

**GALLATIN WILDLIFE
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Subject: Bighorn Sheep – A Species of Conservation Concern

Dear: Leanne

The Gallatin Wildlife Association is a non-profit volunteer wildlife conservation organization made up of dedicated hunters, anglers and other wildlife advocates in Southwest Montana and elsewhere. Our mission is to protect habitat and conserve fish and wildlife for this and future generations. We support sustainable management of fish and wildlife populations through fair chase public hunting and fishing opportunities that will ensure these traditions are passed on for future generations to enjoy. We also support the Montana constitution which states: “the opportunity to harvest wild game is a heritage that shall forever be preserved” and that “the legislature shall provide adequate remedies to prevent unreasonable depletion of natural resources.” Thank you for meeting with us today and for accepting these detailed comments we have for bighorn sheep as a species of conservation concern on the Custer Gallatin National Forest.

How does the USFS define a viable population? Traill et al. (2010) suggests thousands not hundreds of animals are required to ensure a 90% probability a population will persist for a 100 years or more. How many bighorns are on the CGNF? FWP (2010) notes 640 animals total observed in 12 herd units. However, only 2 of the 12 herd units in described in FWP (2010) are greater than 100 animals and none are greater than 200. These numbers are perilously low and none of these herd units separately can be considered genetically adequate (FWP 2010, pp. 57&58). Even where herd connectivity is suspected or likely (Upper Yellowstone Complex, HDs 300, 303, 304, 305 and perhaps Mill Creek herd) the total number of animals is a mere 115-134 animals.

Please consider these risk factors as substantial threats to the long term persistence of the bighorn sheep population(s) currently on the Custer-Gallatin National Forest.

Disease

1. Infectious disease contributed to historical declines and extirpations of bighorn sheep (*Ovis canadensis*) in North America and continues to impede population restoration and management in Montana and Wyoming (Butler et al. 2014). Reports of pneumonia outbreaks in free ranging bighorn sheep following contact with domestic sheep have been validated by the results of 13 captive commingling experiments (Cassirer et al. 2018). Furthermore, the demographic costs of disease persistence can be equal to or greater than the impacts of the initial epizootic (Cassirer et al. 2018).
2. Many of the bighorn sheep herd units on the Custer-Gallatin National Forest have suffered periodic or recent disease related die-offs (FWP 2010, pp. 16, 82&83). Two of the largest populations, the Upper Yellowstone complex and the Hilgard herd have an 80% and 85% probability of experiencing ≥ 1 pneumonia epizootic within 10 years, respectively, if risk factors do not change (Sells et al. 2015).
3. Foraging rams may travel over 30 miles (50 km) (O'Brien et al. 2014) and are particularly susceptible to commingling with domestic sheep and picking up novel pathogens, which if transferred back to the native herd/population can result in devastating all age die-offs and substantial long term demographic costs related to disease persistence (Brewer et al. 2014, Butler et al. 2018, Cassirer et al. 2017, Cassirer et al. 2018).
4. Severe all age disease die-offs and subsequent poor lamb recruitment can occur for years if not decades further reducing, degrading and geographically isolating bighorn populations (Brewer et al. 2014, Butler et al. 2018, Cassirer et al. 2017, Cassirer et al. 2018).

Small isolated population effects are compounded by periodic die-offs

1. Bighorn sheep populations and distributions have already been greatly reduced and severely fragmented/isolated in Montana and across the West (FWP 2010, map p. 10 and Brewer et al. 2014, map p. 3). Local population extirpation or loss of migration behavior can expunge generations of knowledge about the locations of high quality forage and likely suppress population abundance (Jesmer et al. 2018). Berger (1990) documented rapid extinction in bighorn herds of less than 50 animals. Small population sizes across the West were listed as a threat by Festa-Bianchet (2008).
2. Bighorn sheep herd units on the CGNF are very small in number, ranging from 0-158 observed animals (FWP 2010, pp. 82&83). Only 2 of the 12 herd units on the CGNF described by FWP (2010) were greater than 100 animals and none were greater than 200. None of these herd units alone can be considered genetically adequate (FWP 2010, pp. 57&58). Furthermore, the total number of bighorn sheep observed on the CGNF in 2010 was only 640 animals, which is significantly below what Reed et al. (2003) and Traill et al (2010) consider necessary for a population to have a 90% probability of persisting at least 100 years. Geist (1974) for bighorn sheep and Shaffer (1981) and Uttam Kumar Rai (2003) in general discussed the need for clarification on what constitutes a viable

