



September 6, 2026

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Subject: Blue Mountains Forest Plan – Draft Environmental Impact Statement (DEIS) - Malheur, Umatilla, and Wallowa-Whitman National Forests Land Management Plans.

We agree there is a need to revise the 1990 Malheur, Umatilla, and Wallowa-Whitman Forest land management plans (forest plans).

Since these plans were developed, forest and habitat conditions have changed significantly due to wildfires, insects, disease, and public use. Scientific information and management advancements have also changed during this period. The understanding of the science of wildlife disease, particularly for bighorn sheep (BHS) and of wildlife response to public uses are much better understood. Under the 2012 Planning Rule, land management plan revisions need to replace outdated plan direction with new, integrated plan components informed by best available science that provide for ecosystem sustainability and contribute to social and economic sustainability.

The new plans should provide integrated direction for social, economic, and ecological sustainability and allow for multiple uses of forest lands and resources.

The following comments on the Draft Environmental Impact Statement (DEIS) Malheur, Umatilla, and Wallowa-Whitman National Forests Land Management Plan Revisions are from the Oregon (OR WSF) and Washington (WA WSF) Chapters Wild Sheep Foundation, and the Wild Sheep Foundation (WSF).

We have provided comments to you concerning bighorn sheep (BHS) management on several occasions since 2005 when the Blue Mountain Forests (BMNFs) began revising the Forest Plan. Including during the latest Assessment Phase via a letter sent May 21, 2024, during the Draft Preliminary Need for Change via a letter sent November 7, 2024, and on the Preliminary Draft via a letter sent September 29, 2025. Proactive BHS management, as outlined in these letters, is critical to disease-free wild sheep populations.

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We support the multiple use of these public lands and opportunities to meet the needs and desires of local, regional and national publics. There is a need to manage these landscapes for a full suite of needs and desires and landscape resilience. We are supportive of the active management of vegetation both mechanically (timber harvest, thinning, and fuels reductions), by managed grazing, and the use of fire, both prescribed and the appropriate use of wildfire.

We would like to thank you for recognizing BHS as a Species of Conservation Concern (SCC) on all three National Forests.

Bighorn Sheep (*Ovis canadensis*) are among nature's most awe-inspiring animals. Native to western North America, wild sheep usually live in remote and rugged habitats. They have high ecological and economic values and are culturally and socially important. They are a vital component of the natural heritage of North America. The historic and recent distribution of wild sheep in western North America has changed with time; while once widespread, their ranges and populations are far smaller today.

Bighorn sheep (BHS) populations declined significantly between the mid-1800s and the mid-1900s and have never fully recovered. BHS were extirpated in many states across the West during that time, due to many factors including disease, habitat disturbance/loss from human activities, effects of a changing climate, and predation.

As the BMNFs Assessment Report indicates *"Hunting and fishing remain important to Tribes, national forest visitors, and people who live throughout the region. The activities contribute to and diversify local economies, and the national forests of the Blue Mountains maintain a reputation as one of the best places to hunt big game in the Pacific Northwest."* The assessment report also states *"Hunting was the most popular activity"* amongst all the recreational uses. Maintaining and improving this popular recreational activity should be a priority throughout the planning process.

The Species of Conservation Concern (SCC) analysis indicated that the most significant threat to BHS is respiratory disease (pneumonia) caused by bacteria transmitted from domestic sheep or goats or other infected wild sheep. Outbreaks of pneumonia have occurred in BHS herds for decades, throughout their range. These "die-offs" continue to cause catastrophic population declines and herd losses. Evidence that association or contact between domestic sheep and BHS leads to respiratory disease in BHS is overwhelming (Besser, et al. 2008, Clifford et al. 2009, Foreyt et al. 1994, Silflow et al. 1993). Although some adult bighorns appear to have or acquire immunity to pneumonia-causing pathogens, disease continues to impede lamb survival in the years to decades following disease-introduction events (Cassirer et al. 2013).

