Barry L. Perryman, Ph.D.
Professor of Rangeland Ecology and Management
Department of Agriculture, Nutrition, and Veterinary Sciences
University of Nevada-Reno

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Mr. Chairman, Members of the Committee; I am honored to be here and wish to express my gratitude for this opportunity to inform you and the people you represent on what I and others in my profession recognize as an extremely important issue, often unknown and sometimes overlooked or perceived as inconsequential by a significant portion of both our citizenry and our elected representatives.

As you know, Land Grant Universities authorized by the Morrill Act are supported in part by funding derived from Hatch Act allocations. My institution, the Nevada Agricultural Experiment Station at the University of Nevada-Reno, is attempting to fulfill the directive of conducting agricultural research for the constituents of Nevada, the various states and territories of the United States, and semi-arid areas of the world. Researchers from my Experiment Station have partnered with colleagues within the U.S. and throughout the world to enhance our understanding and practices of agriculture, natural resources, and nutrition.

In my personal research endeavors, I have worked, and continue to work very closely with the Agricultural Research Service Centers in Reno, NV and Burns, OR. Our partnerships are providing new and exciting research focused on livestock grazing in the Intermountain West. As a specific example, a significant body of published, peer reviewed scientific literature has formed over the past ten years that addresses the beneficial role that targeted, well managed livestock grazing can have on the management of fine fuels and invasive species. This is the central point of my testimony today.

But first, I must provide some context. The ecosystem process of herbivory or grazing is often promoted and understood with a negative connotation, especially livestock grazing when it is practiced on public lands. Indeed, a quick search engine word search of *livestock grazing* will provide any number of negative responses written in superlative language. However, almost never do these publications and opinions describe the kind of grazing that is being castigated as a villain. This is also unfortunately true in portions of scientific literature. The process of grazing has three components, timing, duration, and intensity. In other words, when are the animals grazing an ecosystem, how long are they grazing it, and how intensely are they grazing it while they are there? If the three components are applied in an inappropriate way, there can be negative effects. But, when these three components are in balance with the management objectives and growth stages of the plant communities that are being grazed, some very beneficial ecosystem services become a product of the grazing practice.

If we were to substitute the term surgery in place of livestock grazing, we notice that the terms are similar in their application. Targeted, well managed surgery performed at the appropriate time, intensity, and duration, can have a profound beneficial effect on the health of the patient. But surgery performed at the wrong time, intensity, and duration can and has created serious harm. Knowing the tradeoffs or risks between good and bad surgery however, will never incite the public to declare that surgery is altogether bad, and that it has to be stopped immediately in all its forms! Why is livestock grazing viewed with contempt by many while surgery is seen as a blessing?

The body of research that I mentioned earlier and have attached to my written testimony, addresses two issues of significant concern. Wildfire and invasive weeds have been on the forefront of the conversation for more than two decades in the Intermountain West, most recently in the form of sage grouse habitat concerns. Wildfire has been universally identified as the most challenging threat to the sagebrush ecosystem, and invasive annual grasses comprise a significant portion of that risk. A landscape scale approach is needed to remediate the threat potential. The only, truly landscape scale tool that land managers have at their disposal is a better understanding and practice of fuels management. And the only application that can bring a landscape scale infrastructure to that remediation is targeted livestock grazing. Given this, I and others have sought to understand the role that targeted livestock grazing can play in fuels and invasive species management.

Recent, joint Nevada Agriculture Experiment Station and Agriculture Research Service Center (Burns and Reno) research has demonstrated how targeted livestock grazing can beneficially affect fine fuel characteristics and change the dominance of invasive annual grasses at a landscape scale. Implementation of this new, cutting edge research will require a paradigm shift in the way public lands are managed in the Great Basin and public lands in other western states as well. Science is demonstrating that targeted livestock grazing can reduce the amount of fuel, reduce flame lengths, break up the continuity of fuel, decrease the spatial extent of burns, and at the same time reduce the mortality of perennial grass plants subjected to wildfire. All of these effects are beneficial for sage grouse and other sagebrush obligate wildlife species, not to mention the cost savings associated with fire suppression, and the buffering of economic fallout endured by rural communities in the wildland-urban interface resulting from post-fire management directives and grazing moratoriums. All of these fire related issues have been addressed with published research by rangeland ecologists working in the Great Basin.

The invasive annual grass, Cheatgrass, has become dominant on over 100 million acres across the Intermountain West. Its presence in sagebrush and salt desert shrub communities has contributed to all sorts of degradation, but primarily it alters normal fire regimes and through its competitive nature comes to dominate the plant communities it invades. Its arrival and movement across the landscape has been phenomenal, and its competitive ability that allows it to become dominant is well known.

