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Dear Chairman Goicoechea:

As Dean of the College of Agriculture, Biotechnology, and Natural Resources (CABNR), and Director of the Nevada Agricultural Experiment Station (NAES), I have been asked to conduct a review of the Nevada and Northeastern California Greater Sage-Grouse Proposed Land Use Plan Amendment and Final Environmental Impact Statement (FEIS). Accordingly, I have imposed upon three faculty members with expertise in Range Ecology and Management, and one with expertise in Agricultural and Natural Resource Economics, to review the FEIS. I have also asked a retired Professor of Range Science from the University of California, Davis, for comments, and reviewed earlier comments made by two University of Nevada Cooperative Extension (UNCE) experts on the draft Environmental Impact Statement (DEIS).

CABNR and NAES strive to play leading roles in addressing key issues in Nevada in the areas of agriculture, food production, nutrition, veterinary sciences, biotechnology, natural resources, and environmental sciences through research, teaching and outreach. We partner closely with UNCE with a view towards improving lives of Nevadans.

The FEIS is a very long (more than 2,000 pages) and cumbersome document intended to "help to conserve greater sage-grouse habitat and support sustainable economic development" (BLM, 2015a). My review will mostly be restricted to matters of science and process.[1] I do not presume to give any legal opinion, but since the FEIS addresses issues of sustainable natural resource use and agriculture, I do find it appropriate to point out that there is a legal definition of sustainable agriculture in the United States (U.S. Code Title 7, Section 3103):

[1] One of the most troubling aspects regarding process is inadequate time given to study a large document that had significantly changed since its draft form. The DEIS was issued on November 22, 2013, and the FEIS on May 28, 2015. Thus, while the BLM took more than one and one-half years to revise the EIS, the public was only allowed 30 days to protest the FEIS, which exceeds 2,000 pages in length, and 60 days for consistency review. This despite the fact that there were major departures from and additions to the DEIS, and lack of response to or incorporation of many comments that were well grounded in science [For example, Humboldt County (2014) submitted a 40 page critique of the DEIS written largely by a UNCE expert, replete with a great many scientific citations. It was virtually ignored in the FEIS]. Some revisions included important changes in methodologies, with insufficient justification or explanation for the public, making it difficult if not impossible even for scientific experts to make an informed response.

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*Sustainable agriculture means an integrated system of plant and animal production practices having a site-specific application that will over the long-term:*

- *Satisfy human food and fiber needs.*
- *Enhance environmental quality and the natural resource base upon which the agriculture economy depends.*
- *Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls.*
- *Sustain the economic viability of farm operations.*
- *Enhance the quality of life for farmers and society as a whole.*

I will also point out a recent Supreme Court that affirms that agencies "must consider cost—including cost of compliance—before deciding whether regulation is appropriate and necessary." In other words, policies that do not take into account the economic viability of farm operations or quality of life for farmers and ranchers are counter to sustainable agriculture, and federal agencies must take into account the costs of new policy regulations to the farming and ranching community.

**Background**

As you are aware, the US Department of Interior Bureau of Land Management (BLM) and US Department of Agriculture Forest Service (FS) are together responsible for managing approximately 178 million of 260 million ha of public lands in the United States. In Nevada, the U.S.'s driest state, the federal government manages 87% of the land, a higher percentage than in any other state. These BLM- and FS- managed lands are essentially common lands which, by statute, must be managed for diverse, often competing uses[2], among them wildlife, ranching, recreation, and extractive industries. Historically, ranching practices on these common lands were a case study in unregulated land degradation, and figured prominently in Garret Hardin's seminal paper "Tragedy of the Commons" (Hardin, 1968). By the mid 1880's, western lands had undergone unrestricted grazing for more than three hundred years, and had a cattle population of 35-40 million animals (Skaggs et al., 2011). Several measures were taken to assert federal control over these lands, including creation of the Forest Service in 1905, and passage of the Taylor Grazing Act of 1934, which was intended to prevent overgrazing and soil deterioration, achieve orderly use and improvement of the lands, and stabilize the livestock industry that depended on the lands (Skaggs et al., 2011). Since the passage of the Taylor Grazing Act, the number of animal unit months (AUM) permitted by federal agencies has declined dramatically, and continues to do so. For example, in Nevada, federal land AUMs fell between 1980 and 1999 by 473,553, or 16%, with a corresponding negative economic impact of $24,800,000 on the state, which fell disproportionally on rural economies (RCI, 2001) . According to the Department of Interior's Fact Sheet on Management of Livestock Grazing, "Grazing use on public lands has declined from 18.2 million AUMs in 1954 to 8.5 million AUMs in 2013" (DOI, 2015). Between 1949 and 2011, the number of BLM grazing leases fell from about 31,000 to 18,700 (DOI, 2013). During more or less that same period, populations of greater sage grouse are also generally estimated to have dropped. For example, Connelly and Braun (1997) estimated that the of number of males per lek decreased by an average of 33% from the early 1950's to the late 1990's across 10 states and one province. Braun (1998) concluded that declines in sage grouse populations were not attributable to one factor (including grazing), but rather to a complexity of factors.

[2] "Where there are competing resource uses and values in the same area, Section 103(c) of FLPMA (43 U.S.C. 1702(c)) requires that the BLM manage the public lands and their various resource values so that they are utilized in the combination that will best meet multiple use and sustained yield mandates." (BLM, 2015b).

**Science**

According to both BLM policy[3] (BLM, 2015b) and NEPA statute[4], integrated scientific approaches, i.e. those that use both biophysical and social sciences, must be used in developing and preparing environmental impact statements. When it comes to governance of rangelands as a "common-pool resource" (CPR), sound management demands the integration of these two groups of sciences, simply because "...solutions to land degradation and desertification have human roots that require societal answers" (Reed et al., 2015).