Many organisms are associated with respiratory disease, including bacteria, lungworms, and viruses. One bacterium, *Mycoplasma ovipneumoniae* (*Movi*), has been frequently identified in the early stages of outbreaks, acting as a trigger. *Movi* infection in BHS reduces their immune defenses and allows other, often more aggressive bacteria entry into the lungs; the result is pneumonia and rapid death of the individual bighorn. The disease spreads to other individuals quickly and may kill the entire herd. After a die-off, survivors may carry and shed *Movi* and, if passed to lambs, it usually results in most lambs dying. This pattern may repeat year after year, with many infected herds never recovering or extirpating.

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Other afflictions of BHS such as scabies and lungworm have not been shown to drastically reduce populations. Additional potential threats include predation, poaching, genetic isolation, and habitat loss.

There are organizations that suggest the possibility of other species transmitting *Movi* to BHS. While *Movi* has been reported in species other than sheep and goats (Caprinae), neither its ability to persist in these hosts for long periods of time, nor the ability of these non-Caprinae hosts to transmit the pathogen to BHS has been demonstrated, and the low carriage prevalence and the low genetic diversity of *Movi* in non-Caprinae hosts are not consistent with them representing a separate reservoir for BHS infection. Together, these data show that domestic sheep, if present on the landscape occupied by BHS, carry *Movi* that represents a large risk for BHS infection and resulting pneumonia outbreaks. Domestic goats also pose a definite risk to BHS due to their *Movi* reservoir status, although limited current data shows that goat sources tend to cause less severe and less persistent bighorn disease. In contrast, non-Caprinae species have not yet been shown to present any risk of transmitting *Movi* to BHS (Dr. Tom Besser, Declaration, Feb. 26, 2021).

M. ovipneumoniae infections from different sources can be identified and distinguished based on variation within their DNA sequences. The DNA sequence-based molecular strain typing method (Multi-Locus Strain Typing, MLST) developed for *Movi* can be used to track spread of specific strains within and between BHS populations, and to identify potential sources of strains responsible for new bighorn pneumonia epizootics.

Strains of *Movi* carried by domestic sheep were clearly distinguishable from strains carried by domestic goats, indicating that the strain type analysis could indicate the likely source host of this pathogen. Researchers have successfully identified the sources of *Movi* strains that were transmitted from domestic sheep and domestic goats, under range conditions, that resulted in BHS pneumonia outbreaks (Dr. Tom Besser, Declaration, Feb. 26, 2021).

Multiple BHS populations in the Hells Canyon area, the Wallowa's and throughout the Blue Mountains have experienced high rates of mortality due to pneumonia outbreaks from the 1980s, through the present. We continue actively monitoring another ongoing disease event as we write this letter. The origin of these outbreaks has been documented as domestic sheep and/or goat strains of *Mycoplasma ovipneumoniae* (*Movi*), which continues to have lingering effects. Many of these populations have not recovered, and are currently limited by low lamb survival, primarily due to persistent pneumonia-caused mortality. Pathogen transmission to BHS is controlled by maintaining effective spatial and temporal separation between BHS and domestic sheep and/or goats.

BHS continue to exist and, in some places, thrive often due to intensive restoration and monitoring efforts, including funding from conservation partners. Active management includes moving animals to re-establish new populations, closing or moving domestic sheep and goat allotments, and actively managing and monitoring nearby domestic sheep and goats. The Hells Canyon BHS Initiative (HCI) includes much of the northern and eastern Blue Mountains, and has been an established partnership since the large BHS die-off in the mid- 1990's. Even with this active management, BHS populations are a fraction of their historic numbers and currently occupy a small proportion of their original range.

Because of the economic, recreational, cultural and social value, we believe there should be additional emphasis on game species and hunting. You have identified hunting as the most popular activity on the three forests; the plan should reflect the importance of this activity and include desired conditions with identified objectives.