- population size. All discussed the need for large reserves of essentially undisturbed habitat to ensure species persistence. Singer et al. (2001) noted that in the 24 bighorn sheep populations they studied persistence was strongly correlated with larger habitat patch sizes, greater distance from domestic sheep, higher population growth rates, migratory movements as well as larger population sizes. Persistence was also positively correlated with larger average home range size. Singer et al. (2001) also found that larger populations (250+ animals) were more likely to recover rapidly to their pre-epizootic survey number following a disease epizootic. None of the herd units on the CGNF are this large.
3. Inbreeding, inbreeding depression, genetic drift, and loss of genetic variability/diversity can result within small populations of bighorn sheep (<200 animals) in as little as 2-3 generations (10-15 years) (FWP 2010, p. 57&58). All 12 (100%) of the herd units described by FWP (2010) on the CGNF were less than 200 observed animals. In fact 10 of the 12 herd units (83%) were below 100 observed animals and 8 (67%) were below 50 animals. As noted earlier, Berger (1990) documented rapid extinction in bighorn herds of less than 50 animals. Indeed, one herd unit on the CGNF has been completely extirpated (HD 504, Lower Boulder River, extirpated in 2000). Four or five of these herd units in the “Upper Yellowstone Complex” may be genetically connected, in which case that population (HDs 300, 303, 304, 305 and perhaps Mill Creek, which is not hunted) still only had 115-134 observed animals as described in FWP (2010).
 4. Loss of disease resistance (Cassaigne et al. 2010); loss of reproductive fitness and female survival, and poor female lamb recruitment resulting in older, smaller, less resistant/less healthy populations has been documented (Rioux-Paquette et al. 2011 and Martin and Festa-Bianchet 2010).
 5. Disease die-offs, predation, severe weather events (droughts, tough winters, and poor lambing weather), road kill/accidents and harvest impacts can become significant in small populations especially if they are isolated (Bailey 2018 and Butler et al. 2018).
 6. Extirpation and/or loss of meta-population connectivity have been documented (Berger 1990, Brock et al. 2006, FWP 2010 and Brewer et al. 2014).

Habitat Degradation/Fragmentation or Loss (1-8 come from USFS documents Dixon et al. 2017 and Tesky 1993)

1. Invasive species invading winter, summer, rutting and/or lambing ranges (cheatgrass, knapweed, domestic sheep, others)
2. Presence of domestic sheep/goats; cattle competition
3. Spatial and/or forage/water competition with livestock and/or other wildlife
4. Fences, roads and other human developments
5. Conifer encroachment, fire suppression, decreased visibility/secure habitat
6. Loss, degradation or severing of migration/connectivity corridors and habitat patches.
7. Presence and/or competition with domestic livestock
8. Human activities/recreation on preferred bighorn habitats including snowmobiles on winter range.

Foray Behavior of Bighorn Sheep (USFS Risk of Contact Tool accessed online Mar. 22, 2019): https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd513118.pdf

1. Both sexes foray (leave and return) from their core herd home ranges
2. Rams (males) exhibit foray rates 9.4 times greater than ewes (females)
3. Rams increase foraging behavior during the breeding season (rut)
4. Forays can occur at any time of year
5. Forays can occur through atypical habitat, but most occur through “connectivity” habitat
6. Foraging bighorn sheep return to their core herd home range and interact with other members of the herd

See also O’Brien et al. (2014) for incorporating foray behavior into estimating contact risk from bighorn sheep core herd home range to areas of domestic sheep (up to 50km (31 miles) from their home range).

Summary and Specific Threats near the CGNF

Bighorn Sheep are still considered a Sensitive Species in USFS Region 1 including on the Beaverhead-Deerlodge NF, Caribou Targhee NF and the CGNF. The area where these three National Forests come together has been mapped as important original habitat for bighorn sheep by Couey (1950), Brock et al. (2006), FWP (2010) and Brewer et al. (2014). Geist (1971) documented that bighorn sheep may have 4-6 distinct seasonal ranges and Jesmer et al. (2018) found that learning and cultural transmission are the primary mechanisms by which ungulate migrations evolve.

