David H. Becker (OSB # 081507)
Peter M. Lacy ("Mac") (OSB # 01322)
Oregon Natural Desert Association
917 SW Oak Street, Suite 408
Portland, OR 97205
(503) 525-0193
dbecker@onda.org
lacy@onda.org

Stephanie M. Parent (OSB # 92590)
Pacific Environmental Advocacy Center
10015 SW Terwilliger Blvd.
Portland, OR 97219
(503) 768-6736
(503) 768-6642 (fax)
parent@lclark.edu
Attorneys for Plaintiffs

Kristin F. Ruehter (OSB # 05368)
Advocates for the West
P.O. Box 1612
Boise, ID 83701
(208) 342-7024
kruether@advocateswest.org

Attorneys for Plaintiffs

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF OREGON

OREGON NATURAL DESERT ASS'N **CENTER FOR BIOLOGICAL DIVERSITY** and **WESTERN WATERSHEDS PROJECT** Plaintiffs, **v.** **ABIGAIL KIMBELL,** et al., Defendants **v.** **HARLEY & SHERIE ALLEN,** et al., Defendants-Intervenors.	Case No. 07-1871-SU [Related Case No. 08-151-SU] **DECLARATION OF** **ROBERT L. BESCHTA, Ph.D.**

I, ROBERT L. BESCHTA, Ph.D., state and declare as follows:

1. My name is Robert L. Beschta. I am a certified professional hydrologist (#317 American Institute of Hydrology) with more that 35 years of experience in studies of hydrology and riparian systems. For informational purposes, I am an Emeritus Professor of Forest Hydrology in the Department of Forest Ecosystems and Society, College of Forestry, Oregon State University, Corvallis. I have a B.S. in Forest Management from Colorado State University (1965), a M.S. in Forest Hydrology from Utah State University (1967), and a Ph.D. in Watershed Management (with a minor in Hydrology) from the University of Arizona (1974).

2. Since 1974, I have worked at Oregon State University (OSU) where I planned and conducted research projects as well as reported their findings in professional journals, book chapters, reports, and at workshops and symposiums (Attachment A). I have been major professor for approximately 30 MS/PhD students in natural resources hydrology/watershed management and have represented the academic "minor" of water resources/hydrology for numerous additional graduate students doing research in soils, rangeland resources, riparian ecology, geosciences, fisheries and wildlife, engineering, and other programs at OSU. I have taught courses in watershed management, watershed processes, water quality and forest land use, watershed analysis, snow hydrology, and subsurface flow pathways at OSU. In addition, I have presented numerous seminars and guest lectures.

3. My research and other professional activities have involved a variety of basic and applied studies at various locations across the western United States, including both eastern and western Oregon, southeast and interior Alaska, northwestern Wyoming,

western Montana, central Utah, the Sierras of California, and the Olympic Peninsula of Washington. I have also conducted research in Alberta, Canada, and in the Torlesse Range of New Zealand's southern Alps. Research topics have included suspended and bedload sediment transport of mountain streams, effects of riparian vegetation on stream temperatures, stream temperature modeling, peakflow assessments and simulation modeling, road drainage and slope stability, the hydro-geomorphic role of large wood in streams, channel morphology, hyporheic and subsurface flow in riparian areas, hydrology of wetlands, the influence of land use on streamflow and water quality, the hydro-geomorphic role of beavers, the impacts of large herbivore grazing/browsing to riparian ecosystems and rivers, and others.

4. I have served on the Board of Registration and as Academic Vice President for the American Institute of Hydrology and have been a co-organizer (and co-editor of symposium proceedings) for several major Pacific Northwest symposiums on erosion and sedimentation, management of riparian and aquatic systems, and watershed management. Other professional activities include: reviews of fisheries enhancement projects in Idaho and Oregon (for Bonneville Power Administration); member of National Research Council committees that evaluated 1) factors affecting salmonid stocks in the Pacific Northwest and 2) the functions and strategies for managing riparian areas; co-PI of a project addressing the cumulative effects of forest practices in Oregon; member of governor appointed Science Team that addressed forest health issues in eastern Oregon; member of Committee of Scientists evaluating the scientific principles of National Forest Planning; member of technical advisory committee for review stream temperature standards for the State of Oregon; and others.

