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Comments: Here are comments from WildLands Defense, Alliance for the Wild Rockies, Native Ecosystems Council and Yellowstone to Uintas Connection on the Railroad Saddle restoration project on the New Meadows RD of the Payette Forest.

Katie Fite

WildLands Defense (WLD), Alliance for the Wild Rockies, Native Ecosystems Council and Yellowstone to Uintas Connection are submitting this information on the Railroad Saddle Restoration Project. It is very difficult to understand how such large-scale disturbance leveling and/or seriously fragmenting beautiful native forests and shrublands could be considered "restoration".

The EA provides minimal information on the population and habitat quality and quantity status of the native animal species that inhabit the forest areas in this landscape. Many of the most critical habitat areas and mature and old growth communities these species require will be lost or torn apart by these large-scale vegetation treatments.

How much old growth of all veg community types is left in the project area? Across the RD? How much mature veg community area of all type remains in the project area and across the RD? WHERE are all these veg communities located? Please provide detailed mapping and analysis. How does the FS define mature vs old growth vs. earlier successional communities?

The EA provides insufficient information on the very heavy recreational use much of this area gets, which already places a significant strain on Forest watersheds and native animals. It provides almost no information on the adverse ecological footprint of the very heavy livestock grazing burden and livestock-caused watershed and habitat impairment of these watersheds and habitats.

The document is not adequate for fostering informed public comment on complex vegetation communities, wildlife habitats and populations, wild lands values and many other aspects of this sprawling project. The USFS should re-scope this project and provide much more basic biological inventory and other information to the public that thoroughly details the status and habitat condition of the animal species who currently occupy the communities the USFS deems "unhealthy" or in need of often destructive and weed-causing "treatments" -

We are concerned about the FS use often by use of artificial categories and vegetation and fuels models that appear designed to justify extensive manipulation. After reading the document, it appears that the Forest is not really satisfied with ANY existing vegetation community. How many unmanipulated acres of all vegetation types remain at present across this landscape, across the New meadows Ranger district, which is very heavily logged and disturbed? How fragmented has the landscape become from all FS sensitive and MIS species? What is the current viability of all populations of species of concern, and how will this project impact species numbers and persistence across the project, area, RD and Forest? Are current Forest plan goals met for these species? Where is monitoring data that shows this?

USFS lands here are suffering significant deleterious grazing impacts. No current NEPA and FRH or land health analyses related to grazing impacts have been conducted in many areas. The poorer condition that lands are in prior to a disturbance, the greater risk of weed and other problems following vegetation treatment disturbance - especially these large-scale treatments that will result in hotter, drier windier weedier sites and likely resulted in significant use of toxic chemical herbicides for which the FS does not appear to have adequate current risk

assessments and NEPA analysis of these chemicals toxic impacts on terrestrial and aquatic species and human users of the Forest.

There are also significant land areas neighboring and across the RD, with large-scale habitat losses and watershed degradation and weed infestations occurring as well. There have been many past logging, and other treatments across land ownerships, and the USFS land condition is often highly degraded as a result of past logging, thinning, or other actions based on failed management paradigms. Please provide detailed mapping and analysis of all logging, thinning, vegetation treatment projects across the new meadows RD in the past 20 years, and monitoring of wildlife use, watershed condition and fish and wildlife populations in these treated areas. Please also provide weed inventories.

This project would impact a huge area of very weed-susceptible wild lands and fish and wildlife habitats. By drastically reducing protective forested vegetative cover, the project will reduce the ability of the land to retain snow cover. It would remove shading vegetation that helps retain moisture on the site so it is slowly released to provide sustainable perennial flows. Not only will this shading and cooling moisture-trapping protection be diminished by the project, conditions will become even harsher due to increased temperatures and other weather changes resulting from climate change stress. This will amplify and worsen the adverse effects of climate change stresses.

An EIS must be prepared to examine the host of adverse and other direct, indirect and cumulative impacts of this severe proposed project disturbance to the area watersheds, to streams and springs and their replenishment, to soils and protective microbiotic crusts (mosses, algae, lichens that help protect lands from weeds, sequester CO₂, and prevent soil erosion), to diverse and complexly interspersed native vegetation communities, to sensitive and rare plant and animal communities and populations, to very important Inventoried Roadless Areas and other wild land natural and scenic values, irreplaceable cultural sites, and other values. Note that the unexamined levels, schemes, and stocking rates under actual use of livestock here will exacerbate and worsen the stresses of climate change. See Beschta et al. 2012, 2014. Grazing makes lands LESS resilient and less able to recover from such severe vegetation disturbance stresses as the FS seeks to impose here - on top of already damaged watersheds.

There is currently serious livestock grazing degradation occurring across portions of the project area, and the level of degradation and impairment must be fully examined in an EIS for this project. A complete livestock current capability and suitability analysis must be provided including data on perennial vs. annual weed production.

Not only is the USFS destroying protective forested cover here, many other projects are underway in the Boise and Payette Forests and across Region 4 that will have cumulative adverse effects on sustainability of fish and wildlife habitats and populations, and recreational and wild land uses and enjoyment.

The cumulative and synergistic effects of all of these projects must be fully examined in an EIS that takes a hard look at the sustainability of forest vegetation types in a time of Climate Crisis, at irreversible weed invasion risks that may be caused by the severe project treatment disturbances, at the condition of sensitive wildlife species habitats and population viability and persistence, at migratory bird habitats and population viability and persistence, and at other important species habitats and population viability and persistence across this landscape.

Impacts of Federal Agency Actions removing Environmental Protections Will Ripple Across Project Area - Causing New Harm to Biota and Watersheds

There is a Trump Administration proposal to drastically revise and gut NEPA, our nation's bedrock environmental law. This is being met with public and state governmental outrage.

All of these treatments and road network will fragment and destroy migratory bird species habitats, and migratory birds face a grave and growing crisis across the US. See Rosenberg et al 2019 describing the loss of 3 billion birds from North Americas.

Forests across Region 4 - from the Dixie Forest in southern Utah to the Payette Salmon-Challis Forest in the north - are proposing a huge amount of deforestation projects and "treatments" that will destroy and fragment forest habitat, and migratory bird habitats. These massive treatments are the dead opposite path a federal agency should be on as climate change stresses are bearing down on the land, waters, watersheds and habitats for native biota. Loss of forested cover must be considered cumulatively, as it will impact populations of precipitously declining migratory birds at a West-wide level, including during migration. An analysis of the loss of forested habitats for each of the vegetation habitat community types the USFS proposes to "treat" or deems to be unhealthy must be provided. The Forest must determine the amount of habitat loss that has taken place in recent decades, and that is foreseeable for species of concern/sensitive species, ESA-listed species.

Please conduct full and thorough baseline inventories for all important and sensitive animals, rare plants and migratory bird species of concern across the project area and surrounding lands to serve as a necessary baseline for project impacts.

Please conduct current detailed sediment bacteria and other aquatic habitat, water quality and quantity studies so that a solid environmental baseline and mitigation and minimization measures can be established for these large-scale treatments and expanded roading and erosion that will impact water quality, quantity and aquatic biota.

The aggressive USFS deforestation, logging and other treatment projects may drive serious population losses and/or may extirpate sensitive species across the region, along with cumulative impacts from BLM projects are also taking place.

Large fires have burned in many areas of the Region and in the Payette Forest - whipping right through intensively logged areas. This also represents significant loss of forested habitat cover for sensitive species of concern. Many lands also have suffered significant early settlement era human impacts including deforestation for wood products, and the use of promiscuous burning from livestock grazers setting the range afire, and other human deforestation and disturbance. Thus, in many areas, the forests are still recovering from significant past human disturbance, which the agency vegetation and fuels models and assumptions do not take into account. They may in fact have suffered much greater disturbance than the Forest claims has occurred, or that is used in disturbance interval models to justify the projects' massive intervention and clearing.

Forest conditions are getting harsher and less resilient under climate change stress. Surface water is becoming more limited with reduced snowpacks that decrease sustainability of perennial flows. Snowpack is essential to provide water to springs and streams. Deforestation will result in hotter, drier sites prone to more rapid and erosive runoff and resulting degradation. Ubiquitous livestock grazing further degrades and depletes springs and streams and riparian habitats. Belsky et al. 1999.

Cheatgrass, bulbous bluegrass and other flammable invasive exotic weeds are already exploding across the lower elevations of this region. The Forest must carefully examine and map this landscape to determine the extent to which cheatgrass, bulbous bluegrass and other weeds are already present, or where they are likely to expand to - determining sites that may be dominated post-treatment. This project is made even more risky due to planned use of aerial fire ignitions. In these, ping pong balls with napalm-like highly flammable material are spit out of spinning device on helicopters. This type of ignition can have devastating impacts to forests. Please see photos and info on cd illustrating the severe and highly damaging impacts of aerial ignitions in "prescribed" fires. This shows the damage caused by aerial ignition in rugged mountainous terrain in the Juniper Mountain area of

Idaho. Ancient trees and groves of old growth arid forest were destroyed after the napalm ping pong balls ignited the forest. Plus many of the logging and other projects also include burning, increasing weed infestation risk, and cause elevated wildfire risk.