Integration of these two groups of sciences to better govern and manage ecoystems is in fact one of the cutting edges of science. I have recently served on two National Science Foundation panels that awarded $50 million grants to address the integration of social and biophysical sciences to better manage multi-purpose ecological systems in the United States, and I chaired the Scientific Advisory Committee to the 3rd Scientific Conference of the United Nations Convention on Combatting Desertification, which dealt with similar issues in drylands around the world. A major finding of that convention (UNCCD, 2015) was:

> An environment of co-learning that places value on “hybrid knowledge” needs to be fostered in research. In such an environment, the perceptions and experiences of local populations are recognized, and social, economic and biophysical information is integrated. Since cultural and socioeconomic factors influence adaptation options, local stakeholders must be involved in both the identification of scientific questions and the search for solutions

Hardin believed that the only ways to manage CPRs were 1) privatization of the commons, and 2) “socialism,” i.e. control by government (Hardin, 1978)--and he preferred privatization. However, alternative views on governance of CPRs have emerged, such as those of Nobel Prize Laureate Elinor Ostrom (1990), who found commonalities among several long-term, sustainably managed CPRs, including those in the United States. All of them a) faced uncertain and complex environments; b) comprised individuals who shared a past and expected to share a future; c) exhibited sheer perseverance; and d) relied on rules defining when, where, and how an individual’s allotted resource units could be harvested. Certainly these commonalities apply to ranching communities in Nevada. Ostrom (1990) also identified eight “design principles,” supported by follow-up studies (Cox et al., 2010), that were common among long-enduring CPRs. Some that are relevant to the FEIS and its Land Use Plan Amendment include:

- Appropriation rules should be related to local conditions;
- Individuals affected by operational rules should be able to participate in modifying the operational rules, i.e. flexibility is needed when justified;
- Monitors who actively audit CPR conditions and appropriator behavior should be accountable to the appropriators;
- Graduated sanctions should be used against those who violate operational rules; and
- Conflict-resolution mechanisms that are rapid and low-cost are needed to resolve conflicts among appropriators and officials.

[3] "Environmental impact statements shall be prepared using an inter-disciplinary approach which will insure the integrated use of the natural and social sciences" (BLM, 2015c).

[4] Section 202(c) of FLPMA (43 U.S.C. 1712) requires that in developing land use plans, the BLM a) use and observe the principles of multiple use and sustained yield; and b) use a systematic interdisciplinary approach to integrate physical, biological, economic, and other sciences.

These principles are more than abstract, academic prattle, and instead reflect increasingly mainstream, science-based, and widely accepted approaches to managing CPRs including public rangelands. In my career I have seen these basic principles help achieve sustainable land management of public lands, both as director of a large, integrated research program implemented in 24 dry countries to sustainably improve agricultural productivity and economic condition, and as research director of the Borlaug Institute for International Agriculture, which addressed CPR issues around the world. These principles are also largely consistent with statements of the National Academy of Science, one of the most prestigious scientific societies in the United States, in its recent critique of BLM management of feral horse populations (NAS, 2013):

> "Resolving conflicts with polarized values and opinions regarding land management rests on the principles of transparency and community-based public participation and engagement in decision-making. Decisions of scientific content will have greater support if they are reached through collaborative, broadly based, integrated, and iterative analytic-deliberative processes that involve both the agency and the public."

The current method of control of Western public lands, “socialism” through control by federal agencies, is constantly subject to litigation by entrenched political and philosophical adversaries, and therefore very slow to change or adapt. Some groups have even used the Equal Access to Justice Act to recover attorney fees and other litigation costs from the federal government at taxpayers’ expense. A strong case could be made that this approach to managing CPRs is not achieving sustainable land management, including habitat restoration, based on increased levels of catastrophic fires, invasive species, habitat degradation, an unsustainable and growing number of feral horses, and other manifestations of desertification (Miller and Narayanan, 2008).

Thus, to summarize, based on current knowledge in integrated social and biophysical sciences, and design principles for sustainable management of CPRs, long-term, sustainable land use plans should include: recognition of the perceptions and experiences of local populations who gain livelihoods from CPRs; integrated social, economic and biophysical science; rules appropriate to local conditions and local knowledge; the ability to modify rules or exercise flexibility; monitors who are accountable to land users or appropriators; rapid and low-cost conflict resolution between officials and appropriators; and transparency and public participation in decision making.

There are many examples in the West of such CPR management approaches to improve rangeland productivity and ecosystem functioning, including for sage grouse and other wildlife habitat. One is the Stewardship Alliance of Northeast Nevada (SANE), a group of landowners who strive to improve sage-grouse habitat (Nature Notes, 2013) through on-the-ground habitat projects, with a long term view towards collaborative solutions to habitat-related conflicts. Together, they own or lease 0.7 million ha of prime sage-grouse habitat, including BLM and FS allotments. The group uses a landscape and watershed approach to land management in an effort to benefit all animals that depend on sagebrush, and at the same time help their own ranch operations. It is an outgrowth of the Shoesole Holistic Management Team which has been effective on a growing number of ranches for more than 20 years. In addition to ranch families, members of the group include personnel from federal agencies (FS, BLM, USFWS, and Natural Resource Conservation Service) state agencies (Nevada Department of Wildlife, Nevada Department of Forestry, and University of Nevada Reno) and environmental or conservation groups (e.g. Trout Unlimited). With the aid of a multi-stakeholder technical advisory committee, SANE has divided land area into four sage-grouse population management units. They examine the risks and possible actions to lessen those risks, prioritize projects planned for each PMU, and implement grazing and land rehabilitation or preservation goals accordingly. By

any standards that I know of, in the 20 years of operation, the Shoesole and more recently SANE teams have achieved remarkable results, while changing the tone of conversation on a divisive, emotionally polarized issue.

SANE isn't unique. As the Western Governors Association has pointed out in letters to the Department of Interior, there are many similar groups across the West (WGA, 2014a, b). One, from Utah, which has been in operation since 1996, was just recognized for its impact by being named State Program Winner for Multi-State Research during the Western Region Joint Summer Meeting of land grant universities (CSU, 2015). The Utah network includes 111 community-based local sage grouse working groups throughout the state, as well as cooperators from the Governor's Office, and federal, state, industry, and private-sector partners.

Because SANE and similar groups take pains to incorporate many of the principles of design and participatory decision making espoused by Ostrom (1990), the National Academy of Sciences (NAS, 2013), and international organizations (UNCCD, 2015), their approach to restoring and maintaining sage-grouse and other wildlife habitat is much more likely to have sustained impact and success. Yet they also address issues of sustainable agriculture, including profitability and quality of life. The approach that such groups take stands in stark contrast to the litigious, non-transparent, non-participatory, inflexible, and top-down approach increasingly taken by federal land-management agencies.