5. Since 1990, I have authored or co-authored over 90 publications related to the hydrology of forest and rangeland watersheds, riparian areas, large herbivore impacts, and related topics (Attachment A). Some publications of note that are directly related to streams and riparian issues include: Beschta and Platts 1986, Elmore and Beschta 1987, Beschta 1991, Beschta et al. 1991, National Research Council 1996 and 2002, Beschta 1997a and 1997b, Kauffman et al. 1997, Beschta 1999, Committee of Scientists 1999, Beschta and Kauffman 2000, Beschta 2005, Beschta and Ripple 2006, 2008, Ripple and Beschta 2006. Over the years, I have also reviewed numerous manuscripts for possible publication in various scientific journals.

Interest in the Area

6. In 1991, as a consulting hydrologist for the Bonneville Power Administration, I participated in field reviews of streams and riparian systems to assess the effectiveness of various riparian and stream treatments on the Malheur National Forest and surrounding lands. Most treatments involved fencing of livestock or instream additions of structure (e.g., large wood, boulders). More recently, I was a co-principal investigator on research funded by the National Science Foundation/Environmental Protection Agency directed at addressing issues associated with fisheries, hyporheic flows, riparian plant communities, and stream temperatures for streams in eastern Oregon. Previous research in the John Day, Malheur, and Grande Ronde River Basins have involved interdisciplinary efforts directed at developing a better understanding of disturbance mechanisms and ecological process associated with streams and riparian systems as well as the effects of land use practices upon channel morphology, water quality, and riparian plant communities.

Cooperating scientists include those with backgrounds in salmon biology, stream ecology, botany, riparian ecology, and fluvial geomorphology.

7. In October of 2003 and October of 2004, in the company of Jonathan J. Rhodes, I undertook a field inspection of the Murderers Creek Allotment as well as other allotments on the Malheur National Forest. Subsequent to those trips, I provided declarations dated January 18, 2004, November 8, 2004, and November 12, 2004 that summarized my observations and conclusions regarding grazing impacts to streams, riparian areas, and plant communities in these various allotments. In early October of 2008, I inspected a portion of the Long Creek Allotment at which time I measured heights of several woody species inside and outside of exclosures.

Scope of Review

8. In preparation for this declaration I reviewed: 1) the fall 2008 monitoring reports by Christopher Christie for the Hamilton, Murderers Creek, Long Creek, Slide Creek, Lower Middle Fork, Upper Middle Fork Allotments, and the second Christie declaration and attachments; 2) the 2008 End of Year Grazing Report for the Blue Mountain Ranger District of the Malheur National Forest; 3) the fall 2008 monitoring reports of the Grand County Conservationists for the Murderers Creek Allotment; 4) the declaration of Elizabeth E. Howard (2/12/09) and exhibits; 5) the declaration of Loren Stout (2/10/09) and exhibits; and 6) the declaration of Pat Larson (2/10/09) and exhibits.

9. I reviewed portions of "Monitoring Strategy for Rangelands" (2007, Idaho Bureau of Land Management, BLM State Office, Boise, Idaho, 51 pp.) and "Monitoring Stream Channels and Riparian Vegetation-Multiple Indicators" (T.A. Burton, S.J. Smith, E.R. Cowley, April 2008, Interagency Technical Bulleting, Version 5.0, BLM/ID/GI-

001+1150). I also reviewed Beschta and Platts 1986, Elmore and Beschta 1987, Chaney et al. 1990, Beschta et al. 1991, Sedell and Beschta 1991, National Research Council 1996 and 2002, Beschta 1997a and 1997b, Belsky et al. 1999, Beschta and Kauffman 2000, and Kauffman et al. 2002. In addition, I am familiar with a large number of other reports and publications related to streams, riparian systems, and the effects of lands use practices.