The project will also irreversibly alter heavily used recreational areas and scenic wild lands. The essential migratory bird and wildlife habitats currently present in these forests and the currently often diverse vegetation communities will be harmed and simplified as the USFS attempts to "groom" and manicure lands into an artificial state based on sketchy models.

This current proposal (and many of the other projects taking place or foreseeable) will alter this scenic and biodiverse area of Idaho for 150 years or longer - and that's if cheatgrass or other weeds do not invade and truncate plant succession, which is a very real possibility. Cheatgrass/flammable weeds/noxious weed invasion and ensuing site dominance is especially likely given the highly damaging large levels of livestock grazing the Forest and adjacent BLM management allows to take place here.

This proposal would inflict a huge battery of highly uncertain mechanical (heavy equipment and chain saw) treatment disturbances, and also impose prescribed burning, or burning in the aftermath of other treatments. There would be many opportunities for fire to escape, kill non-target vegetation, scald soils, and result in expanded weed problems.

This intensive treatment disturbance will injure or weaken trees, and result in hotter, drier, weedier less resilient sites. It is likely to result in expanding the insect/disease "problems" the agency cites in the scoping material (as a result of burned, cut, injured and otherwise damaged trees). It will result in large-scale loss of forested habitat.

The insects are a natural part of the forest ecosystem. Standing dead trees are not a fire risk. They provide soil stabilization and structure to moderate site conditions as well as provide shade to cool the site. The deforestation project is likely to increase tree injury and disease, as sap from cut trees lures in insects, and as "leave" trees are injured. It will make matters worse, not better.

This project includes areas of steep, rugged terrain where control of fire may be difficult, and where spoils bared by treatment disturbances may be highly vulnerable to erosion. These risks will be increased by continued chronic high levels of livestock grazing pressure. Clearing trees may expand the areas of livestock impact and give livestock access to areas previously less impacted - further expanding weeds, erosion and degradation. How will the massive treatments alter grazing capability? Please provide detailed livestock monitoring information for riparian and upland sites, data on actual use, stocking per pasture or unit, grazing schemes, etc.

The USFS must provide full and detailed very site-specific mapping of tree age classes in all forested areas and adjacent vegetation communities of all types. Where are all old growth and mature forests/sage/mountain shrub/aspen veg communities located? Detailed information on stand characteristics and wildlife habitat values and wildlife use of the site must be provided based on current site-specific inventories and inventories across this landscape. This further discussed below on comments.

Costs of Project

The USFS often fails to address the costs to the public of the welter of environmental damage and losses that would take place under the proposed actions. These will pose a significant drain to taxpayers, as well as harm or destroy recreational uses and enjoyment, and sustainability of clean water and other resources. Further, as the serious damage and destruction from the proposed activities is carried out, taxpayers will bear many uncalculated costs - from toxic chemical herbicide costs to costs to try to restore species whose populations are pushed to very low levels due to the project impacts.

Alternative Actions for Land Health

Preventing expansion of ecosystem-dooming flammable annual grasses and other weeds should be paramount for ensuring forest health.

The USFS ignores passive restoration to protect native vegetation communities and to recover native understories, shrubs and microbiotic crusts, a primary and essential element of preventing flammable weeds from choking public lands and reducing future fires. Passive restoration, (letting lands naturally heal from disturbance), helps ensure that public lands are in good condition and better able to withstand fires, insects and other disturbance and able to recover from fire events. It also helps to buffer ever-growing climate change stress. As cheatgrass and other weeds spread due to continued harmful levels of livestock grazing exacerbated by climate change stress (see Beschta et al. 2012), all sagebrush communities are extremely sensitive to grazing and other exploitive disturbance.

Please provide comprehensive current mapping of current bulbous bluegrass/cheatgrass/annual grass infestation areas at all percentages of infestation so the enormity of the problem can be understood.

Concerns about FS Veg Models

Federal agencies are increasingly using modeling that create an alternate vegetation reality. The info in scoping documents appears to be very similar to the Forest Service and TNC methodologies and models that critiqued in this article about a Pine Valley Utah Project. <https://www.counterpunch.org/2019/12/20/voodoo-vegetation-modeling-dooms-native-forests-and-wildlife-habitat/>

Comments on the Pine Valley Project are germane here. The Forest uses various disturbance intervals, FRCC categories and devices to artificially categorize and segregate plant communities to elevate commodity use exploitation. The models are often divorced from real world ecological processes. Complex native and other vegetation communities are greatly threatened by cattle/sheep grazing and disturbance-caused weeds. Modeling may also be used to justify maximizing cattle and sheep grazing exploitation and depletion for commodity purposes. These models are also used to justify manipulating lands in veg treatments (ostensibly for fuels suppression or forest health - but in reality the treatments often make sites more likely to burn, and generate more grass by killing off woody veg for livestock forage production purposes).

Climate change stress disrupts ecological processes. The NEPA analysis must accurately explain and provide data for how various veg communities that are the supposed desired outcomes and explain how models used take into account large climate driven wildfires.

Please provide info on the ecological condition of lands subjected to livestock grazing here. The condition of lands prior to a treatment including a fire often determines how effective recovery will be and helps to limit weed dominance following fires and other disturbances. This means that agency must provide full and detailed data and analysis of current land health and actual on the ground ecological conditions and factors such as a plethora of livestock facilities and high stocking levels that are causing expanded cheatgrass, weeds and degradation.

Grazing Causes Expanded Cheatgrass Weeds

Information in the Reisner 2013 paper and Williamson et al. 2019 papers show livestock grazing causes irreversible weeds. The aggressive treatments proposed do the same. Now, there are several additional papers detailing that grazing causes flammable ecosystem-dooming annual grass infestation and spread.

Williamson et al. 2019 <https://link.springer.com/article/10.1007%2Fs10530-019-02120-8>

Fire, livestock grazing, topography, and precipitation affect occurrence and prevalence of cheatgrass (*Bromus*

tectorum) in the central Great Basin, USA. 2019. Biological invasions. Vol. 22, pps. 663-680.

"Our novel time-series data and results indicate that grazing corresponds with increased cheatgrass occurrence and prevalence regardless of variation in climate, topography, or community composition, and provide no support for the notion that contemporary grazing regimes or grazing in conjunction with fire can suppress cheatgrass".

We are mailing a cd with documents including Belsky and Gelbard (2000) Reisner Dissertation 2010 and Reisner et al. 2013 and Williamson et al. 2019 ---demonstrating that grazing causes cheatgrass. To ensure forest health, the forest should develop a series of honest and scientifically defensible alternatives that rapidly remove grazing completely from areas not yet infested with cheatgrass/weeds.

Motorized Use Damage and Disturbance

For all public lands areas, please provide:

- * Maps of all existing routes or their descriptive categories/route types.
- * Current travel plans.
- * Travel plan enforcement and compliance info.
- * Current inventory of routes (including unauthorized ones).
- * Specific info on driving or motorized use impacted sensitive species seasonal habitats and wildlife habitat use disturbance; projected severity of vehicle impacts to soils and microbiotic crusts; to vegetation and increased weed spread risk, to watersheds and water quality.
- * Data on wildlife seasonal habitats that project access routes will traverse and/or that are present in all areas where driving may occur.
- * Data on the extent of noxious and other weed infestations on the interspersed and other BLM, state and private lands where vehicles (and livestock) may be entering the project area from and then spreading weeds onto and across public lands.

SCIENTIFIC INFO THAT MUST BE CONSIDERED

Alarming New Scientific Information Has Been Published on the Decline of North American Avifauna - Management Must Conserve and Recover Habitat of Both Sensitive and Plummeting Common Species to Conserve Avian Biodiversity

There is great concern about avian declines across North America. All project impacts (direct, indirect and cumulative) must be considered in view of this large-scale loss of sustainability of species habitats and populations. Rosenberg et al. 2019 recently described the staggering decline of the North American Avifauna:

<https://science.sciencemag.org/content/366/6461/120>

<https://www.nytimes.com/2019/09/19/science/bird-populations-america-canada.html>

There is a "bird emergency". <https://patch.com/colorado/across-co/bird-emergency-big-declines-u-s-including-colorado>

Forest and grassland inhabiting birds are one of bird groups documented as suffering the steepest declines. Please fully consider the full spectrum of adverse ecological impacts of the existing disturbed areas of forest and the very significant grazing burden on sensitive species and migratory birds (including the use of habitat for birds "refueling" on during energy-consuming migration). This project must fully examine the relative scarcity of species habitat at the local and regional level, and the effects of logging, thinning, fire and other treatments as well as grazing degradation and habitat harms, along with these specific vegetation treatments, may have on population viability and persistence of avian species.

Alarming Information on the Biodiversity and Climate Crises That Must Be Considered

This project and the Proposed Grazing Reg and NEPA Revisions threaten biodiversity and will make the biodiversity crisis worse. The Global Biodiversity Crisis is inter-twined with the Climate Crisis:

<https://www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report/>

The five direct drivers of change in nature with the largest relative global impacts so far. These culprits are, in descending order: (1) changes in land and sea use; (2) direct exploitation of organisms; (3) climate change; (4) pollution and (5) invasive alien species.

The Report notes that, since 1980, greenhouse gas emissions have doubled, raising average global temperatures by at least 0.7 degrees Celsius - with climate change already impacting nature from the level of ecosystems to that of genetics - impacts expected to increase over the coming decades, in some cases surpassing the impact of land and sea use change and other drivers.