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Reviewing the DEIS we are concerned on how the Forests and new plans will meet the intent of Executive Order 13443 – “Facilitation of Hunting and Wildlife Conservation”. This EO requires Federal Agencies, including the Department of Agriculture, to facilitate the expansion and enhancement of hunting opportunities and management of game species and their habitat. Federal agencies shall:

- (a) Evaluate the effect of agency actions on trends in hunting participation and, where appropriate to address declining trends, implement actions that expand and enhance hunting opportunities for the public;
- (b) Consider the economic and recreational values of hunting in agency actions;
- (c) Manage wildlife and wildlife habitats on public lands in a manner that expands and enhances hunting opportunities, including through the use of hunting in wildlife management planning;
- (d) Work collaboratively with State governments to manage and conserve game species and their habitats in a manner that respects private property rights and State management authority over wildlife resources;
- (e) Establish short- and long-term goals, in cooperation with State and Tribal governments, and consistent with agency missions, to foster healthy and productive populations of game species and appropriate opportunities for the public to hunt those species;
- (f) Ensure that agency plans and actions consider programs and recommendations of comprehensive planning efforts such as State Wildlife Action Plans, the North American Waterfowl Management Plan, and other range-wide management plans for big game and upland game birds;
- (g) Seek the advice of State and Tribal fish and wildlife agencies, with respect to the foregoing Federal activities.

Chapter 2 – Forest-Wide Plan Components –

We believe there should be desired conditions, identified objectives, and standards and guidelines for hunting and the principal game species. This should include at least BHS, Rocky Mountain Goat, elk, mule deer, black bear, cougar, and moose.

The draft states (page 148): “*Ecological integrity provides the key characteristics, conditions and functionality of native ecological systems, and provides for habitat needs of diverse plant and animal species in the plan area. These ecosystems are resilient and provide social and economic benefits derived from observing, fishing, hunting, foraging and other recreational pursuits of fish, wildlife, fungus, and plant species.*”

The plan ignores the impacts of known and encouraged human activity on landscapes and associated wildlife. Quality habitat without quality security is just empty habitat.

- **The Draft includes a *Desired Condition (FW-SPRSK-DC)* (page 152 of plan doc) for BHS –**

- *Grasslands with nearby rocky escape areas provide native, high protein grass and forbs for bighorn sheep. Habitat on national forests can support viable bighorn sheep herds at current or larger populations.*

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- We prefer the earlier version from the preliminary draft (page 59): “*Bighorn sheep herds are sustained at current or larger population size with minimal disease transfer from permitted domestic sheep and goats. Grasslands with nearby rocky escape areas provide native, high protein grass and forbs for bighorn sheep.*” The Species of Conservation Concern (SCC) analysis indicated that the most significant threat to BHS is respiratory disease (pneumonia) caused by bacteria transmitted from domestic sheep, domestic goats or other infected wild sheep.

There needs to be discussion in the section on Social and Economic Sustainability, in Chapter 2 specifically on the importance of hunting in the BMNFs as a significant economic driver for our local economies. Especially for our smaller, more remote communities. This discussion should include cultural and social needs and desires.

In the DEIS (page 6) under “**Substantive Issues Considered for Analysis Issue 1: Contribution to Economic and Social Sustainability**” there is no mention of the economic importance of hunting, fishing, or wildlife viewing.

In Chapter 2 - Social and Economic Sustainability, Local Communities (LOCCOM) (page 158) the DEIS discusses the desire for “Sustainable levels of forest resources such as timber, livestock grazing, fish and wildlife, recreation and wilderness experiences, contribute to the social, cultural, and economic sustainability of local communities.”

We do not believe this demonstrates the importance of hunting and wildlife viewing as two of the most popular activities in the BMNFs. It says nothing of the economic, cultural and social importance of hunting and the associated wildlife species to Tribes, to our public and our communities. Nor does it meet the intent of Executive Order 13443 – “Facilitation of Hunting and Wildlife Conservation”.

- Bighorn sheep across the Nez Perce and Confederated Tribes of the Umatilla Indian Reservation Tribe’s treaty territory, are a culturally significant treaty resource (Pinkham 2007). Based on archeological evidence and verbal histories of tribal elders, bighorn sheep were the primary game animal that sustained the Nez Perce way of life prior to European settlement (Randolph and Dahlstrom 1977, Pinkham 2007). Bighorn sheep were used for a large variety of purposes, including food, clothing, tools, utensils, and weapons (Pinkham 2007). The Tribe is in the process of designating bighorn sheep as a tribal critically imperiled species (Nez Perce Tribe 2016) and continues to work towards bighorn sheep restoration with state, federal, and other partners.
- There should be standards and guidelines on how you are going to balance the needs of the hunting community (your largest recreational user group) with the desires and needs of other interests.
- The plan should include standards and guidelines to maintain or improve these valuable economic, cultural and social resources. Examples of this should include; management for security, management of risk of contact from disease, managing impacts, and habitat.