10. I submit this declaration to indicate how historical and current grazing in Murderers Creek and Lower Middle Fork Allotments of the Malheur National Forest is directly and indirectly affecting riparian vegetation, streambanks and channel morphology, hydrologic processes, water quality, and aquatic habitat for salmonids. This declaration is not intended as an exhaustive depiction of the direct, indirect, and cumulative effects of grazing on these resources, but instead focuses on the some of the more significant effects to riparian plant communities, to hydro-geomorphic processes, and to streams and channels. Special emphasis will be made regarding how these changes can impact fish habitat.

Discussion Points

A. Historical grazing practices on allotments of the Malheur National Forest have caused a loss of root strength in the deciduous woody plants (hardwoods) and herbaceous species (e.g., grasses, sedges) in riparian areas. These practices have significantly contributed to the widespread and undesirable changes in channel morphology (e.g., widening, incision, loss of sinuosity). Current grazing practices continue to maintain channels in a degraded state and are preventing recovery.

11. One of the most important functions of streamside plant communities is that they provide stability to streambanks *via* their root systems (Sedell and Beschta 1991, National Research Council 2002). These roots bind soil particles and provide physical protection from the forces of flowing water. Thus, where grazing intensities are sufficiently high to suppress plant growth (Case and Kauffman 1997, Brookshire et al. 2002), the associated root strength is also diminished. Deciduous woody plants such as willow, dogwood, alder and other riparian hardwoods (because of their deep, woody root systems) in combination with sedges and grasses are extremely effective at providing bank stability. Over a period of many decades of livestock grazing, these important riparian functions have been largely lost for streams within livestock allotments of the Malheur National Forest. The long-term degradation of plant communities, stream channels, and associated resource values (e.g., wildlife food-web support, water quality, and fisheries) has been severe and wide-spread.

12. Deciduous woody species are extremely important in riparian systems not only for root strength and bank stability, but for a wide range of other ecological benefits (e.g., shading streams and helping to maintain cool water temperatures, food-web support for aquatic species, habitat and food-web support for wildlife including birds, beaver, wild ungulates, and others) (Johnson and O'Neil 2001, Wigington and Beschta 2000, Kauffman et al. 2001). Even where palatable woody plants have been able to persist on grazing allotments, they are normally heavily hedged from below (i.e., "highlined"), occur as widely scattered individuals, and have been functionally marginalized along streams due to the continued high rates of browsing from livestock. Any loss or

decrease in woody species near streams effectively allows other impacts from cattle (e.g., streambank shearing and trampling) to increase in severity.

13. Recruitment of woody browse species (i.e., their establishment and growth above the browse level of cattle) is typically non-existent on most allotments. The widespread lack of recruitment due to historical and current grazing indicates riparian hardwood species are eventually destined to be functionally extirpated (if they haven't already been so) from riparian areas within many grazing allotments on the Malheur National Forest. To illustrate the magnitude of browsing that is occurring, in October of 2009 I measured the heights of willows and cottonwoods outside and inside of small exclosures within the Hiyu unit of the Long Creek allotment, Malheur National Forest. Results indicate the dramatic effects current grazing is having on the growth and recruitment of woody plants (Attachment B). Outside of the exclosures, woody species (i.e., willow and cottonwood) were limited to an average height of no greater than 1.4 ft (43 cm), while inside the exclosures young willow and cottonwood were able to attain average heights of 6.0 ft (183 cm) and 5.3 ft (162 cm), respectively, with only four years of grazing protection. These data illustrate how annual grazing can totally suppress the height growth and recruitment of woody species. The severity of these impacts are apparently unrecognized by the Malheur National Forest. For example, in their 2008 End of Year Grazing Report for the Blue Mountain Ranger District, it was indicated that 6 grazing units had "light hedging" and an additional 83 grazing units (including the Hiyu unit) had "light to moderate hedging". Yet field measurements of plant heights on the Hiyu unit of the Long Creek Allotment indicate that current browsing levels are anything but "light to moderate" since woody species are unable to grow taller than 2 ft in height.

The current level of grazing on this allotment, and by extension to other allotments that are similarly rated as "light to moderate hedging" by the Forest Service, is heavily impacting woody plant communities and preventing their recovery. Without improved woody plant communities, impacts to water quality, stream channels, and fisheries will continue unabated.