Given the overwhelming scientific information on climate change stress impacts now underway and foreseeable across western public lands, an analysis for this Railroad Saddle project must fully consider how hotter temperatures, less precipitation falling as snow (and hence earlier snowmelt and runoff and longer snow-free periods), more extreme weather events such as drought or weather whiplash, will have on any hoped for outcomes of this project, and the site's ability to recover. This must be fully assessed along with the role of livestock grazing and the grazing that will take place under the revisions, on further degrading increasingly less resilient lands. Proposed grazing to be imposed will further slow or preclude any native or crust recovery.

Please must provide detailed monitoring data, actual use data, permitted use, compliance records and current land health assessment data so that a fair consideration of the full effects of grazing disturbance on top of treatment disturbance can be obtained, and so that the proposals' full range of direct, indirect and cumulative threats to species habitat and to conservation and recovery of native vegetation communities can be fully understood.

New Studies on the Cheatgrass/Annual Grass Threat with Continued Grazing Disturbance

New scientific papers describe the serious threats of cheatgrass and annual grasses to arid western ecosystems. Mountains are becoming treeless - as these grasses that thrive in the wake of fires and grazing. This project and high levels of grazing on USFS lands exacerbate and elevate the threat of weeds like cheatgrass.

This Railroad Saddle proposal will increase disturbance to veg communities, soils and protective microbiotic crusts and create hotter, drier, windier, weedier sites that not only fast forward climate change effects, they also pave the way for the weedy "little arson grasses" like cheatgrass, medusahead and bulbous bluegrass to dominate ever-larger areas and be transported by cow/sheep vectors into adjacent uninfested sites.

See 2019 Fusco et al. paper on cd. Mountains may become treeless as a result.

<https://ktla.com/2019/11/04/little-arson-grasses-non-native-grass-species-making-california-wildfires-more-frequent-study-finds/>

"Invasive species are spreading more because of climate change as warmer weather moves into new areas, said study lead author Emily Fusco, also of the University of Massachusetts.

The study in Monday's journal Proceedings of the National Academy of Sciences looks at the connections

between a dozen species of invasive grasses and fires nationwide, finding fires occur more often in places with the non-native grasses [hellip]

This project promotes more intensive and extensive disturbance which will foster more and worse cheatgrass and other weed problems.

See also: <https://link.springer.com/article/10.1007/s10530-019-02120-8>

Fire, livestock grazing, topography, and precipitation affect occurrence and prevalence of cheatgrass (*Bromus tectorum*) in the central Great Basin, USA. Matthew A. Williamson, Erica Fleishman, Ralph C. MacNally, Jeanne C. Chambers. Bethany A. Bradley David S. Dobkin. David I. Board. Frank A. Fogarty. Ned Horning. Matthias Leu. Martha Wohlfeil Zillig.

Our novel time-series data and results indicate that grazing corresponds with increased cheatgrass occurrence and prevalence regardless of variation in climate, topography, or community composition, and provide no support for the notion that contemporary grazing regimes or grazing in conjunction with fire can suppress cheatgrass.

Cumulatively, the BLMs Grazing Reg Revision and Four Rivers RMP and actions such as targeted grazing or "flexibility" to extend harmful and damaging grazing use periods elevates weed and degradation risks in this landscape. We are very concerned about the proposed Project's serious adverse direct, indirect and cumulative environmental impacts in also promoting weedlands, in harming soils and crusts, in disrupting watershed processes, in increasing desertification, and so causing expanded loss of sustainability of habitats essential for viable populations of sensitive species and biodiversity. There will be worsened altered fire cycles if annual grasses invade more areas as a result of vegetation disturbance from relentless severe project grazing, expanded livestock facilities and unlimited amounts of salt/supplement use. EIS preparation is essential to fully assess, minimize and mitigate protect harms and to consider a broad range of alternatives. Soils (due to erosion and loss of topsoil (how much has already taken place in the region and where?) may also permanently lose recovery potential and soil horizons necessary for restoration of native species.

These new papers showing livestock grazing causes cheatgrass expansion - follow on several past papers such as Reisner et al. 2013. The grazing burden on these lands is a serious threat to recovery after the severe project disturbance, on top of levels of habitat degradation and outright habitat destruction that may be taking place elsewhere in the local and regional area. Grazing substantially aggravates weed risk - including cheatgrass infestation risks.

Abstract Cheatgrass (*Bromus tectorum*) has increased the extent and frequency of fire and negatively affected native plant and animal species across the Intermountain West (USA). However, the strengths of association between cheatgrass occurrence or abundance and fire, livestock grazing, and precipitation are not well understood. We used 14 years of data from 417 sites across 10,000 km² in the central Great Basin to assess the effects of the foregoing predictors on cheatgrass occurrence and prevalence (i.e., given occurrence, the proportion of measurements in which the species was detected) [hellip] Similar to previous research, our models indicated that fire is a strong, positive predictor of cheatgrass occurrence and prevalence. Models fitted to all sample points and to only unburned points indicated that grazing and the proportion of years grazed were strong positive predictors of occurrence and prevalence. In contrast, in models restricted to burned points, prevalence was high, but decreased slightly as the proportion of years grazed increased (relative to other burned points). Prevalence of cheatgrass also decreased as the prevalence of perennial grasses increased. [Yet the project will decrease the prevalence of perennial grasses through inflicting severe level of grazing use]. Cheatgrass occurrence decreased as elevation increased, but prevalence within the elevational range of cheatgrass increased as median winter precipitation, elevation, and solar exposure increased. Our novel time-series data and results indicate that grazing corresponds with increased cheatgrass occurrence and prevalence regardless of variation in climate, topography, or community composition and provide no support for the notion that

contemporary grazing regimes or grazing in conjunction with fire can suppress cheatgrass.

The analysis must fully address these serious ecological concerns, and develop a full range of reasonable alternatives to minimize or mitigate the threat noxious and other weeds - including bulbous bluegrass and/or cheatgrass infestation threat posed by current grazing.

New Study Showing Significant Benefits of Removing Grazing for Vegetation Community Health

Poessel et al. 2019 describe the very significant benefits of removing cattle for recovery of native vegetation communities and associated bird diversity. Prolonged rest must be fully considered in this project following any treatment disturbance, and in place of treatments including to recover aspen stands.

Removal of cattle grazing correlates with increases in vegetation productivity and in abundance of imperiled breeding birds Sharon A. Poessela, Joan C. Hagarb, Patricia K. Haggertyb, Todd E. Katznera

Livestock grazing is the most prevalent land use practice in the western United States and a widespread cause of degradation of riparian vegetation. Riparian areas provide high-quality habitat for many species of declining migratory breeding birds. We analyzed changes in vegetation and bird abundance at a wildlife refuge in southeastern Oregon over 24 years, following cessation of 120 years of livestock grazing. We quantified longterm changes in overall avian abundance and species richness and, specifically, in the abundances of 20 focal species. We then compared the local responses of the focal species to population-scale trends of the same species at three different large spatial scales. Overall avian abundance increased 23% during the 12 years after removal and remained consistent from then through year 24. Three times as many species colonized the survey sites as dropped out. Of the focal species, most riparian woodland-tree or shrub dependent, sagebrush obligate, and grassland or meadow taxa increased in abundance or remained stable locally. As these species were generally of conservation concern, the population increases contradicted regionally declining or stable trends. In contrast, most riparian woodland-cavity nester species decreased in abundance locally, reflecting disruption of aspen stand dynamics by decades of grazing. Avian nest parasites and competitors of native species declined in abundance locally, matching regional trends. Restoring riparian ecosystems by removing livestock appeared to be beneficial to the conservation of many of these declining populations of migratory birds.

Microbiotic Crust Literature - Analysis Must Assess the Pivotal Ecological Role of Intact and/or Recovering Crusts, and the Damage the Project Will Cause to Crusts,

A new study by Root et al. 2019 highlights the tremendous role crusts play in protecting lands from invasive flammable weeds.

Abstract. Exotic invasive plants threaten ecosystem integrity, and their success depends on a combination of abiotic factors, disturbances, and interactions with existing communities. In dryland ecosystems, soil biocrusts (communities of lichens, bryophytes, and microorganisms) can limit favorable microsites needed for invasive species establishment, but the relative importance of biocrusts for landscape-scale invasion patterns remains poorly understood. We examine the effects of livestock grazing in habitats at high risk for the invasion to test the hypothesis that disturbance indirectly favors exotic annual grasses by reducing biocrust cover. We present some of the first evidence that biocrusts increase site resistance to invasion at a landscape scale and mediate the effects of disturbance. Biocrust species richness, which is reduced by livestock grazing, also appears to promote native perennial grasses. Short mosses, as a functional group, appear to be particularly valuable for preventing invasion by exotic annual grasses. Our study suggests that maintaining biocrust communities with high cover, species richness, and the cover of short mosses can increase resistance to invasion. These results highlight the potential of soil surface communities to mediate invasion dynamics and suggest promising avenues for restoration in dryland ecosystems.