**SETT Letter of Protest**

The Sagebrush Ecosystem Technical Team (SETT) letter of protest written to Director Kornze of the Bureau of Land Management, dated June 29, 2015, expressed concern regarding: 1) Adaptive Triggers, 2) Allowance of Other Unspecified Mitigation Systems, 3) BLM and USFS Habitat Objectives/Desired Conditions, 4) Sagebrush Focal Areas, 5) Exclusion Areas, 6) Three Percent Disturbance Cap, 7) Livestock Grazing, 8) Map Update Process, 9) "No mitigation requirement in OHMAs or mitigation requirement for indirect impacts to PHMA and GHMA as a result of disturbances occurring in OHMAs," 10) Travel and Transportation Management, and 11) Wild Horse and Burro. Dr. Sherman Swanson, who is Associate Professor of Rangeland Ecology and Management, and holds a joint appointment with CABNR, NAES, and UNCE, served on the Nevada Sagebrush Ecosystem Council, and contributed his expert opinion to the letter.

Each of the SETT concerns could be the topic of very lengthy reviews, but constraints for space and time (including very short protest and consistency review periods) preclude this. Instead, I have tried to concisely summarize problems of science and process for nine of these eleven concerns in Table 1. A few additional remarks are warranted on some of these concerns.

Adaptive Triggers. For certain forest, district, and field offices, e.g. Winnemucca, "Drought Response Actions" based on drought prediction tools are proposed (p. 27-28). The Drought Response Plan uses the U.S. Drought Monitor developed by the National Drought Mitigation Center (NDMC), despite the fact that the NDMC “recommends that decision makers adopt an operational definition of drought for their own circumstances, incorporating local data such as grazing conditions or streamflow at a nearby gauge”. The Winnemucca District Drought Response Plan does not generate a local operational definition, as advised by the DM's developer, but rather uncritically accepts the drought categories generated by the DM. For Nevada, the DM categories are determined solely by the Surface Water Supply Index (SWSI) and snowpack water equivalent. Dissimilarity comparisons are determined based on current SWSI and snowpack values, and long-term averages. This approach to setting a drought trigger is scientifically unjustified and demonstrates a lack of understanding of basic rangeland ecology. These metrics have little to no ability to serve as accurate

indicators of annual herbage production. Declaring drought based solely on DM data misses the ecological principle that shallow rooted plants, such as grasses, do not depend on the amount of absent precipitation prior to the recent months affecting the effective growing season. Aboveground biomass production of herbaceous species is strongly affected by the amount and timing of precipitation that occurs when it influences soil moisture in the thermal growing season. This basic ecological concept is known as the effective growing season. Greater flexibility for grazing management decisions--one of Ostrom's (1990) common design principles among sustainable CPR management--can be achieved by using more accurate prediction tools that recognize the effective growing season concept. Either or both the crop year (Sept 1-June 30) or April + May + June precipitation can serve as more accurate predictors of plant growth or forage production (Sneva and Hyder, 1962; Mosley 2001; Mosley 2015). Both have been utilized successfully (Daubenmire 1956; Sneva and Hyder 1962), and take into account the effective growing season conditions. When the drought monitor indicates drought in January, February or even March of the current year, that categorization may be totally irrelevant to the effective growing season and herbaceous plant growth (Craddock and Forsling 1938; Hutchings and Stewart. 1953; Blaisdell 1958; Sharp 1970; Sneva and Britton 1983; Derner and Hart, 2007; Smart et al. 2007). In the Great Basin, it is common for about 50-60 percent of precipitation to occur from October through March, and about 30 percent to occur in the spring months of April through June (Western Regional Climate Center, 2015). The former period coincides with winter plant dormancy of both herbaceous and woody plant species; thus, little or no plant growth occurs. Most of the precipitation during this period has the potential to infiltrate deep into the soil profile and restore moisture needed by deep rooted woody species that may serve as forage for grazing animals later in the growing season. Animals with a preference for grazing (e.g., elk, cattle, sheep) can switch diet preference to woody plants as a source of protein when grasses begin to mature and senesce, and as shallow soil moisture becomes depleted during the summer and early fall months. When actual root zone drought occurs, the results are less biomass production and/or a shorter period for the plant to complete its annual growth cycle, including the production and storage of energy reserves. Bunchgrasses exposed to as little as 50% of mean annual effective growing season precipitation typically show about a 50% decline in the number of perennating buds needed for regrowth the next growing season (Busso et al. 1989). However, drought stressed grass plants can still have as many as 3 buds per tiller, even after three years of drought (Busso et al. 1989). Three buds are sufficient to ensure plant survival and rapid recovery to pre-drought growing conditions. Additionally, the concentration of stored energy reserves often increases in drought stressed plants (Busso et al. 1990), although the total amount of stored energy may decline because there are fewer buds, less tiller development, and smaller root systems. Perennial grass plants must maintain enough stored energy to keep growing points alive during long dormant periods; thus, plant growth will cease before energy storage ceases.

The Winnemucca District Drought Response Plan also uses the Vegetation Drought Response Index (VDRI) for determination of drought. The VDRI is a predictive model that includes as inputs the Palmer Drought Severity Index (PDSI, for unirrigated cropland), Standard Precipitation Index (36 week), and the satellite imagery indices Percent Average Seasonal Greenness (PASG) and Start of Season Anomaly (SOSA), along with several biophysical parameters. The VDRI website states that “No single measure can be used to assess the accuracy (both quantitatively and qualitatively) of the VegDRI because of the varying definitions of drought.” Recognizing the limitations of both the DM and VDRI are paramount to any delineation of drought occurrence, severity, and timing. The VDRI cannot predict drought in the coming growing season because reflectance of green or non-green plants must be determined in real time. Both the DM and VDRI may serve as indicators of potential drought, but soil moisture drought can only be assessed as a growing season event. Although the U.S. Drought Monitor and VegDRI contain a significant amount of objective information, their

spatial scale is extremely coarse; and their inability to detect soil moisture drought or recovery at shorter timescales of weeks instead of months is a major short-coming with regard to rangeland management.

Concrete examples of the failure of these systems in drought detection can easily be provided. What is needed is a flexible, multi-scalar drought index combined with remote sensing of vegetation that accounts for land-atmosphere interactions to more accurately monitor the rapid onset or relief from drought in Nevada rangelands. Flexibility in general is needed to achieve both sustainable land manage goals, and meet the design principles for CPR management that were identified by Ostrom (1990). In the absence of this, we can and have used consistent light-to-moderate stocking levels that provide economic stability to ranches and appropriate management over the long term. Such stocking levels rarely drought-stress key forage plants, because herbaceous plants are much less susceptible to grazing impact when dormant, and allow recovery after drought. We can also use movement of animals to provide periods of deferred use to allow riparian plants to recover.

