



October 22, 2025

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Subject: Okanogan-Wenatchee National Forest DEIS Forest Plan Amendment for Planning and Management of Domestic Sheep and Goat Grazing Within the Range of Bighorn Sheep.

Please accept these comments on the assessment of the Okanogan-Wenatchee National Forest (OWNF) Forest Plan Amendment (FPA) from the Washington Chapter Wild Sheep Foundation (WA WSF) and the Wild Sheep Foundation (WSF).

Bighorn sheep (*Ovis canadensis*) are among nature's most awe-inspiring animals. Native to western North America, bighorn 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 bighorn sheep (BHS) in western North America has changed with time; while once widespread, their ranges and populations are far smaller today.

BHS populations declined significantly between the mid-1800s and the mid-1900s and have never fully recovered. BHS were extirpated in many states, including Washington, 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.

The Wild Sheep Foundation and WSF Chapters & Affiliates have been involved with Forest Plan Revisions/Amendments and other projects that could potentially affect BHS across the West. We have commented on BHS issues and concerns, when and where appropriate. We acknowledge and appreciate, that under the 1982 USFS Planning Rule, bighorn sheep have long been designated by the Region 6 Regional Forester as a Sensitive Species which calls for the agency to provide habitat to maintain viable populations distributed throughout their current range and to avoid or minimize impacts to the species (FSM 2620.1, 2622.01, 2670.22, 2670.32, 2672.1).

BHS is identified as a Species of Greatest Conservation Need (SGCN) under the Washington State Wildlife Action Plan (WDFW 2015). BHS is also identified as a Priority Species under WDFW's Priority Habitat and Species Program. BHS are considered imperiled by NatureServe Washington and are considered imperiled or vulnerable under the Washington Heritage Program.

Your March 14, 2023, public information meeting confirmed that this OWNF FPA will occur under the 2012 USFS Planning Rule; reviewing the DEIS for the Forest Plan Amendment, we cannot determine from the analysis if BHS were identified as a "Species of Conservation Concern" (SCC). We continue to strongly recommend that bighorn sheep be designated as a SCC, since the OWNF Plan Amendment is guided by the 2012 USFS Planning Rule.

We appreciate that the OWNF is acknowledging that since FY2016, Congress has annually directed the U.S. Forest Service (USFS) and Bureau of Land Management (BLM) to implement a variety of solutions to the risk of deadly pneumonia outbreaks where BHS and domestic sheep encounter each other on public-land grazing allotments.

Historically, bighorn sheep on OWNF occurred in sizeable numbers within multiple herds, in contiguous habitat. This "meta-population" function fostered constant interchange between populations that provided increased genetic

diversity, greater adaptability in handling environmental changes and disease, and population persistence over time. However, because of high risk of disease, today's BHS managers are forced to maintain small, isolated bighorn populations across the planning unit to provide for effective separation between BHS and domestic sheep.

Viability analysis requires actions to ensure that BHS habitat is well-distributed across the planning unit, and that that habitat is available to bighorn sheep. Bighorn sheep habitat should be well-connected, to allow reproducing individuals to come in contact with each other. There is a need to address migration corridors and assure the potential for genetic exchange between bighorn herds. Connectivity and genetic interchange are important, and necessary to assure long-term viability in bighorn sheep populations.

The most significant threat to BHS is respiratory disease (pneumonia) caused by bacteria transmitted from domestic sheep or goats or other infected BHS. 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/goats 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 BHS 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* (referred to as *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.

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

The DEIS and other organizations have discussed 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 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).

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, converting, closing or moving domestic sheep and goat allotments, and actively managing and monitoring nearby domestic sheep and goats. Even with this active management, BHS populations are a fraction

of their historic numbers and currently occupy a small proportion of their original range.

Regarding domestic and BHS conflicts, the Forest Service should minimize risk of contact between the species. Well-designed Risk Assessments (using the updated Risk-of-Contact Model 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 evaluating effectiveness of management, especially when it comes to maintaining and restoring BHS populations.

We are pleased that the OBNF utilized the (USFS and BLM Risk of Contact Tool (ROC) to calculate rates of contact between BHS and active domestic sheep allotments (O'Brien et al. 2014).

The ROC was used to delineate Core Herd Home Ranges (CHHR) based on available telemetry and observational data and to estimate ROC for seven (7) BHS herds (Chelan Butte, Manson, Swakane, Cleman, Quilomene, Tieton, and Umtanum) with domestic sheep grazing across ten (10) allotments on the OBNF. Analysis conducted using the ROC in this document has shown that there is a potential for BHS to enter domestic sheep grazing allotments.

All four alternatives analyzed address how the risk of contact and subsequent disease transmission changes under differing livestock management approaches. The alternatives identify lands that are suitable or unsuitable for domestic sheep and goat grazing, taking this risk into account.