Significant threats to bighorn sheep still exist on public lands in this area, including:

1. Domestic sheep are trailed to and from and grazed on the Agricultural Research Service Domestic Sheep Station public lands on historic bighorn habitat in the Centennial Mountains in Montana and in other locations along the Continental Divide in Idaho to the West.
2. Domestic sheep are trailed through occupied bighorn habitat on the Robb Ledford Wildlife Management Area and the Snowcrest Mountain Range to and from 8 allotments on the BDNF in the Gravelly Mountain Range near Bighorn Mountain.
3. Domestic sheep are used for weed control along the west side of the Madison River and then allowed to trail up Standard Creek on the BDNF to the 8 allotments in the Gravelly Range near Bighorn Mountain.
4. Domestic sheep allotments occur on bighorn sheep habitat in the Caribou-Targhee NF along or near the Continental Divide in Idaho in the Centennial Mountains.
5. Domestic sheep use the Montana State University Red Bluff Station near the Madison River and the BLM Bear Trap Canyon Lee Metcalf Wilderness Unit, which is currently occupied bighorn sheep habitat.

Specific examples of conflicts with domestic sheep impacting habitat suitability and/or bighorn herds on the CGNF include:

1. Bighorn sheep (likely from the Spanish Creek herd) have been lethally removed for commingling with domestic sheep on the MSU Red Bluff Experiment Station near the Bear Trap Canyon along the Madison River. Bighorn sheep are pioneering into the Bear Trap Canyon. I and others personally saw 12 bighorn sheep in a mixed sex and age class herd in the summer of 2018 on the west side of the Madison River just below the Kitchen Sink.
2. Bighorn sheep (a small band of ewes and lambs, likely from the Hilgard herd) have been observed and reported to the USFS on the BDNF in the lower part of Standard Creek near the Madison River where domestic sheep are used for nearby weed control and then allowed to trail up Standard Creek to allotments on the BDNF.
3. Montana FWP has initiated 2 bighorn sheep reintroduction efforts on the CGNF within the Bridger Mountain Range that have been halted due to concerns with domestic sheep off but close to the national forest.
4. Numerous bighorn sheep disease related die-offs have been documented by FWP (2010) over the years both on the CGNF and the BDNF.

Conclusion

Based on genetic threats alone the small isolated herd unit sizes (All < 200 animals) of the bighorn sheep on the CGNF described in FWP (2010) indicate there is substantial reason to be concerned about their capability to persist over the long term in the plan area. Combined with the best available science and information regarding their original habitat (Couey 1950), ongoing disease threats (Sells et al. 2015, Butler et al. 2018 and Cassirer et al. 2018), small population effects (Traill et al. 2010, Bailey 2018 and Butler et al. 2018) and continuing habitat degradation, fragmentation and/or loss (Brock et al. 2006 and Brewer et al. 2014) it is clear bighorn sheep warrant designation as a species of conservation concern. With successful management/elimination of adverse impacts to the suitability and connectivity of bighorn habitat the potential for natural recolonization of the historic bighorn habitat may be higher than previously thought (DeCesare and Pletscher 2006). We conclude ensuring persistence over the long term will require a large landscape of cooperation from a variety of jurisdictions (Brock et al. 2006) that are ecologically connected to the CGNF including the BDNF, CTNF, ARS Sheep Station Centennial Mountains, BLM, MSU Red Bluff Station, Montana FWP, Idaho Fish & Game Department, Wyoming Game & Fish, Yellowstone National Park, the Montana Department of Natural Resources and Conservation and private landowners.

As recently summarized by Cassirer et al. (2018): “In the long term, agencies will need better strategies for the management of larger interconnected bighorn sheep populations for species viability.” And 45 years ago Dr. Valerius Geist noted: “The objective of conservation of mountain sheep is to safeguard the future of the species. As a minimum it means the preservation of a diverse gene pool in interaction with a natural ecosystem unaltered by man. In practical terms it means a system of sanctuaries, reserves or refuges in which mountain sheep, as well as the ecosystem they are found in, live protected from interference by man” (Geist 1974).

Respectfully,

Glenn Hockett
Volunteer President, Gallatin Wildlife Association

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