A larger issue with regard to rangeland health and sage-grouse habitat is large, sometimes catastrophic wildfires, which burn residual fuels after very wet years. To address this, alternative, responsive management tools are needed, such as temporary, nonrenewable AUMs, are needed to manage fuels across landscapes. A pro-active monitoring approach is needed to avoid the severe, sometimes irreversible ecosystem and habitat damage that wildfires can cause. We advocate a flexible, multi-scalar fuels index combined with fine resolution remote sensing of vegetation that accounts for both account for land-atmosphere interactions and residual fuel load. When fuel and atmospheric conditions merit intervention, flexible management tools, including temporary nonrenewable AUMs, should be at the ready for strategic fuels reduction. In order to be responsive when both fuel loads and fire level dangers are high, the NEPA planning must occur now, before we have wet years and excessive fuel loads.

Allowance of Other Unspecified Mitigation Systems

Regarding the considerable amount of time, consultation, and science that was used in developing the Conservation Credit System, it is appropriate to point out that the Western Governors Association, which represents Governors of 19 Western states and 3 U.S.-flag islands, has written to the Secretary of the U.S. Department of the Interior: 1) "Only when state and federal agencies work collaboratively toward adoption and implementation of complementary management plan provisions will we be able to finalize a framework that works – for greater sage-grouse habitats and populations across private, federal and state lands" (WGA, 2015); 2) "Continued lack of involvement and coordination with the states will only further exacerbate disjoint federal and state plans with regard to conservation of the GSG and future land use development" (WGA, 2014a); 3) "Federal agencies should take into account state data and expertise in development and analysis of underlying science which serves as the legal basis for federal regulatory action" (WGA, 2014b); and 4) "In considering whether to list a species under the ESA, the FWS should give full recognition to voluntary conservation efforts conducted by landowners, states, non-profit organizations, and other stakeholders, whether independently conducted or in partnership with federal programs like the Sage Grouse Initiative (SGI)" (WGA, 2014b). Disregard of the CCS and the State plan would seem to ignore not only principles of CPR management and participatory decision making, but as well the repeatedly expressed views of a large block of state governors with strongly vested interests in and commitment to sage grouse habitat improvement.

BLM and USFS Habitat Objectives/Desired Conditions

Some observations on Tables 2.6 and 2.7 are in order. Table 2.6 was discussed among landowners, university experts, representatives of state and federal agencies, and nongovernmental organizations, including environmental groups at the most recent Shoesole meeting. At the meeting, which Dr. Swanson and I attended, the lack of specificity and room left for interpretation was of great concern. Range ecology experts felt that the indicators of Rangeland Health were not standards that could realistically be met. Using these indicators as standards would appear to be counter to the statement in the introduction of the publication:

> *"The protocol is NOT to be used to:*
>
> *Identify the cause(s) of resource problems.*
>
> *Independently make grazing and other management changes.*
>
> *Monitor land or determine trend.*
>
> *Independently generate national or regional assessments of rangeland health."*

Directing that areas meet all standards is in direct conflict with the stated purpose and intent of the Indicators of Rangeland Health protocol. With regard to Table 2.7, utilization rates are based primarily on Holecheck (1988). The title of that publication, "*An approach for setting the stocking rate*," indicates that it is only ***one*** approach, and certainly not the ***only*** approach. Further, the publication proposes only a guideline for establishing an ***initial*** stocking rate for a particular range, and points out that the method is *no substitute for experiential or local knowledge* (consistent with principles presented by Ostrom, 1990, and UNCCD, 2015). Table 2.7, as written, ***limits flexibility when and where flexibility is essential***. Frost et al. (1994), in the same journal, state: "Another problem of the 50% (or any other percentage) guideline is that the basic assumption that undesirable vegetation changes, (e.g., decline in the key species), is caused by the level of utilization on individual plants in any given year. In fact, the tolerable level of utilization on a plant is highly dependent on season of use, length of rest following use, and especially on weather conditions before, during and after use occurs. It is also highly likely that the increase or decrease of key species populations as a result of grazing is as much or more related to recruitment of new plants as to direct effects on existing plants." Frost et al. (1994) also establish the principle that what forage has been utilized may be irrelevant with respect to plant physiology, and that utilization is a tool to achieve a goal, not the other way around.

Every rangeland ecologist I consulted felt that the proposed habitat indicators do not incorporate ecological potential or the suite of variability that can occur across the suite of ecological sites in Nevada, and do not incorporate current state-of-knowledge concepts on resistance and resilience in state and transition models. The ability to produce different kinds and amounts of vegetation is a defining factor that differentiates one ecological site from another. Actions in the proposed plan that require management to "meet, restore, reestablish, and achieve" the narrowly focused habitat objectives, such as a desired sagebrush height and cover amount, may very well be beyond the ecological potential of a particular site. The FEIS does not utilize the best science available for determination of ecological potential and management guidance for achieving desired habitat conditions, as outlined in Stringham et al. (2015 a,b). In Major Land Resource Area 28B alone, there are over 160 upland ecological sites with varying degrees of resistance and resilience. Understanding the ecology of these systems is critical to the appropriate management of Nevada's rangelands. The FEIS does not incorporate Ecological Sites or State-and-Transition models as a foundation for understanding the ecological potential and disturbance response trajectories or restoration potential of various sage grouse

habitats. This is in contradiction to BLM and USFS policies on the use of Ecological Sites and State-and-Transition models for the management of our nation's rangelands.

On April 5, 2013, Director Kornze of the Bureau of Land Management, followed May 15, 2013 by Chief Tidwell of the U.S. Forest Service, signed into policy the use of the Interagency Ecological Site Handbook for Rangelands. This handbook was developed to implement policy outlined in the Rangeland Interagency Ecological Site Manual, which provides direction to the BLM, USFS, Natural Resource Conservation Service (NRCS) to cooperatively identify and describe rangeland ecological sites for use in inventory, monitoring, evaluation and ***management*** of the Nation's rangelands. This handbook also provides a standardized method to be utilized by the BLM, USFS, and NRCS to define, delineate, and describe terrestrial ecological sites on rangelands. The BLM, USFS, and NRCS have a common objective of utilizing science-based technical processes to sustain and enhance natural resources and the environment. Previously, they have used different methods to stratify landscapes into units for planning, analysis, and decision making. Yet their jurisdictions are intermingled throughout much of the United States, and include both private and public lands. A standardized method to define, delineate, and describe terrestrial ecological sites would be much more efficient, and much less confusing, than each agency having its own methodology.