In Species at Risk Guidelines (FW-SPRSK-GDL): (page 154). It is stated that “To reduce the potential for spread of disease from authorized domestic sheep and goats to bighorn sheep, design activities to minimize risk of contact in project, grazing allotment, and special use permit areas”.

We believe this should be a Standard (STD) and not a Guideline (GDL).

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In *Species at Risk Management Approach (FW-SPRSK-MAPR): (Page 155)*, includes the following:

- *The potential for spread of disease from domestic sheep and goats to bighorn sheep may be reduced by following a site-specific plan for sheep grazing allotments and special use permit areas for sheep and goats within 21.75 miles (35 km) of bighorn sheep herds. At minimum, plans would consider the following best management practices recommended by ODFW and WDFW.*
 - *Maintain control of sheep or goats with use of herders and dogs.*
 - *Individually mark domestic sheep in a manner that allows field identification of ownership while on National Forest System lands.*
 - *Count domestic sheep as they go onto and off the permitted area to determine if any are missing. Report discrepancies to the District Ranger within 24 hours, and the permittee is to make a concerted effort to find missing sheep.*
 - *Remove sick or injured sheep or goats from the allotment as soon as discovered.*
 - *Manage recreational uses to consider health to bighorn sheep herds.*
 - *Report bighorn sheep observed near active sheep allotments to the state wildlife agency.*

You should also:

- Include IDFG in the development of best management practices, as these BHS populations are interconnected across all three state lines.
- Address the issue of disease transmission between BHS and domestic sheep and goats, working closely with the States and the Tribes.
 - The Forest Service should minimize risk of contact between the species. A Standard should be developed to utilize a well-designed Risk Assessment (using the best available science - which is the updated Risk-of-Contact Model (ROC) that the FS, BLM, and Western Association of Fish and Wildlife Agencies (WAFWA) have invested in), coupled with wild and domestic sheep/goat monitoring are critical to evaluate effectiveness of management, especially when it comes to maintaining and restoring BHS populations.
 - If any new domestic sheep or goat allotments are initiated, or there is a proposal to utilize domestic sheep and/goats within or near BHS populations or habitat (targeted grazing) to treat vegetation for fire, invasives or energy management within the BMNFs under the plan, a standard should be adopted to disallow domestic sheep/goat grazing. Until either a ROC analysis is completed or within 21.75 miles of BHS herd home ranges, as proposed by the ODFW and WDFW. This is a similar distance to those identified in the 2010 Payette National Forest decision to maintain a low risk of contact (U.S. Department of Agriculture, 2010). These measures should reduce the risk of new disease transmission events.
- We respect the access sought by those that use domestic goats as pack animals. However, allowing their use in bighorn habitat is simply not worth the risk to BHS populations. Best Management Practices are NOT

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foolproof, and the presence of domestic goats in proximity puts BHS populations at risk. The States of Washington and Oregon have already banned the use of pack goats in wildlife management areas that contain BHS, and Federal agencies should do the same. It only takes one incident to have catastrophic consequences that could take decades to overcome.

- With the existing emergency closure order in Hells Canyon NRA, the Forest Service recognized the potential for disease transmission between BHS and domestic sheep and goats. The plan should develop guidelines for the rest of the BMNFs, to ensure that effective separation exists to reduce the potential for pathogen transmission and subsequent disease outbreaks.
 - Standards and Guidelines should be developed for domestic goat use. New authorizations and Permit reauthorizations for domestic goat packing or for vegetation treatments should include provisions to prevent disease transmission between domestic goats and bighorn sheep.
 - We would like to see a Standard: To prevent disease transmission between BHS and domestic pack goats, domestic pack goats shall not be permitted within 16 miles of BHS occupied herd home ranges. This would ensure that separation exists between these species and should reduce the potential for disease transmission.
- The DEIS and Plans should address impacts to BHS habitat from invasive plants, forest succession, increasing or changing recreational uses and climate change.
 - Habitat, wildlife, and recreational management are all important elements that should be focal points. Healthy abundant BHS populations can only be achieved through good forest, range and recreation management practices. Invasive nonnative plants can replace native vegetation, rendering foraging areas unusable for BHS. Fire can rejuvenate native forage and reduce conifer encroachment, which increases connectivity between source habitats. Fires can increase security by reducing trees or shrubs cover increasing sight distances.
- To ensure long-term viability of BHS, the plan should include an analysis related to migration corridors and the potential for genetic exchange between BHS herds.