14. The heavy utilization of herbaceous vegetation (e.g., grasses and sedges) due to high levels of grazing also reduces the capacity of these plants for maintaining stable streambanks during periods of high streamflow. When herbaceous plants are heavily grazed, the capability of their fibrous root systems for stabilizing streambank soils is diminished (Kauffman et al. 1983, Sedell and Beschta 1991, Belsky et al. 1999, Toledo and Kauffman 2001). Furthermore, when above-ground leaves and stems are removed by heavy grazing, the "hydraulic roughness" of these affected plants is reduced. As a result, grazed plants are ineffective at trapping the fine sediments during high flows, sediments that are necessary for rebuilding degraded streambanks (Elmore and Beschta 1987, Sedell and Beschta 1991, Belsky et al. 1999). Over time, degraded plant communities allow streambanks to become sources of increased sediment production.

15. Overhanging banks, formed by the root systems of streamside vegetation, perform several important ecological functions that benefit fisheries and are common where streams and their riparian systems are in good ecological condition. For example, overhanging banks and the plants that grow on them 1) provide shade to the stream and thus help prevent the occurrence of excessively high stream temperatures during the summer, 2) stabilize streambanks thus preventing or greatly retarding potential bank erosion during periods of high flow, and 3) shelter fish from predators. Overhanging

banks are essentially non-existent along streams and water courses of grazed allotments that I have visited on the Malheur National Forest. Due to a combination of long-term loss of root strength associated with persistent overgrazing, trampling and shearing of banks by livestock, and the subsequent erosion of these cattle-impacted streambanks during periods of high flow, over-widened and "dish-shaped" channel cross-sections with "laid-back" and "flattened" streambanks are exceedingly common along streams and rivers of the Malheur National Forest. Such channel morphology is indicative of highly degraded stream systems.

16. High levels of livestock herbivory occurring year-after-year can create, over time, the widespread occurrence of eroding banks, the loss of overhanging banks, over-widened channels (width-to-depths well in excess of 10), channel incision, and a loss of sinuosity (i.e., channels that become straighter over time. Thus, riparian habitats, habitats for fish and other aquatic organisms, water quality, and other riparian dependent resources continue to be negatively affected by livestock grazing. Given the current level of utilization by cattle of both woody and herbaceous species in riparian areas of grazing allotments, there is no opportunity for stabilization of streambanks or for the recovery of relatively narrow and sinuous channels (Magilligan and McDowell 1997).

17. Floodplain morphology and riparian plant communities are normally sustained by high flows in ecologically intact systems (Chapin et al. 2000). However, the over-widening or incision of channels that occurs as a result of heavy grazing over time can greatly reduce the frequency of overbank flows. Under such conditions, riparian plant communities thus become at risk of being hydrologically disconnected from the stream or river. Instead of moist-site vegetation typical of floodplain settings (Kovalchik

1987), species such as lodgepole pine, sagebrush, rabbitbrush, annual grasses, and others that are adapted to dry-site conditions become established and increasingly common. In essence, floodplain plant communities adapted to and which require high levels of soil moisture to sustain themselves are converted to more xeric (dry-site) plant communities. These latter types of plants seldom contribute to high quality fisheries since they are less efficient at trapping fine sediments and organic matter during overbank flows, are less effective at stabilizing streambanks, usually provide less shade, or are incapable of performing other important functions of riparian plant communities. Thus, the occurrence of "dry-site" vegetation upon streambanks and floodplains typically contributes to continued bank erosion and further prevents recovery of riparian plant communities and high quality fisheries habitat. On allotments of the Malheur National Forest where grazing has occurred over many years, field observations indicate that a loss of hydrologic connectivity has occurred between many streams and their floodplains, and it continues to occur.

B. Historical grazing practices on allotments of the Malheur National Forest have significantly contributed to increased summertime stream temperatures that can have major adverse consequences for cold-water fisheries (e.g., bull trout and steelhead). Current grazing practices are maintaining high summertime temperatures and preventing recovery (i.e., a reduction in high summertime temperatures).