Tables 2.6 and 2.7 seem to also contradict or at least bring into question previous agreements. In 2012, the Nevada State Office of BLM entered into a Grant and Cooperative Agreement with the University of Nevada, Reno to "develop ecological site descriptions and state-and-transition models for groups of upland rangeland ecological sites by Major Land Resource Areas (MLRA) in Nevada….The BLM will benefit from this project by attaining the necessary tools for determining ecological potential and ecosystem functions for range habitat within the Great Basin and Mojave. The information resulting from this project will be useful for managing public lands. State and transition models will facilitate planning efforts and will help to insure appropriate decision making by BLM for public land management decisions including mining, lands actions, fire rehabilitation, weed control and grazing permits. Scientifically developed and reviewed technical resources increases the reliability, acceptance, and credibility of BLM decisions" (NSO-CESU-UNR Agreement No. L12AC20545).

This model of land grant university-federal agency cooperation has born fruit. For example, Dr. T. Stringham and a team of experts that includes NRCS State Rangeland Management Specialists, Soil Scientists, a GIS Specialist, and BLM Hazardous Fuels Managers, has completed state-and-transition models for MLRAs 24, 25, 28A and 28B, which cover almost 36 million acres and a large portion of greater sage grouse habitat in Nevada. The team is continuing to work in MLRA 23 and MLRA 26 with a projected completion date in 2017. Forty models for MLRA 23 are already been completed and are available for use by management. These 40 models target ecological sites providing habitat for greater sage grouse (Stringham, 2011, 2015a,b).

Exclusion Areas. How the many other factors that determine sage grouse viability, including wildfires, invasive species, feral horses, and predation, would be affected in exclusion zones is not discussed. Really, these are all areas of research. Let us consider wildfire and fuel management. Given that wildfire is considered the greatest threat to sage grouse habitat, why is there no language about temporary non-renewable AUM allocations? It is the above -average years for herbaceous biomass production that create conditions for massive wildfires. This is true for annual grasses (cheatgrass) as well as native and non-native perennial grass species. A special assessment should be included that evaluates each forage production year to allow management for fuel production rather than simple, dubious tables of utilization levels. Science indicates

that management policies outlined in the FEIS are the major cause of cheatgrass proliferation (Trowbridge et al. 2013, Schmelzer et al. 2014), and numerous studies have shown that prior year precipitation is correlated with fire extent. Fall cheatgrass grazing experiments have shown the potential to both reduce fuel load and improve perennial grass populations where cheatgrass has become dominant. Ignoring this and other innovative tools, without even provisions to test and potentially use them on a landscape scale, further reduces flexibility and innovation. This is counter to principles of range ecology, sustainable CPR management (Ostrom 1990), and participatory decision making (NAS, 2013). In short, it does not use integrated biophysical and social sciences.

Livestock Grazing. In general, this is the most frustrating aspect of the FEIS. There is a very large body of scientific evidence that shows that properly managed grazing can restore ecosystems, improve quality and functioning of soils, reduce wildfire severity by controlling fuel loads, improve riparian zones, control invasive species, and enhance biodiversity (Franzluebbers and Stuedemann, 2010; Teaque et al., 2011; Roche et al., 2013; State of Utah, 2015; Swanson et al., in press; Schmelzer et al., 2014; Collins et al., 1998; Davison et al., 2006). The SETT letter of protest covers some, but certainly not all literature to this effect. In fact, Dr. Swanson submitted a 12-page critique with several scientific references to challenge and refute assumptions about livestock grazing as a causal factor in habitat degradation for sage grouse (the UNCE agent from Humboldt county submitted an even longer critique for the DEIS--see Humboldt County, 2014). Indeed, if one goes to the ScienceDaily website (www.sciencedaily.com) and types “grazing” in the search window, one will find several peer-reviewed scientific articles that document that properly managed grazing can improve rangeland ecosystems. Moreover, I can say with confidence that the notion that grazing can be an environmentally friendly and cost-effective way to enhance habitat for wildlife and preserve nature is widely accepted internationally (English Nature, 2005; UNEP, 2014).

Yet what we read in FEIS section 2.6.3 is "There are currently no science-based studies that demonstrate that increased livestock grazing on public lands would enhance or restore GRSG habitat or maintain or increase GRSG abundance and distribution." This was directly refuted, but ignored, in citations by the UNCE expert (Humboldt County, 2014): "Numerous studies have shown the direct and indirect benefits that managed grazing can have for sage-grouse (e.g., Neel 1980; Klebenow 1982, 1985; Evans 1986) or their habitat (e.g., Laycock 1967; Davies 2009, 2010).

One would think that, at the very least, federal agencies would recognize the hypothesis that properly managed grazing can restore ecosystem functioning and wildlife habit, including sage grouse habitat, as a researchable issue.

Wild Horse and Burro. So much has been written about the flawed and ineffective approach to managing feral horses that nothing new could be added in this short review. I will therefore quote something old from Garret Hardin (1986), who succinctly pointed out the feral horse conundrum some time ago:

> *“How many Americans have a suitable horse lot, and the money and the inclination to adopt a wild horse? The number is unknown. How fast is the number of potential adopters increasing? With continued urbanization the population of potential adopters is undoubtedly shrinking. Meanwhile the wild horse population grows at plus ten percent per year.”*

In fact, as NAS (1991) pointed out, the growth rates are closer to 15-20%, and we seem to be well on our way to the annual cost of $1 billion that Garrott and Oli (2013) predicted, with untold consequences of unregulated growth to wildlife habitat.

**Economics**

Overall, the FEIS seems to indicate negligible impact of its land management plan on economics in general, and of rural and ranching communities in particular. I have pointed out that favorable economics and quality of life for farmers and ranchers are part of the definition of sustainable agriculture, and that federal agencies must take into account industry costs of their regulations. I have also pointed out the negative economic effects, especially on rural communities, of past (RCI, 2001) and potential future (Richardson et al., 2013, 2015) reductions in grazing permits or AUMs. The Richardson et al. (2015) pointed out that indebted ranchers, who are typically younger, are especially vulnerable to losing their livelihoods. This at a time when the U.S. government is investing more than $100 million per year to train the next generation of farmers and ranchers in order to fight hunger, ensure global food security, and increase agricultural education and scientific literacy.