Living soil crusts in arid lands stabilize soils, protect them from erosion, sequester carbon dioxide and are a frontline defense against cheatgrass and other invasive species. See other research info:

Beymer et al 1992. Harmful effects of cattle grazing on microbiotic crusts. The project's clearing trees gives cows access to previously ungrazable sites with crusts that have been protected by tree limbs. Such sites are very often 100% covered by mosses, lichens and native grasses. The high level of grazing use and veg treatments across this landscape will strip this protective cover, and greatly increase watershed erosion and bare soil areas for weed colonization.

Bowker et al. 2008. Crusts serve as soil function indicators. Yet the project ignores and completely sacrifices crusts -exposing sites to even more intensive cow impacts such as weed-causing soil/crust trampling, deposition of weed-causing manure, cows eating and beating down plants protecting crusts.

Bortherson et al. 1984. This describes adverse effects of long-term livestock grazing on crusts.

Concostrino-Zubiri et al. describe effects of exposure and livestock grazing on crusts - example Bryophytes (mosses).

Deines et al. 2007. Lichen cover resulted in significant decreases in cheatgrass. Livestock trampling tears apart and/or pulverizes crusts.

Evans and Belnap 1999. Effects of loss of nitrogen from crust lost in soils in arid communities.

Fernandez et al. 2007. Results show that areas used by domestic livestock have 20% less plant cover and 100% less soil organic carbon and nitrogen compared to relict sites browsed by native ungulates. In actively grazed sites, domestic livestock grazing also appears to lead to clustered, rather than random, spatial distribution of soil resources.

Kettering 2009. Soil crusts were not totally recovered from disturbance following 40 years. This also impacts crusts carbon sequestration ability.

NRCS 2007. This describes microbiotic crusts and disturbance impacts.

Ponzetti and McCune 2007. This describes adverse effects of soil disturbance and increased incident radiation, increased heat load, and topographic position in crust recovery.

Rosentreter et al. Field Guide. Lichens and mosses typical of the region. Which species have been found, and where, in the project area and surroundings?

Serpe et al. crusts. 2008. Crusts tend to reduce the spread of invasive species. The project will harm and/or destroy or lead to greater cow-caused destruction of crusts.

USDI BLM Belnap et al. 2001. Tech. Ref. on Biological Crusts. Describes grazing and mechanical impacts to crusts, and their vital role in the ecosystem protecting soils from erosion in wind and water and other ecological functions.

These crusts will be highly degraded, disturbed and destroyed by the series of vegetation treatment and heavy equipment and fire use. Please provide a detailed baseline analysis of their current type, extent and occurrence here.

SENSITIVE SPECIES SUMMARY. Examples of Some Sensitive Avian Species Habitat Needs and Grazing and

other Land Management Conflicts and Threats Must Be Addressed in Shrub Communities

There must be a comprehensive and careful evaluation of sensitive species habitat needs, and systematic baseline inventories so the agency can understand what species are present in the project area and surrounding lands, and take a candid hard look at where, and how, the project may impact these sensitive species, and the full spectrum of habitat restoration needs for these species. Please also provide a detailed assessment of many important and rapidly declining migratory bird and other sensitive species habitat needs. It must take a hard science-based look at how intensive grazing and other management activities will impact these species.

We summarize some Sensitive Sagebrush Species Habitat Requirements. Habitat needs are derived from scientific papers and expert naturalist observations found in Dobkin and Sauder 2004, Rich, Knick et al. 2003 Teetering, Vanderhagen and other papers. As shown by Knick and Connelly (2011) Studies in Avian Biology, Crist et al. 2015 and 2016, the loss, damage, fragmentation and stresses on sagebrush plant communities essential to sagebrush species survival continues to increase across the sagebrush biome. The losses and stresses on the sagebrush community have escalated even more since 2011. There have been more fires, more exotic crested wheat and other cow food seeded to the detriment of native vegetation and animals, has allowed very high levels of livestock use to continue- causing cheatgrass proliferation in native communities. Agencies have also constructed more facilities impacting local populations - causing habitat loss, degradation and fragmentation. The Trump administration has also altered, weakened, gutted protections for migratory bird species (many of which are sensitive species) in many ways - adding to the need for this site-specific analysis to adopt much more protective measures in order to ensure compliance with the NFMA, and the Forest Plan.

[bull] Greater Sage-Grouse. Causes of Declines: Habitat destruction, degradation and fragmentation, altered fire frequency (both lower and higher), livestock grazing, converting shrub-steppe to annual monocultures are Threats. Range "improvements" (fences, water pipelines and troughs), and West Nile virus are threats. Please assess the degree to which grazing degrades and depletes taller mature and old growth sagebrush that takes many years to develop - with adverse impacts from high levels of livestock use; use of excessive non-mandatory measurable use limits especially when areas are grazed during the growing/nesting season, etc. Grazing is imposed during harmful time periods of use increasing GRSB and other sensitive biota predation risk and seriously damaging native veg communities (Mack and Thompson 1982, Anderson et al. BLM Tech Bull on BBWG defoliation). Agencies allows wanton placement of habitat destroying and fragmenting livestock facilities and salt/supplement and/or water that will attract predators and cause severe degradation of the native vegetation in the facility/supplement placement site. See Fleischner 2004, Knick et al. 2003, Freilich et al. 2003, Connelly et al. 2004, Knick and Connelly, eds. 2011 Studies in Avian Biology, Coates et al. 2016. See also Salazar Federal Court Order.

[bull] Sage Sparrow. Particularly associated with big sagebrush or may be found in mixed shrub communities with greater shrub cover, abundant bare ground, sparse grass cover. Shows high site fidelity. Habitat destruction, degradation and fragmentation are chief threats, and are caused by frequent fire, livestock grazing, range "improvements" (shrub treatments, exotic grass plantings) - and these promote other impacts - predation and nest parasitism. Grazing periods and facilities/water haul/salt supplement will degrade and deplete taller mature and old growth sagebrush that takes many years to develop with high levels of cow use, no measurable use limits, chaotic grazing including during harmful time periods of use, placement of habitat destroying and fragmenting livestock facilities that will attract predators and cowbirds. See Knick et al. 2003, Knick and Connelly, eds. 2011 Studies in Avian Biology. Also, Fite field obs. in project area. Presence of livestock during spring periods increases presence of raven nest and egg predators. See Coates et al. 2016.

[bull] Loggerhead Shrike. Shrubsteppe, open woodland, field edges, and occasionally riparian areas. Presence and abundance in shrubsteppe is positively correlated with the diversity, density and height of shrubs. Loggerhead shrikes require tall structurally diverse big sagebrush in the project area and also nest in taller salt desert shrubs in proximity to ARTRW, and extend up through tall dense sage communities and sage-bitterbrush

to juniper areas in some sites. (Fite, field obs.). Intensive grazing use breaks and simplifies protective shrub structural complexity. It degrades, depletes and often destroys taller mature and old growth sagebrush/shrubs that take many years to develop. The structural complexity of these shrubs is simplified by high levels of cow use, sky high measurable use limits, grazing during harmful time periods of use, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement (causes extreme cattle damage to sites where they are placed and will also attract predators and cowbirds). Knick et al. 2003, See Knick and Connelly, eds. 2011 Studies in Avian Biology, Coates et al. 2016.

[bull] Sage Thrasher. Habitat destruction, degradation and fragmentation are threats, including activities that destroy shrub cover (fire (pile burning associated with deforestation will cause collateral damage and cheatgrass invasion) and harm local populations. Although authors note that livestock grazing may increase shrubs, livestock grazing also alters and simplifies shrub structure, especially that of taller sagebrush or other shrubs which are the specific sites where sage thrashers nest. The end result is lollipop like see-through sage providing suboptimal cover for many species. Sage thrashers require mature and old growth taller big sagebrush that takes many years to develop. Grazing degrades and depletes taller mature and old growth sagebrush with high levels of cow use. The very high use limits and stocking, grazing during harmful time periods of time, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under TG, OBG, flexibility, minimal review- all will attract predators and cowbirds. See Rich 1997, Knick et al. 2003, Knick and Connelly, eds. 2011 Studies in Avian Biology. Also Fite field obs. in project area.

[bull] Green-tailed Towhee. In shrubsteppe, its presence and abundance are positively correlated with increased shrub species diversity, shrub cover, and taller shrubs. Threats are habitat destruction and degradation - livestock grazing and frequent fire have impacted shrubs. Simplification of shrub cover results in population reduction or elimination. Green-tailed towhees require taller dense big sagebrush and other shrubs that take long periods of time to develop. Grazing at continued levels and even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under TG, OBG, flexibility, minimal review-will degrade and deplete taller mature and old growth sagebrush with high levels of cow use, no measurable use limits, chaotic grazing including during harmful time periods of use, placement of habitat destroying and fragmenting livestock facilities that will attract predators and cowbirds. Knick et al. 2003, Knick and Connelly, eds. 2011 Studies in Avian Biology. Coates et al. 2016. Also, Fite field obs.in project area.

