities.

33. Further, the LMRP states that the Forest Service is required to “. . . plan, design and implement riparian habitat improvement activities to upgrade riparian areas that are not in a condition to meet management objectives or desired future conditions.” This grazing-related standard is not being addressed at present in the wild and scenic river corridors. Rather, the current grazing management is degrading riparian areas and moving their condition further away from desired future conditions.

34.  Likewise, current grazing management is failing to “improve the rate of recovery in riparian areas that are not in a condition to meet management objectives” and is failing to “maintain sufficient streamside vegetation to maintain bank stability and fish habitat capability.”

Current management is resulting in the continued degradation of these essential riparian attributes.

35. In my field review of the Malheur River and other Malheur National Forest riparian zones in Spring 2003, I observed damage resulting from livestock grazing that was as bad as anything I have seen in my twenty-five year career as a rangeland riparian ecologist. Current livestock management and levels of use are resulting in the continued degradation of riparian zones within the Malheur National Forest, including the Malheur and North Fork Malheur wild and scenic rivers and their tributaries. The current management goes far beyond simply retarding attainment of RMOs. The grazing management within these allotments is resulting in the degradation of among the most productive and biologically diverse riparian zones in Oregon.

36. Based upon conditions of the riparian zones along the Malheur and North Fork Malheur rivers and their tributaries, it is my opinion that there are few areas where I have witnessed such a blatant disregard for policies and laws that are supposed to guide grazing management for the improvement of public resources, the management of threatened species, and the management of Wild and Scenic Rivers. This lack of proper management, as specified by law, has caused, and continues to result in, the degradation of public resources, particularly the diverse riparian/stream ecosystems and the species that require pristine ecosystems to survive (particularly bull trout). This is an area where grazing should be eliminated or suspended in order to begin to meet riparian management objectives.

37. With proper management (cessation of livestock grazing), the riparian zones of the Malheur and North Fork Malheur wild and scenic rivers and their tributaries could be among the best willow, aspen, and alder-dominated riparian zones in eastern Oregon. Recovery potential

in the geomorphic settings of many of the riparian zones is quite high and I would predict that even with the long term press disturbance that has occurred on these areas for more than a century, they still maintain a degree of resilience or recovery if livestock grazing were to be halted. This ability will not last, and perhaps has been lost for some reaches. Nevertheless, I predict there would be dramatic increases in riparian/aquatic habitat structure and function with a rest of 20 to 30 years or more. This prediction is based upon my and my colleagues' research on the rates of change in riparian zones excluded from grazing for long periods of time (Kauffman et al. 2002; Kauffman et al., 2003). This absence of grazing is necessary to recover vegetation composition and structure, streambank structure, soil properties, and channel diversity. The science is fairly unequivocal on the fact that cessation of livestock grazing results in shifts in vegetation structure and composition that is favorable to the native aquatic and terrestrial biota. The benefits, ecosystem services, and values of ungrazed riparian/stream ecosystems increases through time and may not be fully realized until decades after exclusion. We have found that the longer riparian zones are rested from livestock use, the better the habitat features are for native fish (Kauffman et al. 2002).

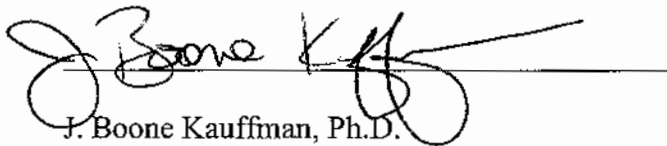
38. In summary, the benefits of livestock exclusion described in this declaration are based upon observations and years of research experience in Blue Mountain riparian zones of eastern Oregon. In comparing grazed and exclosed reaches along Blue Mountain riparian zones (including those in the Malheur National Forest) we have observed:

- Increased deciduous cover over exclosed (ungrazed) channels
- Increased herbaceous cover along exclosed streambanks
- Increased undercuts in exclosures; increased bank stability (fewer raw banks)
- Difference in soil compaction, water holding capacity and infiltration rates

- Narrower channels in enclosed riparian areas
- Tremendous channel complexity in exclosures
- Increases in root biomass in exclosures resulting in improved bank stability
- Increases in plants more adapted to riparian/wetland environments
- Increased growth and reproduction of willows and other riparian shrubs
- Increased allochthonous inputs (sources of nutrients and energy for aquatic food webs) from the riparian zone to the stream

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 10th day of July 2003.



J. Boone Kauffman, Ph.D.

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DECLARATION OF J. BOONE KAUFFMAN

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