What follows is a succinct review of the economics contained in the FEIS:

1. The economic data employed in the IMPLAN model should always be validated and verified before use. Procedures outlined by Holland et al. (1997) and Lahr (1993) should be employed to verify and validate the IMPLAN economic data set. The text never states that the input data supplied by IMPLAN was verified and validated. If it was, then the procedures that were used to verify and validate the IMPLAN model need to be stated. To omit this constitutes a lack of transparency.
2. For public land grazing, Sector 11 from the IMPLAN model is often used to derive economic, employment, and labor income impacts. This sector, titled “Cattle Ranching and Farming” is a regionally derived sector using secondary procedures rather than direct interviews or agricultural budgets, from a national input-output model to derive economic linkages in the study area. Nationally, *Sector 11 is not specific to public land ranching*. IMPLAN’s Sector 11 represents an aggregation of ranch fed cattle, range fed cattle, and cattle feedlot operations. This aggregation of different cattle operations may yield an aggregation error, especially when the unique impacts of a range cattle operation in the West are to be analyzed. The use of Sector 11 from the out of the box IMPLAN model with no modifications can miscalculate the impacts for many reasons, such as the linkage between range cattle operations and alfalfa hay sectors, differing levels of labor, different profit margins, and different input purchases. A study by Darden et al. (2001) investigated the use of employing Cooperative Extension budgets to develop a Range Cattle Sector or to modify an IMPLAN Sector 11 input-output vector. The study showed statistically significant differences in economic linkage and multiplier estimates between the out of the box IMPLAN model Sector 11 and an augmented IMPLAN model using Cooperative Extension budgets to develop a Range Cattle Sector or modify the out of the box IMPLAN Sector 11.
3. Also, Sector 10 is designated as the "All Other Crop Farming Sector" that includes alfalfa hay as well as many other crop sectors including mint production, grass hay production, etc. Again, aggregation errors may arise. The Make Table of the IMPLAN model should also be validated. Many range cattle producers in Nevada produce alfalfa hay and other grass hay for their cattle. If these commodities are not produced by the range livestock industry in the Make Table, this could cause economic linkages to be incorrect. Use of a national model could lead to aggregation errors in the Make Table. There may need to be for improvements in Sector 10 and Sector 11, including a separate Alfalfa Hay Sector to be developed from Cooperative Extension budgets. This would yield better economic linkage estimates to derive economic, employment, and labor income impacts from changes in range livestock production from modified land use outlined in the FEIS.

4. Following procedures by Seung and Waters (2009), a supply-driven model analysis should have been used. Given potential further federal restrictions on grazing, the approach used needs to change from a final demand-driven model to a supply-driven one. That is, production levels for the range cattle operations change from a market or demand-driven to a supply-driven model given that federal grazing permits restrict production levels. In fact for policy analysis, as discussed by Seung and Waters (2010) and Schreiner et al. (1996), a Computable General Equilibrium (CGE) or Dynamic Computable General Equilibrium (DCGE) model would be more appropriate. By using a CGE or dynamic DCGE model, the limitations of a fixed-price model such as an input-output model could be addressed. These limitations are (1) the inability to calculate welfare effects due to fixed prices; and (2) difficulty of addressing supply-side shocks. Welfare impacts of compensating variation or equivalent variation can be estimated through CGE models, which yield information as to the gains and losses from public land management policy decisions. A dynamic CGE model provides valuable information to assist decision makers in identifying not only economic sectors and stakeholders impacted from public land management decisions, but also the magnitude and timing of these impacts. Results of a dynamic CGE model can assist decision makers in better developing public land management policies to mitigate the often contradictory mandates of ensuring biological sustainability while mitigating the negative economic impacts to stakeholders and public at large. This would better achieve the integration of biophysical and social sciences that federal agencies are expected to use.
5. It seems strongly likely that the economies of Nevada and Northeastern California are expected to be impacted by the FEIS. But there are also fiscal impacts to state, county, and local governments that need to be calculated. The report states that any premium to property value associated with the grazing permit is an amenity perception. This could be part of the premium, but a substantial part has to be the added production on public lands capitalized in the private acreage. Reduced property taxes would occur, for example, because less public land cattle grazing will reduce the capitalized value of private lands associated with current ranching enterprises. Since state, county, and local governments cannot tax federal lands, the increase in cattle production from the ability to graze public lands is capitalized in the private land acreage. Changes in public land grazing would reduce the capitalized value of private lands and therefore reduce property taxes from the Range Cattle Sector. Also, potential reductions in range cattle production would reduce purchases by range cattle operators, which would likely impact sales tax volumes for many of the impacted counties. Yet reduction in sales tax revenues were not estimated in the study. Additionally, the peculiarities of the Nevada sales tax code need to be addressed for sales tax impacts. For Nevada, counties are classified as either guaranteed or exporting counties for sales tax revenues. The analysis needs to identify the counties that are impacted by the FEIS so that proper sales tax impacts, by county, can be estimated. Lastly, reduced range cattle activities could reduce corporate and personal income tax revenues to state, county, and local governments, as well as to the federal government. Reductions in tax revenues need to be estimated to derive fiscal impacts to state, county, and local governments from potential designation of the sage grouse. The results from personal and corporate taxes will differ by state. Lack of these considerations in the economic impact assessment raise issues of inadequate social science, inattention to legal definition of sustainable agriculture, and failure to take into account Supreme Court rulings on the need to consider costs to industry of federal regulations.

6. For the Social Justice Section, the report states that there would be little impact to the low income households of the study area. Yet there is no quantitative estimation of these impacts. Within IMPLAN there is a Social Accounting Matrix (SAM) model which can derive the impacts to various household income categories. The SAM model could therefore be used to derive the impacts to these household income classes and therefore empirically show the social justice impacts. Also, using procedures by Berning and Holland (2006), the households in the SAM matrix could be further delineated between farming and non-farming households. With this type of analysis, the distributional impacts can be estimated, as could the welfare impacts to farm and non-farm households from changes in public land management policies. Failure to conduct such analysis in the FEIS for low income households--particularly those in rural communities--raises serious questions about social justice which, incidentally, is an aspect of sustainable agriculture (Payne et al., 2001).