Alternative 1 – No Action - All 9 sheep allotments would continue to be grazed by domestic sheep and goats at established numbers. There would be no restrictions contained in the LRMPs regarding domestic sheep or goats in core native bighorn sheep habitat or to accomplish related management objectives. This alternative would pose the greatest risk to BHS due to proximity of grazing sheep allotments to BHS and elevated risk of contact.

Alternative 2 – Interim Management Strategies - An interim management strategy has been developed over time through administrative changes to address concerns about bighorn sheep. This interim management strategy was to decrease numbers of domestic sheep grazing on most sheep allotments. In addition, the Naches allotment was split into two pastures, and the interim management strategy converts the East Naches pasture from sheep to cattle grazing while vacating the West Naches pasture. This alternative would maintain current risk levels to BHS.

Alternative 3 – No Grazing - All 9 allotments currently identified for sheep and goat grazing would be vacated. This alternative would pose the least risk to BHS populations.

Alternative 4 – Risk Based Management Strategy - Analyze the allotments and explore the effects of removing domestic sheep grazing from allotments with higher risk as evaluated through the ROC model (FS/BLM 2015). Allotments, or parts of allotments, that meet or exceed 0.08 ROC are considered higher risk for domestic sheep grazing and those with less than a 0.08 ROC are considered lower risk and suitable for domestic sheep, although several factors played into the risk of contact analysis and subsequent decisions as to whether to stock an allotment with domestic sheep. Through allotment-specific analysis, those allotments or parts of allotments that are unsuitable for domestic sheep were analyzed for conversion of use from sheep grazing to cattle grazing. If allotments are unsuitable for sheep or cattle grazing, they would be placed in “vacant and unavailable” status.

- Rattlesnake and Nile allotments would convert to cattle.
- Naches allotment would be split into East and West. East Naches would be cattle with DNR lands. West Naches would be vacant.
- Manastash allotment would be split into North and South. North Manastash would be domestic sheep and South Manastash would be converted to cattle.
- Swauk allotment would remain a sheep allotment. There would be no change in the management of this allotment.
- Eagle-Blag, Mosquito Ridge, and most Switchback allotments would be vacated. Vegetation is adequate for cattle, but slope is too steep for efficient utilization and management.
- Limekiln-Sugarloaf and a portion of Switchback allotment that did not have high ROC would remain in sheep

use and the grazing season would be expanded to a full 30-day route.

Alternative 4 would significantly reduce risk to BHS in the planning area. However, the proposed action alternatives would not completely eliminate the risk of contact between BHS and domestic livestock.

- Limekiln-Sugarloaf & a portion of Switchback allotments would remain domestic sheep allotments.
- Swauk would remain a domestic sheep allotment.
- North Manastash would continue to be grazed by domestic sheep.

It is obvious that Alternative 3 best meets the needs of the existing BHS populations as there would be no domestic sheep/goat allotments permitted.

If the decision is to go with the Draft Preferred - Alternative 4 – Risk Based Management Strategy – we would want to see it adjusted to reduce the ROC from domestic sheep to BHS on the Limekiln-Sugarloaf & portion of Switchback, the Swauk and North Manastash allotments.

Limekiln-Sugarloaf & Switchback allotments would continue to pose risk to BHS. The ROC are considerably above the contact rate > 0.08 level to the Swakane BHS herd as analyzed (Hamer Environmental. 2024). Contacts/year equaling or exceeding 0.08 exceed the suggested threshold to limit disease outbreak intervals recommended by the FS/BLM Bighorn Working Group. The DEIS indicates that the risk would be lower due to the short period of potential impact. The ROC model does not have a metric for time, just for presence or absence. Domestic sheep would be present. Risk to BHS needs to be reduced or change of class of livestock should be again analyzed.

The North Manastash and Swauk are both below the ROC < 0.08 level (Hamer Environmental. 2024).

An adjustment would also need to include frequent monitoring and reporting requirements as referenced in the Schommer Declaration, Feb. 23, 2021.

We did not observe what monitoring and reporting requirements the OWNF was going to implement to ensure the risk is low to none. Monitoring and managing BHS disease issues are important and will continue to be a necessary component of BHS management. WDFW is actively conducting research, implementing expensive management strategies (e.g., Test & Remove), to better understand and actively manage threats to BHS herds on the Forest and surrounding areas. OWNF needs to develop, with WDFW, a disease monitoring plan as part of this decision and associated plan.

Monitoring BHS population dynamics is important to ensure that adaptive and pro-active measures are taken immediately if species population viability is threatened. We do not expect the USFS to actively monitor BHS populations; however, we propose that the OWNF specify the use of annually collected data by WDFW to fulfill the monitoring requirement of the 2012 Planning Rule.

The OWNF and WDFW need to jointly develop a plan to monitor movement of BHS. This will ensure that BHS do not stray onto existing forest allotments or private/state lands that may have domestic sheep or goats. 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.

The OWNF needs 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 OWNF allotments, this straying is common enough that disease is spreading from domestic sheep to BHS, continuing to lead to disease.