[bull] Brewer's Sparrow. Its presence is positively correlated with total shrub cover, bare ground, taller shrubs, patch size, and habitat heterogeneity - and negatively correlated with grass and salt shrub cover. Large population declines have occurred in the Columbia Plateau and Great Basin. It is a cowbird host. Threats include habitat destruction and degradation. Activities that destroy shrub cover include fire, chaining, herbicide use, etc. This species is also a cowbird host. It has a positive response to increased shrubs - see previous comments about shrub structure and negative responses to grazing, which reduces and simplifies shrub structure. Grazing degrades and depletes taller mature and old growth sagebrush that takes many years to develop - due to high levels of cow use, no measurable use limits, chaotic grazing including during harmful time periods of use, placement of habitat destroying and fragmenting livestock facilities will attract predators and cowbirds. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under TG, OBG, flexibility, minimal review will all harm this species. See Knick et al. 2003, Knick and Connelly, eds. 2011 Studies in Avian Biology. Coates et al. 2016. Also, Fite field obs. in project area.

[bull] Ferruginous Hawk. Open areas, isolated trees, and edges of juniper woodlands are used for hunting perches and nesting. "Prey abundance, particularly jackrabbits and ground squirrels, is correlated significantly with the number of breeding pairs in an area and with reproductive success". (Dobkin and Sauder 2004, citing Jasikoff 1982 and Deschant 2001 b) (at 36). Habitat destruction and degradation are greatest threats, and directly influence prey abundance, important to reproductive success. Jackrabbits require mature sagebrush communities, which the project will degrade. Raptors can be particularly sensitive to human disturbance (Dobkin

and Sauder at 37). Human disturbance and habitat depletion for prey species is a concern, as are "treatments" and other management across the region destroying juniper nest sites. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under TG, OBG, flexibility, minimal review will all harm this species.

Prairie Falcon. Open habitats with moderate grass cover and low-growing sparse shrubs. Nest-site availability and ground squirrel populations are important factors in habitat selection. Activities affecting ground squirrel abundance, include livestock grazing, frequent fires, ag conversion, poisoning. Disturbance near nest sites (cliffs) can reduce breeding success. The proposal will cause intensified human disturbance and habitat depletion for prey species, with expanded zones of disturbance, and continued very high stocking with meaningless utilization standards will ensure expansion of cheatgrass. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement will all harm this species.

[bull] Long-Billed Curlew. Livestock grazing can be negative if cows/sheep trample nests or disturb birds and cause nest abandonment. The project involves extensive nesting period grazing disturbance. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement, flexibility, minimal review will all harm this species.

[bull] Burrowing Owl. Requires low vegetation and a suitable nest burrow. Owls may use other species burrows, but do not dig their own. Excavation by ground squirrels, marmots and badgers is important in nest burrow availability. Threats are habitat degradation and destruction, and shrub-steppe degradation. Pesticides can reduce populations of insect prey and fossorial mammals (and degraded habitats may result in very high numbers of grasshoppers/Mormon crickets, and thus calls for insecticide spraying). Badgers, coyotes, birds of prey and vehicle collisions may also be problems. Large herds of livestock and facilities/activities during nesting periods, and water hauling or intensive grazing schemes may result in intensified risk of vehicle collisions. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under flexibility or minimal review will all harm this species.

Other Migratory Bird Species Habitats and Populations

[bull] Gray Flycatcher. Shrub-steppe, mountain mahogany and juniper. In shrubsteppe, gray flycatchers are associated with tall, dense sagebrush. Manipulation such as chaining or burning of sagebrush and juniper areas is known to eliminate gray flycatchers. This species is also parasitized by the brown-headed cowbird, a nest parasite whose numbers are increased with the presence of livestock. Habitat fragmentation also likely increases nest parasitism and predation rates. Livestock degrade destroy taller mature and old growth sagebrush that takes many years to recover. See Knick and Connelly, eds. 2011 Studies in Avian Biology. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under flexibility, or minimal NEPA review will all harm this species.

[bull] Vesper Sparrow. Inhabits short, patchy herbaceous vegetation, low shrub cover bare ground, forbs. Habitat destruction and degradation - frequent fires, in conjunction with invasive grasses, heavy livestock grazing (which increases shrub cover), and poor range conditions created by livestock grazing - including grazing causing expansion of cheatgrass - and grazing during drought increases rates of nest abandonment and failure. Cowbird host. Grazing at continued levels and foreseeably even more harmful use, high stocking, placement of habitat destroying and fragmenting livestock facilities/water haul/salt/supplement under flexibility, or minimal NEPA review will all harm this species.

There are additional recent summaries of species trends that support Dobkin and Sauder (2004). Interior Secretaries (Salazar, Jewell) released reports on the declining status of many migratory birds which largely

mirrors the info in Dobkin and Sauder, the Teetering on the Edge paper (Knick et al. 2003), Connelly et al. 2004.

Many species with downward trends in population size are associated primarily or exclusively with shrub-steppe or riparian habitats. In shrubsteppe, this includes northern harrier, mourning dove, horned lark, loggerhead shrike, green-tailed towhee, vesper sparrow, sage sparrow (USGS data) Populations up in one area, down in another: rock wren, sage thrasher, Brewer's sparrow, black-throated sparrow, western meadowlark. Population sizes of mourning dove and loggerhead shrike, whose abundances are declining widely in western North America are also declining in the Great Basin. The preponderance of downward trends in shrub-steppe indicates continuing problems with the health of this community. Likewise, many riparian species also had downward trends: killdeer, violet-green swallow, warbling vireo, yellow warbler, lazuli bunting, savannah sparrow, song sparrow, yellow-headed blackbird, Brewer's blackbird. Downward trends in riparian species are indicative of continuing deterioration of riparian habitats across the biome.

There are the known habitat problems and downward trends across the region, and harmful effects of vegetation manipulation, exotic seedings, roads and road networks and upgrades often associated with high levels of grazing "management" expansion and facilities/development - and other disturbances that form the basis of high levels of livestock disturbance across lands in this landscape, and this will get worse under the proposal.

Landscape-scale conservation is a critical component of ICBEMP assessments (see Wisdom et al. 2002). Agencies are required to follow ICBEMP science under a multi-agency MOU. Lands in this Owyhee region were identified by ICBEMP analyses as Source Habitats for Terrestrial vertebrates dependent on sagebrush in Wisdom and other analyses. (Dobkin and Sauder 2004). Interior's own State of the Birds reports (appear to have been discontinued in Trump admin.) have documented large-scale declines.

General Livestock Grazing and Facility Harms

The environments of the interior West, evolved without significant grazing pressure. This is because bison and other large herbivores were relatively uncommon west of the Continental Divide before Euro-American settlement (Mack & Thompson 1982, Warren & Eldridge 2001, Knapp 1996). The introduction of livestock devastated native bunchgrasses and paved the way for weed invasion. Historical grazing practices established cheatgrass throughout the Intermountain West (Yensen 1981, Knapp 1996, Chambers & Wisdom 2009, Condon & Pyke 2018). Today, grazing continues to drive annual grass invasions throughout the Great Basin. Grazing spreads invasive annual grasses by removing native perennial grasses (Reisner et al. 2013, Rosentreter 1994, Chambers et al. 2007, Belsky & Blumenthal 1997, Briske & Richards 1995), by disturbing soils (Olf & Ritchie 1998), and by damaging biological soil crusts (Belnap 2006, Chambers et al. 2014, Reisner et al. 2013, Ponzetti, McCune, & Pyke 2007, Warren & Eldridge 2001, Belnap 1995). As summarized by Chambers et al. (2014):

Grazing can decrease the relative abundance of palatable grasses and

forbs, disrupt biological soil crusts, and increase soil surface disturbance in communities dominated by herbaceous species and shrubs/trees. These changes can increase available soil water and nitrate in the upper profile of cold desert soils. . . . With increasing levels of grazing intensity, bare soil can increase and cheatgrass can become progressively more abundant in interspaces among residual perennial herbaceous species. These changes can lower resilience to fire due to higher or more contiguous fine fuels that result in greater fire severity and extent and high mortality of fire-intolerant trees and shrubs.

Livestock also distribute annual grass seeds across the landscape through their hooves, fur, and digestive tracts (Schiffman 1997, Olf & Ritchie 1998, Chambers et al. 2016, Mack 1981, Knapp 1996). According to Bartuszevige & Endress (2008), "[c]attle disperse more than an order of magnitude more non-native grass seeds per animal than do elk or deer." Over 70% of viable seeds in cattle feces were exotic grass species

(Bartuszevige & Endress 2008; see also Janzen 1994, Getz & Baker 2008). Areas around troughs, salt/supplement sites and watering sites are especially vulnerable to invasion because of the high amount of trampling disturbance.

Researchers have hypothesized that moderate grazing and deferment schedules increase cheatgrass abundance (Knapp 1996, Schmelzer et al. 2014). Carter et al. (2014), meanwhile, found that so-called "holistic" grazing systems confer no environmental benefits and harm native bunchgrass sagebrush communities. Inconsistencies in monitoring persist within and among agencies, making it difficult to measure current grazing pressure (Condon & Pyke 2018).

The infrastructure of watering systems and barbed-wire fencing needed to manage large herds of cattle in the high desert also fragment and destroy sagebrush habitat, artificially concentrating cattle in important sage-grouse habitat areas, dewatering natural springs and water courses, and creating thousands of potential breeding grounds for West Nile virus-carrying mosquitoes as water stagnates in reservoirs, troughs, and even cattle hoof prints (Walker & Naugle 2011). See also 75 Fed. Reg. at 13,941. The virus is 100% fatal to sage-grouse (Walker & Naugle 2011). See also 75 Fed. Reg. at 13,941, 13,967-68.