**A Better Way Forward**

There is an extremely important need and role for integrated research in resolving a great many issues related to sagebrush ecosystems that are raised in the FEIS. But the FEIS almost completely ignores research needs, as if all scientific issues related to sagebrush ecosystem management--biophysical, social, and their integration--are resolved. They are, of course, not at all resolved. The land grant universities in partnership with federal research agencies are uniquely suited to conduct such research. Land degradation and desertification, including loss of biodiversity and wildlife habitat, should be approached as one issue threatening the natural resource base amongst many other problems (e.g. climate variability, competing claims for natural resources, insecure land resource access, etc.). Specific land degradation problems should be studied within the context of the entire agro-ecosystem. Issues like agro-climatology, soil type, and biodiversity are part of this system, but so are farm and ranch income, land tenure arrangements, local and national policies, market access, etc. Systems-based research intended to reverse land degradation and desertification ideally should have as key components (UNCCD, 2015):

- Farmer communities and other stakeholders who are actively involved in problem definitions, research designs and testing of potential solutions to mitigate land degradation processes (participatory research); and
- Scientists from different backgrounds, such as soil science, agronomy, ecology, socio-economics, work together in project teams to tackle important research questions (inter-disciplinary research).

It should also include greater emphasis on mechanistic, simulation modeling, and improved methods and applications of remote sensing. We believe that use of the design principles described by Ostrom (1990) and participatory decision-making processes outlined by NAS (2013) can be used to develop a much better approach to sustainable land management in the U.S. West than the top-down, litigious approach currently used, and that properly managed livestock grazing is a necessary part of sustainable land management. Participatory decision-making processes such as that embodied in SANE and ShoeSole foster the development of a shared understanding of the ecosystem, an appreciation for others' viewpoints, and the development of good working relationships. Federal agencies charged with managing public lands for multiple users should develop an iterative process between public deliberation and scientific research, and co-design the participatory process with representatives of the public, with a view towards achieving sustainable land management on public (and private) lands in the West.

**Summary**

In summary, I believe that the FEIS has considerable shortcomings with regard to science and process. Scientifically, there are many flaws, including an apparent misunderstanding of ecological principles, failure to take into account major, relevant scientific studies and current state of knowledge in rangeland management science, and relatively little effort to implement policies and actions based on these principles and state of knowledge. With regard to process, many design principles regarding sustainable, long-term management of common-pool resources are ignored, including the need for site specificity, use of local knowledge, and flexibility, as are tenants of participatory decision-making. Failure to take into account major features of state conservation plans, despite their strong support by several Western Governors, and the presence of literally hundreds of community-based conservation groups that are part of those plans, is very troubling. Ignoring economic consequences of federal regulations to rural communities in general and to the ranching industry in particular goes against the very definition of sustainable agriculture and, it would seem, recent Supreme Court rulings.

If I can provide further details on any aspect of this review, please do not hesitate to contact me.

Yours Sincerely,

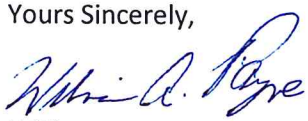

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Table 1. Summary of Scientific and Process Concerns raised by the Sagebrush Ecosystem Council.

| Concern | Science Concerns | Process Concerns |
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| Adaptive Triggers | Large range in the rate of change to reach a hard trigger for an individual lek, as opposed to a narrow range for a hard trigger for a lek cluster. Methodologies for setting the trigger values, and the rationale for widely different trigger values, are vague and incorrectly cited. | Insufficient time and information were given for review. Lack of explanation and documentation of revised methodologies. This creates a lack of transparency and undermines public confidence, and is counter to principles of community participation and engagement (NAS, 2013). |
| Allowance of Other Unspecified Mitigation Systems | The preferred alternative in the FEIS allows for development and use of other mitigation systems in addition to the Nevada Conservation Credit System (CCS). There is a lack of detail regarding the process and science that led to and underpin the preferred alternative systems, and an apparent lack of regard for the scientifically integrated and participatory process that led to the CCS. | The Conservation Credit System is the result of "collaborative, broadly based, integrated, and iterative analytic-deliberative processes that involved both the agency and the public." There is a lack of transparency regarding the alternative mitigation system. Basic principles of design and process (Ostrom, 1990; NAS, 2013) are missing. |
| BLM and USFS Habitat Objectives/Desired Conditions | Management actions proposed in the preferred alternative, tied to Tables 2-2, 2-5, and 2-6, can be challenged on quality of science. Table 2-2 in particular is at times vague. There is significant change in these tables compared to the DEIS, which contained only one Habitat Objectives Table for both agencies (DEIS Table 2-6). In the USFS proposed plan, Seasonal Habitat Desired Conditions in Tables 2-5 and 2-6 are different for ecoregion 341 (intermountain semi-desert and desert) and ecoregion 342 (intermountain semi-desert). Providing for more site specific information is commendable, but the tables are inconsistent for habitat indicators used and conditions described. Proposed habitat indicators do not consistently incorporate allowance for site specific variability, one of the basic design principles in sustainable CPR management (Ostrom, 1990). Furthermore, setting objectives based on one species short-term interests negates other valid consideration for sustainability, other species, and long-term requirements for ecosystem resistance and resilience. | Justification for significant change from the DEIS, which contained only one Habitat Objectives Table for both agencies, to several tables with different criteria for different conditions, is lacking. Insufficient time was allotted to review justification or rationale for such changes. The BLM's land use plans conflict with state and local plans, which were developed in a much more transparent and participatory manner. The Western Governors Association, which represents a non-partisan group of governors of 19 Western states and 3 U.S. flag islands, has repeatedly expressed concern over marginalization by federal agencies. |
| Sagebrush Focal Areas | The methods provided for delineation of the SFAs are not explicit or transparent, and therefore of poor scientific quality. Pages 2-2 and 2-3 describe the general characteristics for delineating focal areas, but there is no information on methodology used in their development. Nevada Management Categories (Coates et al. 2014) and NDOW Habitat Categorization methods are referenced, but prioritization using these tools does not align with SFAs. A USFWS letter is referenced, but no methodology is given in it. Delineation of the SFAs does not appear to incorporate modern scientific concepts of | Criteria used to delineate SFAs do not match the State's assessment of breeding densities or its mapping using resistance and resilience concepts. The poorly justified SFAs constitute a major change from the DEIS, and insufficient time and information were given for review. Lack of transparency regarding criteria used to determine landscapes essential to conservation of the species undermines public confidence. Nevada-specific data were not included in the delineation of SFAs, and no experts in the State were consulted. Overall, these are in conflict |