Chapter 3 – Management Area Plan Components –

It is unfortunate that the DEIS discusses in detail the importance of some uses but does little to discuss interests and management for the largest user group in the Blue Mountains, the hunting community. This is a user group that is a huge economic driver, users that financially and actively reinvest in the BMNFs resources. We will share a couple of ongoing examples:

- The partners in the Tri-State/Hells Canyon Initiative (HCI) have invested over \$786,314 in 2026, \$900,000 dollars in 2025 and invested about \$775,000 in 2024 and plan on continued investment at this scale in 2027 to accomplish actions that will provide healthy BHS populations on these landscapes. You can imagine the long-term financial investment, since this work has been going on for 25 or more years. Unfortunately, BHS populations are still at risk.

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- The Blue Mountain Elk Initiative (BMEI) is another example of the hunting/wildlife interests stepping up to actively provide funds and volunteers for the wildlife resource in the Blue Mountains. This investment has also been ongoing for more than 30 years.
- The Oregon Hunters Association Mule Deer Fund is a third example of the hunter, conservationists actively investing in the landscapes of Oregon and the Blues.

Monitoring Program – We are interested in the monitoring component of the planning rule for the Species of Conservation Concern (SCC).

- We are pleased to see that BHS have been identified as a SCC on all three BMNFs (Umatilla, Wallowa-Whitman, and Malheur) in Appendix C – Species of Conservation Concern (SCC) List. Thank you!
- Wild sheep conservationists have consistently and strongly advocated for BHS to be designated as Species of Conservation Concern (SCC) list. We have had numerous discussions with USFS staff at the National, Regional and Forest Offices regarding their inclusion.

Monitoring BHS population dynamics is important to ensure that adaptive and pro-active measures are taken immediately if species population viability is threatened.

We did not see a specific monitoring plan for SCC in the DEIS. We are assuming that a monitoring plan will be developed for BHS as an SCC as part of the final planning process.

- We do not expect the USFS to actively monitor BHS populations; however, we propose that the BMNFs specify the use of annually collected IDFG, ODFW, and WDFW data to fulfill the monitoring requirement of the 2012 Planning Rule.
- Monitoring and managing BHS disease issues are important and will continue to be a necessary component of BHS management. IDFG, ODFW, WDFW, BLM and BMNFs are actively conducting research, implementing expensive management strategies, such as implementing Test & Remove, to better understand and actively manage threats to BHS herds on the BMNFs and surrounding areas. The BMNFs need to develop, with partner State and Tribal agencies, and develop a disease monitoring plan as part of this decision and plan.
- BMNFs need to monitor the movement of BHS. This will ensure that BHS does not stray onto existing domestic sheep/goat allotments or private & state lands that may have domestic sheep or goats.
- The BMNFs need to develop a site-specific monitoring plan that monitors domestic sheep straying off forest allotments and adjoining private lands. This was required in the monitoring plan on the Payette NF bighorn/domestic sheep FEIS Amendment, and it was found through radio telemetry that domestic sheep were frequently observed off the designated allotments. On the Okanogan-Wenatchee NF allotments, this straying is

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common enough that disease is spreading from domestic sheep to BHS continued to lead to disease (Schommer Declaration, 2/23/2021).

- Landscape vegetation treatments and large fires have the potential to create new BHS habitat or increase connectivity between existing habitats. This could allow BHS to utilize new or additional areas. These should be identified and adjustments made as needed.