Structures such as fences also can inhibit or destroy genetic connectivity between populations. Water collected in livestock reservoirs and troughs—and even in cattle hoof prints—acts as mosquito breeding grounds, facilitating the spread of West Nile virus (Knick & Hanser 2011). Individual mosquitoes carrying the virus can fly more than 11 miles from these water sources (Walker & Naugle 2011, USFWS 2010). Sage-grouse experience 100% mortality when exposed to West Nile virus (USFWS 2010). The virus is capable of extirpating a local sage-grouse population following a single outbreak (Walker & Naugle 2011). West Nile also sickens and/or kills migratory birds including several sensitive species at risk here.

The presence of livestock in the landscape increases stress hormones in sage-grouse, with unknown and likely adverse physiological effects. Jankowski et al. 2014.

Beschta Climate Stress Info - Analysis Ignores Climate Stress and Lack of Land Resilience

The Abstract from Beschta et al. 2014 includes:

"[...] legacy [grazing] effects to western ecosystems were indeed significant and contemporary livestock use on public lands generally maintains or exacerbates many of those effects; (2) livestock grazing has been a major factor affecting fire frequency, fire severity, and ecosystem trajectories in the western US for over a century; and (3) the removal or reduction of grazing impacts in these altered ecosystems is the most effective means of initiating ecological recovery. Svejcar et al. (Environ Manage, 2014) offer no evidence that livestock use is consistent with the timely recovery of grazing-degraded uplands, riparian areas, or stream systems. We thus conclude that public-land ecosystems can best persist or cope with a changing climate by significantly reducing ungulate grazing and related impacts.

This demonstrates the need to fully consider the impacts and stresses posed by legacy and ongoing livestock grazing; impacts of grazing on fire frequency/severity and ecosystem trajectories, and the benefits of removal and/or significant reductions in grazing.

"Contemporary grazing impacts (as described in Beschta et al. 2013) compound" legacy effects, including: altered fire regimes; biological soil crust loss, soil loss, and compaction; altered composition, structure, and function of upland, riparian, and stream biological communities; altered streamflow regimes; and reduced food-web support and physical habitat for terrestrial and aquatic biota (Blackburn 1984; Belsky et al. 1999; Kauffman and Pyke 2001; Belnap and Lange 2003; Fleischner 2010). Combined legacy and current grazing effects have left many streams with degraded riparian vegetation, accelerated bank erosion, widened and/or incised stream channels,

and altered water quality (increased temperatures and sediment loads).

From the 2014 Beschta et al. article text:

Livestock grazing also has widespread effects on the frequency and distribution of native grasses, forbs, and shrubs, and native wildlife species dependent upon those plants [e.g., sage-grouse (*Centrocercus urophasianus*); Manier et al. 2013]. Livestock grazing is not a viable tool for reducing fuels and wildfire effects. Livestock grazing in western US landscapes altered natural fire regimes by decreasing the frequency of low-severity fires beginning in the early 1900s (Swetnam and Betancourt 1998), making large areas prone to invasion by woody species and, in turn, more susceptible to high-severity fires (Chambers and Pellang 2008). Furthermore, cheatgrass (*Bromus tectorum*), an annual exotic, spread rapidly throughout the Intermountain West as a result of livestock movement and overgrazing (Mack, 1986), contributing to more frequent burning. Cheatgrass dominates nearly 70,000 km² in the Great Basin and is a component on an additional 250,000 km² (Diamond et al. 2012). Reisner et al. (2013) found that: livestock grazing increases cheatgrass dominance in sagebrush steppe, reduced grazing may be one of the most effective means of conserving and restoring imperiled sagebrush ecosystems, and livestock grazing is not likely a viable tool for reducing cheatgrass dominance because it promotes cheatgrass invasion. Although livestock grazing has complex ecological consequences, large-scale reductions in grazing effects are likely to reduce cumulative ecosystem degradation. Recognizing the complexity of grazing issues was central to the synthesis and recommendations included in Beschta et al. (2013). Our analyses provided an integrative view of that complexity: we discussed three classes of ungulates (domestic, feral, wild), drawing examples from diverse vegetation types (shrub steppe, desert, conifer forest) and ecological attributes (such as water quality, hydrology, riparian areas, soils, hydrology, biodiversity). Nevertheless, compelling reasons exist to single out livestock as a cause of ecological harm to native plant communities, terrestrial and aquatic habitats, and watershed processes (Belsky et al. 1999; Kauffman and Pyke 2001; Belnap and Lange 2003; NRC 2002). Livestock use is a principal cause of desertification in arid and semi-arid landscapes (Swetnam and Betancourt 1998; Belnap and Lange 2003; Fleischner 2010). It has the most extensive land-use footprint on western public lands (Beschta et al. 2013), and it continues at major public expense (Livestock production also contributes directly and indirectly to greenhouse gases, raising increasing concern about its climate effects (Ripple et al 2014). The cessation or removal of factors that cause degradation or prevent recovery is the most effective and robust approach to ecological restoration (Kauffman et al. 1997). Unlike many stressors, livestock use is subject to human control.

Beschta et al. 2012. Adapting to Climate Change on Western Public Lands: Addressing the Ecological effects of Domestic, wild and Feral Ungulates.

This Abstract includes:

Historical and contemporary livestock production—the most widespread and long-running commercial use of public lands—can alter vegetation, soils, hydrology, and wildlife species composition and abundances in ways that exacerbate the effects of climate change on these resources.

Removing or reducing livestock across large areas of public land would alleviate a widely recognized and long-term stressor and make these lands less susceptible to the effects of climate change. Where livestock use continues, or where significant densities of wild or feral ungulates occur, management should carefully document the ecological, social, and economic consequences (both costs and benefits) to better ensure management that minimizes ungulate impacts to plant and animal communities, soils, and water resources. Reestablishing apex predators in large, contiguous areas of public land may help mitigate any adverse ecological effects of wild ungulates.

Climate-related changes can not only affect public-land ecosystems directly, but may exacerbate the aggregate effects of non-climatic stressors, such as habitat modification and pollution caused by logging, mining, grazing,

roads, water diversions, and recreation (Root and others 2003; CEQ 2010; Barnosky and others 2012).

One effective means of ameliorating the effects of climate change on ecosystems is to reduce environmental stressors under management control, such as land and water uses (Julius and others 2008; Heller and Zavaleta 2009; Prato 2011).

Climate change and ungulates, singly and in concert, influence ecosystems at the most fundamental levels by affecting soils and hydrologic processes. These effects, in turn, influence many other ecosystem components and processes—nutrient and energy cycles; reproduction, survival, and abundance of terrestrial and aquatic species; and community structure and composition. Moreover, by altering so many factors crucial to ecosystem functioning, the combined effects of a changing climate and ungulate use can affect biodiversity at scales ranging from species to ecosystems (FS 2007) and limit the capability of large areas to supply ecosystem services (Christensen and others 1996; MEA 2005b).

Climate induced increases in wildfire occurrence may aggravate the expansion of cheatgrass (*Bromus tectorum*), an exotic annual that has invaded millions of hectares of sagebrush (*Artemisia* spp.) steppe, a widespread yet threatened ecosystem. In turn, elevated wildfire occurrence facilitates the conversion of sagebrush and other native shrub-perennial grass communities to those dominated by alien grasses (D'Antonio and Vitousek 1992; Brooks 2008), resulting in habitat loss for imperiled greater sage-grouse (*Centrocercus urophasianus*) and other sagebrush-dependent species (Welch 2005). The US Fish and Wildlife Service (FWS 2010) recently concluded climate change effects can exacerbate many of the multiple threats to sagebrush habitats, including wildfire, invasive plants, and heavy ungulate use. In addition, the combined effects of increased air temperatures, more frequent fires, and elevated CO₂ levels apparently provide some invasive species with a competitive advantage (Karl and others 2009).

By the mid-21st century, Bates and others (2008) indicate that warming in western mountains is very likely to cause large decreases in snowpack, earlier snowmelt, more winter rain events, increased peak winter flows and flooding, and reduced summer flows. Annual runoff is predicted to decrease by 10-30 % in mid-latitude western North America by 2050 (Milly and others 2005) and up to 40 % in Arizona (Milly and others 2008; ITF 2011). Drought periods are expected to become more frequent and longer throughout the West (Bates and others 2008). Summertime decreases in streamflow (Luce and Holden 2009) and increased water temperatures already have been documented for some western rivers (Kaushal and others 2010; Isaak and others 2012).

Livestock use effects, exacerbated by climate change, often have severe impacts on upland plant communities

Simplified plant communities combine with loss of vegetation mosaics across landscapes to affect pollinators, birds, small mammals, amphibians, wild ungulates, and other native wildlife (Bock and others 1993; Fleischer 1994; Saab and others 1995; Ohmart 1996). Ohmart and Anderson (1986) suggested that livestock grazing may be the major factor negatively affecting wildlife in eleven western states.