After many years of speculation, new research is telling us how we got to this point. We have now discovered the underlying cause that allows the competitive abilities of Cheatgrass to be expressed. For the last several decades, we have used grazing systems that were developed for use in perennial grass ranges. These grazing systems work well when they applied to perennial

grass systems. With the advent of Cheatgrass invasion, sagebrush grasslands in the Great Basin can no longer be described as perennial grass systems. Instead they should now be recognized as mixed perennial-annual grass systems. The grazing systems and other management techniques that have been used for the past four or five decades are inappropriate for the ecosystems to which we have applied them. When this misapplication was combined with substantial indiscriminant reductions in authorized AUM consumption, the situation grew worse, not better. Through our management approach, we have created the perfect environment for Cheatgrass to dominate. Why does Cheatgrass have such a competitive advantage over perennial grasses under the current management scenario? It is because the management systems actually protect Cheatgrass from being grazed, leading to a buildup of carryover fuels from one year to the next. Cheatgrass has become dominant because we have not accounted for the amount of litter or fuel left on the ground at the end of the grazing season. Cheatgrass requires litter or ungrazed fuels in order to expand its dominance. The more litter or ungrazed fuels we leave on the ground at the end of the grazing season going into fall, the more Cheatgrass will increase over time. If someone instructed me to devise a plan that would maximize Cheatgrass production and dominance in the Great Basin, the only thing I would do differently that what has been done over the past 40 years, is remove all the domestic animals from Cheatgrass invaded areas. Almost every management action employed over the last four decades has unknowingly fostered the Cheatgrass explosion.

The good news is that research has demonstrated how to reverse the Cheatgrass explosion across the landscape. It has demonstrated how to reduce the amount, continuity, and height of fine fuels. It has shown us how to reduce the mortality of perennial bunchgrasses that compete with Cheatgrass after wildfires. We do this through a new management paradigm that considers and reduces the amount of fine fuels that are left after the traditional or authorized grazing season. We must begin to more precisely manage the standing, carryover fuels during the fall. Targeted, fall livestock grazing is the key, and an Agriculture Experiment Station-Agriculture Research Service partnership has opened this door through new research.

If we continue our present management course, refusing to integrate this new research into NEPA planning documents and Land Use Plans at all levels, we cannot expect anything except a continued expansion and dominance of Cheatgrass and the subsequent wildfire regimes that accompany it.

The Dust Bowl of the 1930s can serve as a model for how environmental challenges in far off, out of the way places can have significant impacts on the lives and livelihoods of people that live and work remote distances away from the center of the challenge. The Dust Bowl happened at the nexus of global politics, agriculture, economics, land disposal policy, the birth of mechanization, and a limited understanding of the ecosystems being converted to crop agriculture. However, the basic cause of the problem was the imposition of an agricultural system on an ecosystem for which it was wholly unsuited. That does not mean that small grain agriculture cannot be conducted in a sustainable way in the Southern Plains. It has been successfully and sustainably conducted over the past 75 years since the Dust Bowl. The agricultural management systems that were developed to mitigate the disaster were appropriately suited to the Southern Plains ecosystem. New research of that time included terracing, contour

plowing, and other soil and water conservation practices that stabilized the soil and reversed the ecological disaster. President Roosevelt's administration implemented the new science.

In an op-ed article I wrote this past year, I compared the circumstances of the Dust Bowl with what I have termed the Cinder Bowl in the Great Basin. The similarities between the circumstances that led to the Dust Bowl and what is going on today in the Great Basin, are striking. If we as a society continue to manage the Great Basin in the status quo of the past four or five decades, there will be a Cinder Bowl. We can only hope that it will not take the appearance of smoke from Nevada settling in over the National Mall as it did when President Roosevelt found dust from Oklahoma on his desk in the Oval Office.

It is frustrating when researchers see new scientific discoveries being ignored by the very entities that are legally mandated to use the best available science. There is evidence that the status quo is being not only honored but mandated by some managers and administrators that provide biological opinions for federal land management agencies. In the Final Environmental Impact Statement for sage grouse in Nevada, section 2.6.3, states "There are currently no science-based studies that demonstrate that increased livestock grazing on public lands would enhance or restore GRSG (greater sage grouse) habitat or maintain or increase GRSG abundance and distribution." It is unclear whether this is a blatant disregard of new fuels management and invasive species research, or if it is honest ignorance and a lack of professionalism. In either case, it is unacceptable. I and others believe that it is completely unacceptable for a Federal agency such as the Fish and Wildlife Service to state without reservation that wildfire is the greatest threat to the sagebrush ecosystem and simultaneously exclude any and all references to fuels and invasive species management through targeted livestock grazing. The body of research that I have introduced today, was introduced in the Nevada State Preferred Alternative of the Nevada Sage Grouse FEIS, yet completely ignored. It is my sincere desire that Federal land management agencies stay abreast of, and implement new and current research that can benefit the public trust. If they ignore or place themselves in a position denying the implementation of new science, I assure you, smoke and ash from the Cinder Bowl *will* come to Washington D. C.