We respect the access sought by those who use domestic goats as pack animals. However, evidence suggests that although the risk of pathogen transmission from pack goats to bighorn sheep is less than from domestic sheep, the risk is not zero. Although the risk of harmful pathogens being transmitted from pack goats to BHS is lower, the ramifications to BHS herds could be severe if any transmission were to occur. Best Management Practices are NOT foolproof, and the presence of domestic goats in proximity puts BHS populations at risk. Several States and National Forests have banned the use of pack goats in areas that contain wild sheep, and all federal land-management agencies should do the same. It only takes one incident to have catastrophic consequences that may never be overcome.

The experience of seeing BHS along the rivers, canyons, roads and trails of the East Cascades in Washington was not always available. BHS were once extirpated from the entire state. BHS are only present due to the massive efforts of agencies, tribes and conservation organizations that have been willing to invest time and money in the efforts to bring them back and then continue the massive efforts to keep them in these landscapes. BHS are some of the most economically and socially important animals in North America and have extreme value to hunters, conservationists, and the recreational public.

We thank you for the opportunity to comment on the OWNF Forest Plan Revision process and we look forward to continued participation.

Respectfully,



Garrett Grant
President, WA WSF



Gray Thornton
President & CEO WSF



Corey Mason
Chief Operating Officer &
Executive VP of Conservation

CC: WDFW

The following is some information with references and links to publications related to the transmission of disease from domestic sheep/goats to BHS. 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.

1. Domestic sheep and goats carry genetically different strains of *M. ovipneumoniae*. 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 *M. ovipneumoniae* and other bacteria between BHS and domestic goats has occurred in free-ranging conditions, although spillover of *M. ovipneumoniae* 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 *M. ovipneumoniae* status of those goats is unknown. More recent captive commingling experiments produced pneumonia and/or transmission of *M. ovipneumoniae* 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.
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>

Heinse, L. M., L. H. Hardesty, and R. B. Harris. 2016. Risk of pathogen spillover to bighorn sheep from domestic sheep and goat flocks on 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 bighorn sheep, 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>

Additional References:

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

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

Clifford, D. L., B. A. Schumaker, T. R. Stephenson, V. C. Bleich, M. L. Cahn, B. J. Gonzales, W. M. Boyce and J. A. K. Mazet. 2009. Assessing disease risk at the wildlife-livestock interface: A study of Sierra Nevada bighorn sheep. *Biological Conservation*. 142 (11): 2559- 2568.

Cassirer, E.F., R.K. Plowright, K.R. Manlove, P.C. Cross, A.P. Dobson, K.A. Potter, and P.J. Hudson. 2013. Spatio-temporal dynamics of pneumonia in bighorn sheep. *Journal of Animal Ecology* 82:518–528.

Declaration of Dr. Tom Besser in Support of Plaintiffs’ Motion for Preliminary Injunction - Case file No. 2:20-cv-00440-RMP ECF No. 20 filed 2/26/21 pageID.1039 U.S. District Court, Eastern District of Washington.

Declaration of Tim Schommer in Support of Plaintiffs’ Motion for Preliminary Injunction – Case file No. 2:20-cv-00440-RMP ECF No. 20 filed 2/23/21 U.S. District Court, Eastern District of Washington.

Foreyt, W., K. Snipes and R. Kasten. 1994. Fatal pneumonia following inoculation of healthy bighorn sheep with *Pasteurella haemolytica* from healthy domestic sheep. *Journal of Wildlife Diseases*. 30 (2): 137-145.

Hamer Environmental. In prep. Biological Assessment. Bighorn Sheep EIS Project. Okanogan-Wenatchee National Forest.

Hamer Environmental. 2024. Bighorn Sheep EIS Project. Okanogan-Wenatchee National Forest. Summary of Findings Report: Core Herd Home Range (CHHR) Delineation and Risk of Contact (RoC). April 18, 2024.

O'Brien, J.M., C.S. O'Brien, C. McCarthy, T.E. Carpenter. 2014. Incorporating foray behavior into models estimating contact risk between bighorn sheep and areas occupied by domestic sheep. *Wildlife Society Bulletin* 38(2):321-331.

Silflow, R., W. Foreyt and R. Leid. 1993. *Pasteurella haemolytica* cytotoxin-dependent killing of neutrophils from bighorn and domestic sheep. *Journal of Wildlife Diseases*. 29 (1): 30-35.

United States Department of Agriculture-Forest Service and United States Department of Interior-Bureau of Land Management (FS/BLM). 2015. Bighorn Sheep Risk of Contact Tool v2 User Guide. Prepared by the FS/BLM Bighorn Sheep Working Group.

United States Department of Agriculture Forest Service. 2010. Final supplement to the final environmental impact statement for the Southwest Idaho Ecogroup land and resource management plans. U.S. Department of Agriculture, Forest Service, Intermountain Region, Payette National Forest, Ogden, Utah, USA.

WDFW 2015. Washington's State Wildlife Action Plan - 2015 Update. Olympia, WA.