The experience today of seeing BHS along the rivers, roads and trails of the Blue Mountains was not always there. BHS were extirpated from the entire states of Oregon and Washington and much of Idaho. BHS are only present due to the massive efforts of agencies, tribes and conservation organizations, such as the WSF, that have been willing to invest time and money in the efforts to bring them back and then continue the efforts to keep them in these landscapes.

We thank you for the opportunity to comment on the three Blue Mountain National Forest's Forest Plan Revision process, and we look forward to continued participation.

Respectfully,



Craig Foster
OR WSF President



Garrett Grant
WA WSF President



Gray N. Thornton
President & CEO WSF



Corey Mason
Chief Operating Officer &
Executive VP of Conservation

CC: ODFW
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The following is some information with references and links to publications related to the transmission of disease from domestic sheep/goats to wild sheep. There is good evidence for pathogen transmission from goats to BHS. It is true that domestic goats seem to pose a relatively lower health risk to BHS than domestic sheep. That is not the same as no risk, especially considering how severe the consequences can be.

Appendix A – BHS Domestic Goats

1. Domestic sheep and goats carry genetically different strains of Mov. A pneumonia outbreak in BHS at Heller Bar in 2014 was associated with the introduction of a domestic goat strain (Cassirer et al. 2017).
2. A pink-eye epizootic in BHS in Arizona was associated with contact with domestic goats (Jansen et al 2006).

While accounts of disease transmission to BHS from domestic goats are less frequent than from domestic sheep, respiratory pathogens that can cause disease in BHS, including *Mycoplasma ovipneumoniae*, are regularly detected in apparently healthy domestic goats (Heinse et al. 2016, Drew and Weiser 2017). Transmission of Mov and other bacteria between BHS and domestic goats has occurred in free-ranging conditions, although spillover of Mov is detected less frequently than from domestic sheep (Rudolph et al. 2003, Kamath et al. 2019). No disease or mortality was reported in early experimental commingling of domestic goats with BHS (Foreyt 1994); however, the Mov status of those goats is unknown. More recent captive commingling experiments produced pneumonia and/or transmission of Mov to BHS, though epidemic mortality was not observed (Foreyt et al. 2009, Besser et al. 2018).

The following is a list of scientifically published studies to support the disease transmission from domestic sheep/goats to wild sheep, many of which were associated with studies done in Washington State University. While we respect that the Blue Mountain National Forests are accessed for a wide variety of uses, it is imperative to protect fish and wildlife from uses that are scientifically proven to cause a threat.

Besser, T. E., E. F. Cassirer, K. A. Potter, and W. J. Foreyt. 2018. Exposure of bighorn sheep to domestic goats colonized with *Mycoplasma ovipneumoniae* induces sub-lethal pneumonia (vol 12, e0178707, 2017). PLoS One 13. <https://doi.org/10.1371/journal.pone.0178707>.

Cassirer, E. F., K. R. Manlove, R. K. Plowright, and T. E. Besser. 2017. Evidence for strain-specific immunity to pneumonia in bighorn sheep. Journal of Wildlife Management 81:133–143. <http://dx.doi.org/10.1002/jwmg.21172>

Drew, M. L., and G. C. Weiser. 2017. Potential disease agents in domestic goats and relevance to bighorn sheep (*Ovis canadensis*) management. PLoS One 12:e0173396. <https://doi.org/10.1371/journal.pone.0173396>

Foreyt, W. J. 1994. Effects of controlled contact exposure between healthy bighorn sheep and llamas, domestic goats, mountain goats, cattle, domestic sheep, or mouflon sheep. Proceedings of the Biennial Symposium of the Northern Wild Sheep and Goat Council 9:7–14. media.nwsgc.org/proceedings/NWSGC-1994/1994-Foreyt.pdf

Foreyt, W. J., E. J. Jenkins, and G. D. Appleyard. 2009. Transmission of lungworms (*Muellerius capillaris*) from domestic goats to bighorn sheep on common pasture. Journal of Wildlife Diseases 45:272–278. <https://doi.org/10.7589/0090-3558-45.2.272>

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Heinse, L. M., L. H. Hardesty, and R. B. Harris. 2016. Risk of pathogen spillover to bighornsheep from domestic sheep and goat flockson private land. *Wildlife Society Bulletin* 40:625–633. <https://doi.org/10.1002/wsb.718>.