18. Since vegetation shade is one of the most effective means of preventing solar radiation from reaching a channel (and heating the water), the loss of shrubs from along the streams and rivers of the Malheur National Forest are significantly contributing to

high summertime temperatures. Such temperature increases can be very stressful to cold water fisheries, and if high enough, potentially lethal. Thus, the direct loss of streamside shade is one of the major direct impacts of long-term overgrazing within the allotments of the Malheur National Forest.

19. With respect to stream temperatures, functional riparian plant communities have another important role. As previously indicated, the loss of streamside vegetation due to historical and ongoing grazing practices decreases the ability of plants for maintaining stable streambanks. One of the consequences of accelerated streambank erosion is that, over-time, channels widen and become shallower. As this occurs, solar energy (a major source of energy during the summer when high stream temperatures normally occur) is absorbed in an increasingly shallower stream. Since the effectiveness of a given energy loading for affecting maximum stream temperatures is inversely related to water depth (i.e., wide-shallow streams will have higher temperatures, Beschta 1984), any transition towards wide-shallow streams is likely to be detrimental to thermal regime for fish, particularly cold water species. Furthermore, where channels have incised, a common occurrence for streams in allotments that have experienced heavy grazing pressure over many years, the effectiveness of evaporation for preventing increased temperatures is greatly reduced (Benner and Beschta 2000).

C. Pat Larson's declaration (February 10, 2009) generally contends that the relatively rapid disappearance of cattle hoofprints along streambanks is proof that impacts to soils and streambanks are ephemeral and thus not a major concern.

20. Hoofprints, that are made by cattle on a soil surface in the summer or early fall, should visually become less distinct over time due to factors such as wind, rain,

freeze-thaw, biological modification, or other processes. However, this does not mean that such hoofprints are inconsequential to how these soils function or that the effect of a "hoofprint" disappears quickly. The occurrence of a hoofprint indicates soil compaction has occurred and soil compaction is a relatively long-lasting phenomenon. The hydrologic importance of a compacted soil is that infiltration rates can be greatly reduced thus causing increased surface runoff during rainfall or snowmelt events. Greater runoff, in turn, can increase surface erosion and the delivery of sediment laden water to streams. Heavily compacted soils close to stream channels are particularly prone to routing fine sediments directly into a stream because of short travel distances for both runoff and sediment. Because sediments from the erosion of floodplains or streambanks are generally of a relatively fine texture (clay, silts, fine sands), their particles can be particularly damaging to fisheries (e.g., decreased egg survival in spawning gravels).

21. Also of major importance with regard to cattle hoofprints is the shearing of streambanks. The hoof pressure exerted by cattle can physically displace soil along streambanks and is an extremely effective mechanism for causing the collapse of overhanging banks. Bank shearing and collapse are extremely effective since they cause streambank erosion that results in channel widening and elevated instream sediment loads. Thus, the widespread occurrence of bank shearing and active streambank erosion evident in the much of the monitoring data and photographs for allotments on the Malheur National Forest are strong evidence of cattle impacts to water quality and fisheries. Normally, in low-gradient stream systems where riparian plant communities are not impacted by cattle, well-vegetated floodplains and streambanks coexist with relatively narrow and typically sinuous channels that provide high quality fish habitat.

D. Pat Larson's declaration (February 10, 2009) indicates that each year, whether riparian plant communities are grazed or ungrazed, the vegetation achieves a fully productive state.

22. Larson's photographs of ungrazed pastures in the Murderers Creek and Lower Middle Fork allotments indicate that significant growth of herbaceous vegetation can occur during the growing season. The amount of vegetative regrowth, in the absence of livestock grazing, is often quite impressive. However, photographs of vegetative growth taken in mid-summer provide little assurance of recovering streambanks and fish habitat if these plants are subsequently grazed. Current grazing practices on allotments of the Malheur National Forest greatly impact the important functions streamside plants provide for fish habitat (e.g., shading and thermal moderation of the stream in late summer, overhanging banks, streambank protection from erosion, invertebrate flux from the vegetation to the stream). The removal of above ground biomass through foraging (in addition to the mechanical effects to soils such as compaction and bank-shearing) simply ensures the continued degradation of streambanks, channels, and fish habitat during periods of high runoff that normally occur after cattle are removed and before plants begin to grow again the following year (i.e., late-summer or early-fall rainfall or during springtime snowmelt runoff). Thus, non-use (i.e., non-grazing) is needed for these plant communities to continue their recovery so that they can begin to stabilize eroding streambanks and reform highly altered channels. The degradation of these riparian/aquatic systems from grazing has occurred over many years thus it should be of no surprise that recovery will also require a number of years of protection from current grazing practices.