New Nevada Agriculture Experiment Station and Agriculture Research Service Publications addressing fine fuel and invasive species management:

Svejcar, T., et al. (Perryman, Stringham). 2014. Western Land Managers will Need all Available Tools for Adapting to Climate Change, Including Grazing: A Critique of Beschta et al. *Environmental Management*, 53:1035-1038.

Schmelzer, L., B. Perryman, B. Bruce, B. Schultz, K. McAdoo, G. McCuin, S. Swanson, J. Wilker, and K. Conley. 2014. Case Study: Reducing cheatgrass *(Bromus tectorum L.)* fuel loads using fall cattle grazing. *Professional Animal Scientist*, 30:270-278.

Trowbridge, W., Albright, T., Ferguson, S., Li, J., Perryman, B. L., Nowak, R. S. 2013. Explaining patterns of species dominance in the shrub steppe systems of the Junggar Basin (China) and Great Basin (USA). *Journal of Arid Lands*, 5:415-427.

Davies, K.W., J.D. Bates, C.S. Boyd, and T.J. Svejcar. 2016. Prefire grazing by cattle increases postfire resistance to exotic annual grass (Bromus tectorum) invasion and dominance for decades. *Ecology and Evolution*, doi: 10.1002/ece3.2127

Davies, K.W., C.S. Boyd, J.D. Bates, and A. Hulet. 2016. Winter grazing can reduce wildfire size, intensity, and behavior in a shrub-grassland. *International Journal of Wildland Fire* 25:191-199.

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Freese, E., T. Stringham, G. Simonds, and E. Sant. 2013. Grazing for Fuels Management and Sage Grouse Habitat Maintenance and Recovery: A Case Study from Squaw Valley Ranch. *Rangelands* 35(4):13–17.

Gruell, George E. and Sherman Swanson. 2012. Nevada's Changing Wildlife Habitat: An Ecological History. University of Nevada Press, Reno. 178 pp.

Swanson, S., S. Wyman, and C. Evans. 2015. Practical Grazing Management to Maintain or Restore Riparian Functions and Values. *Journal of Rangeland Applications*, 2:1-28.

McAdoo, J. K., B. W. Schultz, and S. R. Swanson. 2013. Aboriginal Precedent for Active Management of Sagebrush-Perennial grass Communities in the Great Basin. *Rangeland Ecology and Management*, 66(3):241-253.

Dalldorf, K. N., S. R. Swanson, D. F. Kozlowski, K. M. Schmidt, R. S. Shane, and G. Fernandez. 2013. Influence of Livestock Grazing Strategies on Riparian Response to Wildfire in Northern Nevada. *Rangeland Ecology and Management*, 66(1):34-42

Swanson, S. and W. Gilgert. 2009. Fuels Management at the Landscape Scale. *Rangelands, 31(2):25-29.*

Tanaka, J. A., L. Coates-Markle, and S. Swanson. 2009. SRM Center for Professional Education and Development: Wildfires and Invasive Plants in American Deserts. *Rangelands*, 31(2):2-5.

Schultz, B.W**.,** M. Ryan, J. Buk, R. Davis, M. Havercamp, S. Lewis, M. Rebori, S. Emm and S. Swanson. 2009. Evaluation of Nevada's State-wide Sage Grouse Planning Effort: Paid vs. Non-paid Participants. UNCE Special Publication 09-09. 41 p.

Ryan, M., B.W. Schultz, S. Lewis, J. Buk, R. Davis, S. Emm, M. Havercamp, M. Rebori and S. Swanson. 2006. Nevada Sage Grouse Conservation Planning Facilitation Study. UNCE Special Publication 06-03.22 p.

Schultz, B.W. 2004. Analysis of Studies Used to Develop Herbaceous Height and Cover Guidelines for Sage Grouse Nesting Habitat. UNCE Special Publication 04-11. 25 p.

McAdoo, J.K., B.W. Schultz and S.R. Swanson. 2003. Habitat Management for Sagebrush Associated Wildlife Species. UNCE Fact Sheet 03-66. 4 p.

Schultz, B.W. 2010. A Review of Nest Trampling by Livestock and the Implications for Ground Nesting Birds on Shrub-Grass Rangelands in the Western States. In: Proceedings Fourth National Conference on Grazing Lands). Reno, NV. Pages 540-550.

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