Jansen B. D, J. R. Heffelfinger, T. H. Noon, P. R. Krausman, and J. C. deVos, Jr. 2006. Infectious keratoconjunctivitis in bighornsheep, Silver Bell Mountains, Arizona, USA. *Journal of Wildlife Diseases* 42:407–411. <https://doi.org/10.7589/0090-3558-42.2.407>

Kamath, P. L., K. Manlove, E. F. Cassirer, P. C. Cross, and T. E. Besser. 2019. Genetic structure of *Mycoplasma ovipneumoniae* informs pathogen spillover dynamics between domestic and wild Caprinae in the western United States. *Scientific Reports* 9:15318. <https://doi.org/10.1038/s41598-019-51444-x>

Rudolph, K. M., D. L. Hunter, W. J. Foreyt, E. F. Cassirer, R. B. Rimler, and A. C. S. Ward. 2003. Sharing of *Pasteurella* spp. between free-ranging bighorn sheep and feral goats. *Journal of Wildlife Diseases* 39:897–903. <https://doi.org/10.7589/0090-3558-39.4.897>

Appendix B - Additional BHS Literature:

Andrews et al. 2024. Comparative genomic analysis identifies potential adaptive variation in *Mycoplasma ovipneumoniae*. *Microbial Genomics* 10:001279.

Beecham, J.J., C.P. Collins and T.D. Reynolds. 2007. Rocky Mountain Bighorn Sheep (*Ovis Canadensis*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region.

Besser and Cassirer. 2023. Epizootic Bighorn Sheep Pneumonia Cause by *Mycoplasma ovipneumoniae*. Chapter 9 in Wildlife Disease and Health in Conservation (Eds. D.A. Jessup and R.W. Radcliffe).

Besser, T. E., E. F. Cassirer, K. A. Potter, J. VanderSchalie, A. Fischer, D. P. Knowles, D. R. Herndon, F. R. Rurangirwa, G. C. Weiser, and S. Srikumaran. 2008. Association of *Mycoplasma ovipneumoniae* infection with population-limiting respiratory disease in free- ranging Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*). *Journal of Clinical Microbiology* 46: 423–430

Besser, T.E., E.F. Cassirer, K.A. Potter, K. Lahmers, J.L. Oaks, S. Shanthalingam, S. Srikumaran and W.J. Foreyt. 2014. Epizootic pneumonia of bighorn sheep following experimental exposure to *Mycoplasma ovipneumoniae*. *PLoSOne*. 9 (10): e110039.

Besser, T. E., M. A. Highland, K. Baker, E. F. Cassirer, N. J. Anderson, J. M. Ramsey, K. Mansfield, D. L. Bruning, P. Wolff and J. B. Smith. 2012. Causes of pneumonia epizootics among bighorn sheep, western United States, 2008–2010. *Emerging Infectious Diseases*. 18(3): 406-414.

[BLM] U.S. Dept. of Interior Bureau of Land Management. 2021. OR/WA State Director Special Status Species List, June 21, 2021. Available at: <https://www.fs.usda.gov/r6/issssp/downloads/policy/20210621-2670-fs-blm-enc1-final-list.xlsx> [accessed November 2022].

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California Department of Fish and Wildlife. 2025. The Conservation and Management Plan for Bighorn Sheep in California. California Department of Fish and Wildlife, West Sacramento, CA, USA.

Evaluations for Wildlife Species Considered for Species of Conservation Concern Blue Mountains Forests: Malheur, Umatilla, and Wallowa-Whitman National Forests. Prepared by: Wildlife Biologists and Natural Resources Specialists Pacific Northwest Regional Office, Pacific Planning Service Group, Washington Office, Malheur National Forest, Umatilla National Forest, and Wallowa-Whitman National Forest. USDA Forest Service. Blue Mountains Forests, July 2025.

Brewer, C., V. C. Bleich, J. Foster, T. Hosch-Hebdon, D. McWhirter, E. Rominger, M. Wagner and B. Wiedman. 2014. Bighorn sheep: conservation challenges and management strategies for the 21st century. Wild Sheep Working Group, Western Association of Fish and Wildlife Agencies.

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