23. It should also be noted that palatable woody plants (e.g., willows, cottonwoods) need several years of protection from excessive herbivory if they are to become established and grow above the browse level of cattle (e.g., Attachment B). Since deciduous woody species (many of which are highly palatable to cattle and other large herbivores) are normally an important component of eastern Oregon's riparian plant communities, their recovery is necessary if improvements in water quality and fish habitat are to occur.

E. Pat Larson's declaration (February 10, 2009) further indicates that 1) livestock are not causing fine silt or clay particles to enter the stream in amounts that can be harmful to fish and 2) there were 0% fines in streams that were monitored in 2007 and 2008.

24. Field observations over many years along streams in eastern Oregon, and specifically those on the Malheur National Forest Allotments, indicate that increased sediment production is a common feature of grazed riparian areas. Potential contributors of increased sedimentation include accelerated surface erosion from riparian (and upland) sites where vegetation has been degraded and soils compacted as well as from streambanks where vegetation has been degraded and soils have been physically altered (shearing/collapse). While the of act bank shearing/collapse usually occurs in summer or fall when cattle are grazing a particular allotment and streamflows are relatively low, increased instream sediment production from these banks normally occurs during subsequent periods of high runoff (i.e., rainfall during late-summer or early fall, snowmelt runoff the following spring). Given the highly altered condition of many streambanks in the Murderers Creek or Lower Middle Fork allotments, it is

incomprehensible to me how one could sample multiple streambeds and attain "0%" fine sediments in all instances. I'm unaware of any published studies for eastern Oregon, or elsewhere, that show 0% fine sediments. Even watersheds undisturbed by large herbivores would normally have some level of fine sediments ("fine sediment" normally comprises particles in the clay, silt, and fine sand fractions) in their substrates.

F. Loren Stout's declaration (February 10, 2009) indicates that feral horses as well as wild ungulates (primarily elk) are present on the Murderers Creek Allotment. Exhibits associated with Loren Stout's declaration identify various streambank and instream impacts attributed to these large herbivores.

25. Large herbivores native to eastern Oregon include elk and deer whereas horses and cattle have been introduced. In Loren Stout's declaration, photographic evidence is presented that indicates feral horses and native elk are creating considerable impacts to riparian vegetation and stream channels. The types of impacts identified (e.g., deterioration of streambank vegetation, bank shearing/collapse, bare soils, streambank erosion, increased sediment production, trampling and disturbance of streambeds) that are being attributed to horses and elk are the same as those caused by cattle. Most of the photographic evidence of feral horse and elk damages provided by Mr. Stout is associated with animal crossings. Such localized impacts are considerably different than the more extensive impacts associated with cattle that utilize riparian areas and streams in late summer or early fall. During these warm periods, cattle often concentrate their foraging efforts adjacent to streams as is indicated by high concentrations of cattle fecal matter at these locations. Based on the relative frequency of cattle, horse, and elk fecal matter that I have observed in the field on various occasions, I would conclude that foraging cattle

represent the primary cause of altered plant communities and damaged streambanks on allotments of the Malheur National Forest. Furthermore, where vegetation and streambank impacts by feral horses or elk exceed forest standards related to stubble height or bank alteration, it would seem such conditions would necessitate the reduction/removal of cattle from those impacted allotments.

26. In conclusion, the cattle grazing on allotments of the Malheur National Forest are causing degraded riparian and aquatic systems, are causing degraded water quality (temperature and sediment), and are adversely affecting fish habitat. While one year of cattle non-use represents an important first step in the recovery of riparian plant communities, stream channels, and fish habitat, additional protection from grazing in subsequent years will be needed if significant levels of recovery are to be achieved.

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 _16th___ day of March 2009.

_s/ Robert L. Beschta____________________________

Robert L. Beschta, Ph.D.

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