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| | resistance and resilience; the level of science is therefore questionable. | with federal policy, and design principles for CPR management (Ostrom, 1990; NAS, 2013). They also ignore inter-national norms regarding use of local knowledge in sustainable CPR management (UNCCD, 2015). |
| Exclusion Areas | There is an implicit, scientifically unjustified assumption that exclusion zones are effective for sage grouse conservation. As Braun (1998) and many others have pointed out, declines in sage grouse populations are not attributable to one factor, but rather to a complexity of factors. How these many other factors, including wildfires, invasive species, feral horses, and predation, would be affected in exclusion zones is not discussed. There are examples throughout the world where mere exclusion has not led to habitat improvement or species recovery. | Exclusion of other land uses over potentially vast expanses of public lands violates the principle of "multiple use" for public lands. It also fails to adequately consider potential negative economic and quality of life consequences on farmers and ranchers (Richardson et al., 2013, 2015). This would be counter to the legal definition of sustainable agriculture. Recent Supreme Court rulings affirm that agencies must consider costs before deciding whether regulation is appropriate and necessary. |
| Three Percent Disturbance Cap | The SEC, which includes a technical team of experts, reviewed the concepts surrounding disturbance caps and concluded they were not beneficial for sage grouse in Nevada. The three percent limit of total discrete anthropogenic disturbances ignores spatial distribution of habitats and private property rights. The one-size-fits-all approach does not assure greater conservation for sage grouse and does not allow for adaptive management in a dynamic biological system. | The team of experts in the FEIS includes NDOW, the USFWS, and the BLM, but nobody from SETT, or for that matter the state Department of Conservation and Natural Resources. Nor does it include anybody from CABNR, NAES, or UNCE, where greater expertise resides. The disturbance cap is inconsistent with the State Plan, and will interfere with implementation of the Conservation Credit System, which were developed using a participatory approach much more consistent with design principles for CPR management. |
| Livestock Grazing | The FEIS narrative seemed to represent a wholesale lack of recognition of the current state of science in rangeland ecology and management, and lacks key and pertinent citations regarding adaptive livestock grazing as related to the functionality and sustainability of sagebrush/perennial herbaceous plant communities and meadows within the sagebrush ecosystem. There is a baffling lack of review of literature that has demonstrated that grazing, as a land management tool, can play a positive (as well as negative) role in the achievement of sustainable land management, including improvement of wildlife habitat, management of fuels and fire effects, and the restoration of noninvasive vegetation. A thorough, objective literature review is part of the scientific process, and the lack of one in the FEIS raises a number of scientific concerns.<br><br>There is a lack of consideration of economic effects on farmers and ranchers, which would not only be part of mandated "integrated use of the natural and social sciences," but is part of the legal definition of sustainable agriculture. | The FEIS contains a highly flawed assessment of grazing and its role as a tool in sustainable rangeland management and habitat restoration. Many comments to this effect including relevant citations were submitted in response to the DEIS (e.g., Humboldt County Commissioners, 2014, who drew upon the expertise of a noted range and ecology expert in UNCE), but they were not incorporated into the FEIS. This raises serious questions about the EIS process itself. Lack of consideration that indirect effects of the proposed action could result in a significant reduction or elimination of grazing, and the subsequent destruction of the ranching industry is contrary to NEPA, the principle of multiple use and sustained yield (BLM, 2015b), principles of design (Ostrom, 1990), norms regarding participatory processes (NAS, 2013) for CPRs, and recent Supreme Court rulings (SCOTUS, 2015). The Livestock Grazing section in the State Plan, which the FEIS also seems to disregard, respects these |

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| | Consideration of industry costs in implementation of agency regulations has been reinforced by recent Supreme Court rulings. Available literature in Nevada (Richardson, 2013, 2015) suggests potentially devastating effects of ending grazing on ranchers and rural communities, especially for young ranchers. | statutes and principles much more than does the FEIS. |
| Map Update Process | Ecosystems and human communities change through time in numerous ways that are directly related to sage-grouse conservation and sustainable multiple-use land management. Recognizing these changes and refocusing on current and emerging priorities as science and resource inventories improve is part of essential adaptation in land management. Yet the FEIS and LUPA provide no mechanism for fostering or incorporating evolving knowledge into habitat maps that have regulatory implications through iterative, participatory research. This constitutes an obvious lack of integrated biophysical and social science. | NEPA and other considerations previously mentioned require that impact on local economies be analyzed. This has not been done in the FEIS in a transparent manner that allows for public comment, which is contrary to policy, statute, and principles previously cited. Resource management plans must be consistent with officially approved or adopted resource related plans of State governments. The State has provided written comments throughout the planning process detailing inconsistencies, yet the BLM has failed to respond to how these inconsistencies were addressed or resolved. |
| Wild Horse and Burro | It is stated that BLM will manage herds in areas that include sage grouse habitat to achieve rangeland health standards and to promote or maintain habitat objectives in Table 2-2, but the type of management that will be used to achieve appropriate management level is not described. The BLM already fails to maintain management levels across the sub-region. Its own estimates indicate that there were at least 49,209 feral horses and burros in 10 western states [but note that NAS ( 2013), concludes this is an underestimation], while the maximum appropriate management level has been set at 26,684 animals. This is issue is of partiuclar concern to Nevada, where about half of these are located. In Fiscal Year 2014 only 1.8 percent ($1.2 million) of the Wild Horse and Burro Program appropriation was spent on gathers and removals, while animal holding facilities are at a maximum. Yet herds are expected to continue increasing at a rate of ~15-20%, or doubling by 2018 to four times carrying capacity (NAS 2013). Unaddressed, this trend will likely permanently degrade the ecosystems needed by sage grouse and all other flora and fauna. Garrott and Oli (2013) estimate that captive wild horses will cost the United States over $1 billion by 2030 unless management approaches change. Furthermore, the FEIS and LUPA offer no management specific to horse grazing in sage-grouse late brood rearing habitats where riparian pastures could be used to effect periods of recovery (Wyman et al 2006) for habitats limiting population success (Atamian et al. 2010), as called for in the Nevada Greater Sage-Grouse Conservation Plan. | The NAS (2013) study outlines flawed science and process in the BLM management of feral horses and burros, which is part of the larger issue of sustainable public land management. Similarly, the government accounting office (GAO, 2008) concluded that costs associated with continuing to remove horses from the range to long-term holding facilities would overwhelm the Wild Horse and Burro Program. Based on BLM's public record of handling feral horses, WHB 2 is not credible, and does not meet the purpose and need of the RMP amendment to "reduce, eliminate, or minimize threats to GRSG habitat." The overall failure of the BLM in managing free-ranging horses is relevant to credibility of the current FEIS. The NAS (2013) criticism of the BLM's lack of social considerations, poor communication with the public, and poor leveraging of public participation to increase confidence in decisions about feral horse and burro management, are highly apropos to the agency's current approach taken to land management to improve or maintain sage grouse habitat and other ecosystem sercies. |

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