Livestock grazing and trampling can damage or eliminate biological soil crusts characteristic of many arid and semiarid regions (Belnap and Lange 2003; Asner and others 2004). These complex crusts are important for fertility, soil stability, and hydrology (Belnap and Lange 2003). In arid and semiarid regions they provide the major barrier against wind erosion and dust emission (Munson and others 2011).

REISNER Dissertation and Reisner et al. 2013 CHEATGRASS AND GRAZING EXCERPTS Demonstrating Grazing Harms to Sagebrush and other Arid Ecosystems

See also Reisner et al. 2013. <http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12097/abstract> Conditions favouring *Bromus tectorum* dominance of endangered sagebrush steppe ecosystems

The following excerpts are from the Reisner dissertation on which the article is based. We are including them here because they provide additional information and scientific references related to the great threat livestock

grazing poses to sage-grouse habitats.

Screen 66, page 50:

Cattle herbivory is a novel type of stress compared to the stress regimes under which native bunchgrasses recently evolved (10,000-12,000yr) in the Northern Great Basin (Mack and Thompson 1982; Adler et al. 2004). Consequently, many bunchgrasses, including *P. spicata*, *P. secunda*, *A. thurberianum*, *S. comata*, *A. thurberianum*, are highly sensitive to intense grazing (Blaisdell and Pechanec 1949; Mueggler 1975; Rickard et al. 1975; Mack and Thompson 1982; Ganskopp 1988). Cattle herbivory and associated disturbances are predicted to be important drivers of *Artemisia* community composition and structure (Miller et al. 1994; Briske and Richards 1995). Interactions between herbivory and water stress would not be surprising because defoliation during water stress reduces bunchgrass recovery (Busso et al. 1989; Brown 1995). Cattle herbivory stress overlapped with heat stress to form the first stress gradient. The increasing heat stress was driven by changes in landscape orientation (aspect and slope). Our findings confirm the prediction of Davies et al. (2007) that heat stress is an important driver of shifts in the spatial patterns of association between *Artemisia* and herbaceous species and others that landscape orientation is an important determinant of *Artemisia* community structure (Passey et al. 1982; Hironaka et al. 1983; Jensen 1990). The only prerequisite to facilitation of this non-resource-based stress gradient is *Artemisia* canopy protection from cattle herbivory and amelioration of heat stress (Callaway 2007; Maestre et al. 2009). Cattle herbivory stress overlapped with water stress to form the second stress gradient. In *Artemisia* ecosystems, water and nitrogen are both limiting factors to plant ..

Screen 70:

In striking contrast to natives, the non-native focal species, *B. tectorum* and *L. perfoliatum*, exhibited the strongest competition at the highest stress levels, which coincided with their ecological optima (Liancourt et al. 2005). Because of their strong herbivory tolerance and avoidance of water stress, both species may derive few benefits from facilitation but incur the costs of competition (Reichenberger and Pyke 1990). The strikingly different patterns of interaction outcomes between *Artemisia* and the non-natives, *L. perfoliatum* and *B. tectorum*, compared to the native bunchgrasses strongly suggest that a shift in the relative importance of selective forces has fundamentally altered the structure of *Artemisia* interactions with herbaceous species. We contend that prior to cattle introduction negative interactions between *Artemisia* and bunchgrasses for water and nutrients were likely one of the most important selective forces (Caldwell et al. 1987; Caldwell et al. 1991; Miller et al. 1991). Positive interactions were probably limited to *Artemisia* amelioration of heat stress and water stress. Competition and neutral outcomes were probably most frequent, i.e. similar to the interaction outcomes at the lowest levels of stress in this study. The competition between *Artemisia* and the non-natives, *B. tectorum* and *L. perfoliatum*, observed in this study evidences these past interactions and forces. [hellip]

Screen 71:

With the introduction of cattle, *Artemisia* protection from herbivory increased in importance as an underlying positive interaction because of the sensitivity of most bunchgrasses to such grazing (Mack and Thompson 1982). Under this novel selective force, facilitation and neutral outcomes increased in frequency and strength, i.e. similar to the interaction outcomes at the intermediate and high stress levels. The consistent *Artemisia* facilitation of native bunchgrasses provided evidence for the strength of this selective force. We contend that these changes fundamentally altered the structure of interactions between *Artemisia* and many bunchgrass species. Finally, our findings support for all three proposed general shapes of the [hellip]

Screen 73:

Valiente-Banuet et al. (2006) found that many species lineages that evolved under more mesic climatic conditions than those of the current Mediterranean are now dependent on positive interactions from nurse plants

for their persistence. Similarly, 57 many native bunchgrass species may now be dependent on *Artemisia* facilitation for their continued persistence under otherwise unsuitable levels of herbivory, heat, and water stress (Valiente-Banuet et al. 2006; Callaway 2007; Brooker et al. 2008). In contrast, the highly invasive *B. tectorum* dominates the interspace microsites where its collective avoidance and tolerance mechanisms minimize stress impacts, but is also present under shrubs where *Artemisia* competition limits its dominance. In *Artemisia* communities characterized by intermediate to high combined levels of heat, water, and cattle herbivory stress levels, sagebrush removal will simultaneously eliminate *Artemisia* competition and facilitation. Released from *Artemisia* competition, *B. tectorum* community composition is likely to increase (Reichenberger and Pyke 1990; Chambers et al. 2007), whereas native bunchgrass cover is likely to decrease without *Artemisia* protection from herbivory and amelioration of heat and water stress. If removal is fire-driven, then the higher fire intensity beneath shrubs may result in bunchgrass mortality (Pyke et al. 2010).

Screen 74:

Ongoing global climate change may increase heat stress and potentially increase water stress by altering precipitation regimes in these *Artemisia* communities (Neilson et al. 2005; Chambers et al. 2009; Chambers and Wisdom 2009). Reducing cumulative cattle grazing intensities may be the only effective means of reducing cumulative stress levels to avoid these fire-triggered catastrophic regime shifts (Scheffer et al. 2009; Briske et al. 2008). Our findings suggest two factors that land managers must consider before [hellip]

Screen 75:

The Greater Sage-Grouse was recently listed as a candidate species under the Endangered Species Act. Strategies to retain sufficient sagebrush cover necessary to ensure sage-grouse conservation will require restoration treatments that maintain minimum levels of *Artemisia* cover at the landscape level (Meinke et al. 2008; Pyke 2010). Our findings suggest that *Artemisia* and the refuge native bunchgrass communities in under-shrub microsites can play a pivotal role in passive and active 59 restoration (McIver and Starr 2001; Pyke 2010). Passive restoration involves changing management practices to recover native species, whereas active restoration involves some level of vegetation manipulation (Pyke 2010). In passive restoration, remnant native bunchgrass populations beneath sagebrush canopies in areas where the native understory has been depleted by cattle grazing or other land uses may serve as a vital source of seed availability and accelerate otherwise slow re-colonization rates. In active restoration, *Artemisia* canopies may serve as important locations for planting native seedlings as an intermediate restoration step prior to reducing the shrub component (Huber-Sannwald and Pyke 2005). In communities characterized by intermediate or high combined stress levels, our results suggest that *Artemisia* may increase the restoration success rates by protecting native seedlings from cattle herbivory and ameliorating heat and water stress.

Screen 76:

... this study has: (1) revealed strikingly different patterns of shifts in interaction outcomes between native and non-native species-including the highly invasive *B. tectorum*; (2) revealed strong *Artemisia* facilitation of many native bunchgrasses; and (3) identified novel cattle herbivory stress as one of the primary potential drivers of shifts in the structure of species interactions. These findings are likely to have profound implications for the compositional and functional stability of these endangered ecosystems.

Screen 108:

This study reports the first evidence of native species facilitation decreasing

community invasibility. *Artemisia* facilitation increased native bunchgrass composition, which reduced the magnitude of *Bromus tectorum* invasion in undershrub compared to interspace communities. Unfortunately, this

decreased invasibility did not translate into lower invasibility at the community level because of the limited spatial scale over which such facilitation occurs. Also, we report that *Artemisia* facilitation increased community compositional and functional stability at intermediate Facilitation became a destabilizing force when native bunchgrass species became "obligate" beneficiaries, i.e. strongly dependent on *Artemisia* facilitation for their continued persistence in the community.

Finally, shifts in the structure of interaction outcomes between *Artemisia* and native bunchgrasses, from competitive/neutral at low stress to facilitative/strongly facilitative at high stress, were associated with a decrease in community compositional and functional stability. A perfect storm of factors likely explain the especially pronounced destabilizing effects we observed. *Artemisia* is a dominant foundational species that exerts strong control over negative and positive interactions in the community, increasing cattle grazing was a predominant driver of shifts in the structure of interactions between *Artemisia* and bunchgrasses, and the structure of interactions between *Artemisia* and the invasive *B. tectorum* was fundamentally different than those with native bunchgrasses. Conserving and restoring the stability of these communities will require significantly reducing cumulative stress levels, and reducing cumulative cattle grazing levels by adjusting utilization rates and/or seasons of use.

Environmental Characteristics of Great Basin and Mojave Desert Spring Systems Donald W. Sada Alexandra D. Lutz Division of Hydrologic Sciences

The proposed change endanger and jeopardize springs, seeps, streams, meadows and other riparian areas - at the same time as the Trump Admin. Has axed the Waters of the U.S. (WOTUS) rule, and is stripping other Clean Water protections as well.

Environmental conditions recorded at 2,256 Great Basin and Mojave Desert springs that were inventoried from the late 1980s into 2013 are summarized. These records provide information about individual springs and their spatial variability across the landscape. Insight into their changing condition is provided by records compiled at springs visited several times over more than 20 years. Although this summary considers a small proportion of springs in this region, it provides broad insight into their size, basic water chemistry, and conditions that are indicative of springs over a large portion of the southwestern US.

This assessment examines physicochemical characteristics of all of the springs surveyed, and by segregating them by land manager or owner (e.g., U.S. Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, and private). Springs ranged widely in size, water chemistry, vegetative cover, and substrate composition. Some springs were very large, as indicated by discharge, springbrook length, water depth, and wetted width. However, median estimated discharged from all springs was less than 10 l/min, springbrook length was less than 50 m, water depth was less than 3 cm, and median springbrook width was less than 100 cm. There was also a wide diversity in water chemistry, from cold to very hot springs, from low to very high electrical conductance (EC), moderately low to moderately high pH, and low to very high dissolved oxygen (DO) concentrations. Most were relatively moderate environments, however. Median temperature was near ambient, EC was relatively high, pH was slightly higher than neutral, and DO was moderate. Emergent and bank cover generally exceeded 50 and 68 percent, respectively, and fines dominated substrate composition in most springs. Sand, gravel, cobbles, and boulders were relatively scarce.

Approximately 3 percent the springs were disturbed by natural factors, and evidence of human disturbance was at approximately 83 percent of springs. Approximately 65 percent were moderately or highly disturbed by either diversion, horse, burro, or cattle use, recreation, or dredging, and many springs were degraded by several of these uses. Recent studies by Keleher and Radar (2008) and Sada et al. (2015) show that these levels of disturbance represent highly degraded, unhealthy ecosystems. Moderately or highly degraded springs were most common on Bureau of Land Management land, followed by private lands, U.S. Forest Service, and finally U.S. Fish and Wildlife Service lands.

Changes in the condition of 265 springs that were surveyed several times over 20 years found that condition improved in 16 percent of springs, were unchanged in 40 percent, but degraded in 44 percent of springs. Many Great Basin and Mojave Desert springs are occupied by rare aquatic life that occurs only in this region. Further evidence of degrading condition is exhibited by extirpation of 27 populations of these taxa between the late 1980s into 2013. Two extinctions were also documented over this period. All of this information shows that springs in this region are degraded, that degradation is continuing, and that current management is not providing for their ecological health.

Springs provide much of the aquatic environment in arid lands as well as a substantial portion of regional aquatic and riparian biodiversity, and water for rural economies. Springs were also highly symbolic and sacred places for Native Americans who believed that landscapes and homelands are often more important than events and time. New strategies are needed to manage and restore these systems, improve ecological health, and stop the extirpation of rare aquatic life that occurs only in Great Basin and Mojave Desert springs.

The proposed revisions are the dead opposite of new strategies - as they would loosen controls on grazing damage to springs, streams and meadows - despite their tremendous values for wildlife and aquatic biota, and the serious threat of climate change on the region's waters - which is amplified by grazing disturbance. Beschta et al. 2012 and 2014

Springs are small aquatic systems that occur where groundwater reaches the surface (Meinzer 1923). In deserts, they range widely in size, water chemistry, morphology, landscape setting, and persistence. Some springs dry each year, some dry only during extended droughts, while some persist for millennia. Desert springs are distinct from springs in more temperate or humid regions because they are typically isolated from other waters, some are more susceptible to drought, and aquifers in these regions are strongly influenced by high elevations, rugged topography, diverse lithology, and aridity (Thomas et al. 1996, Hershey et al. 2010). Geology, aquifer size, geography, climate, persistence of water, and the flow path of groundwater movement constitute the hydrologic context for each spring. These factors also provide the fundamental natural elements that influence spring environments and structure biotic communities. Sada and Thomas (draft manuscript) examined hydrogeology and ecology of reference Great Basin and Mojave Desert springs and found that the characteristics of benthic macroinvertebrate (BMI) communities were associated with aquifer characteristics and groundwater flow pathways.

[hellip] a consequence of their lengthy isolation and long-term persistence, many Great Basin and Mojave Desert springs also support a crenophilic (obligate spring dwelling) and endemic fauna and flora (e.g., Sada 1990, Erman and Erman 1995, Hershler 1998, Baldinger et al. 2000, Polhemus and Polhemus 2002, Keleher and Sada 2012). When they are persistent, and unaffected by human activity, springs are generally more stable than lotic systems because they are not exposed to variability in temperature, discharge, and water chemistry (McCabe 1998). Variability in population size and assemblage structure of aquatic life in persistent springs is low compared to other aquatic systems, and springs are often occupied by animals unable to survive highly variable environments (van der Kamp 1995).

Many authors have noted the degraded condition of desert springs caused by diversion, non-native ungulate use, excessive groundwater pumping, non-native aquatic species, etc. (e.g., Shepard 1993, Sada et al. 2001, Unmack and Minckley 2008). Effects of these activities have been reported mostly as extirpations, extinctions, or declines in abundance of crenophiles (e.g., Miller 1961, Williams et al. 1985, Minckley and Deacon 1968, Sada and Vinyard 2002, Abele 2011).

Several studies provide insight into the ecological effects of disturbance on springs. Sada et al. (2005) and Fleishman et al. (2006) found that BMI and riparian communities in 63 Mojave Desert and southern Great Basin springs generally differed along an environmental stress gradient where highly disturbed springs supported

depauperate communities composed of animals and plants that are more tolerant of harsh physicochemical environments than less disturbed springs. Statistically significant differences could not be detected between BMI and riparian communities in undisturbed and slightly disturbed springs, but differences between springs with these levels of disturbance significantly differed from communities in springs that were moderately or highly disturbed (Sada and Nachlinger 1998).

Sada et al. (2015) examined 115 Nevada springs to assess the influence of natural and human disturbances and other physicochemical metrics on the BMI communities. They found that their structure was less affected by natural factors (e.g., water temperature, elevation, electrical conductance, etc.) than they were to the level of disturbance that was qualitatively categorized as undisturbed, slightly, moderately, or highly disturbed by avalanches, fire, floods, drying, livestock, horses or burros, diversion, dredging, or recreation.

Rheocrenes were the most common springs, followed by helocrenes and limnocrenes (Table 5). Helocrenes were scarce on USFS lands, due to steep slopes and mountainous terrain where flat areas that are necessary for helocrenes are uncommon. Dry springs were most common on BLM land, due to their low elevation and drier climates.

Our assessment of temporal changes in spring condition also found that the condition of some springs improved, others had not changed, but, contrary to Abele (2011), conditions had deteriorated in more than 44 percent of 265 springs that had been visited more than once since the late 1980s.

The degraded condition of more than 65 percent of Great Basin and Mojave Desert springs, extirpation, extinction, or severe declines of 34 crenophilic taxa from the late 1980s into 2013, and continued declines in spring condition show that these systems may be one of the most endangered ecosystems in North America. p. 22

These findings also show current and past management have not protected the ecological health of these systems, and the focus to improve the health of streams, rivers, and lakes has not been applied to springs. New strategies are necessary to prevent additional declines in the quality of isolated wetlands in this arid environment. Continued extirpations also begs two questions, 1[mdash]'What has been lost that was never recorded from these systems?', and 2[mdash]'What will disappear next?'

Springs are distinctive aquatic and riparian systems that function differently from other lentic and lotic environments (see McCabe 1998). Due to these differences, it is inappropriate to manage and restore springs using many of the tools that effectively manage lentic and lotic habitats. Unfortunately, many springs have been degraded, their functional characteristics altered, and invasive species habitats have been created by practitioners employing incompatible methods. Springs appear to be very sensitive to disturbance but Keleher and Radar (2008) and Sada et al. (2015) also observed that their ecological health is minimally affected with minimal levels of disturbance. In contrast, Morrison et al. (2013) found tipping points where springbrook environments were most severely altered when discharge was reduced less than 20 percent. Sada et al. (2015) found the structure and functional characteristics of a BMI community also changed when discharge was reduced by 20 percent.

Restoration Programs: A number of restoration programs have been implemented in Nevada. Some have been successful (e.g., Duckwater Big Warm Springs, Red Spring, several Ash Meadows springs), but a number have not (Duckwater Little Warm Springs, Preston Big Spring, Torrance Ranch Springs). Successful programs have returned each spring to its naturally functioning condition, and unsuccessful programs have either used inappropriate methods (e.g., hydraulic models to determine channel morphology) or created habitats preferred by practitioners (e.g., pools), rather than functional aspects that accurately characterize the target spring. All unsuccessful programs have functionally changed the habitat and created conditions that support invasive species (e.g., bullfrogs, mosquito fish, cattails, etc.), and prevents restoration of healthy spring systems. p. 24.

Note that intensified grazing harms drainage networks and watersheds, and the full range of harms - direct, indirect and cumulative from all the radical soil/veg community/biocrust disturbance due to the Railroad Saddle Project must be assessed with eyes wide open to the combined detrimental effects of grazing. See also Belsky et al. 1999 riparian grazing impacts paper.

Please let me know you have received these comments.

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