Bighorn Sheep Hoof Deformities: A Preliminary Report

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Abstract: In March 2001, 22 bighorn sheep (*Ovis canadensis*) were reintroduced into the Wildcat Hills in the southern Panhandle of Nebraska after nearly a 100-yr absence. During the fall of 2001, one female lamb developed an unusual hoof deformity. Both her front hooves grew to 15-18 cm in length, creating difficulties in mobility. Since that time, one to two female lambs each year developed this deformity. Potential causes of these deformities may be associated with selenium, molybdenum, copper, zinc, anaemia, epizootic hemorrhagic disease (EHD), bluetongue (BT) virus, or genetic bottlenecking. Recognizing the need to understand the cause of the hoof deformities, a study was initiated to address this issue.

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In March 2001, 22 bighorn sheep (*Ovis canadensis*) were reintroduced from Colorado Springs, CO into the Wildcat Hills (41.45.930' N, 103.45.927' W) (Figure 1) in the southern Panhandle of Nebraska after nearly a 100-yr absence.

During the fall of 2001, the hooves of both front feet on one female lamb grew to 15-18 cm in length, Since that time, one to two female lambs each year developed similar deformities (Figures 2 and 3).

The goal of our study is to determine the cause or causes which result in the hoof deformities or possibly eliminate some causes to aid in future management plans. The specific objectives are to: (1) establish baseline seasonal foraging habits of bighorn sheep in the Wildcat Hills, (2) establish differences in diet selection and the trace mineral levels in vegetation chosen by ewes and lambs, (3) develop a spatial analysis of plant communities that carry excessive loads of trace minerals, (4) develop baseline data of trace mineral levels in bighorn sheep, (5) develop baseline data of population exposure and possible effects from epizootic hemorrhagic disease (EHD) and bluetongue (BT) virus, and, if time and money are available, (6) test for possible genetic traits or links among affected adults and lambs.

The research was conducted primarily on the Cedar Canyon Wildlife Management Area (WMA), 41 45.930' N, 103 45.927' W, and also on two other sites on private ranchland (the Hampton 41 42.374' N, 103 50.190' W and Montz properties 41 46.716' N, 103 55.207' W) within the Wildcat Hills of southern Nebraska (Figure 1). These areas were chosen based on past bighorn occupancy

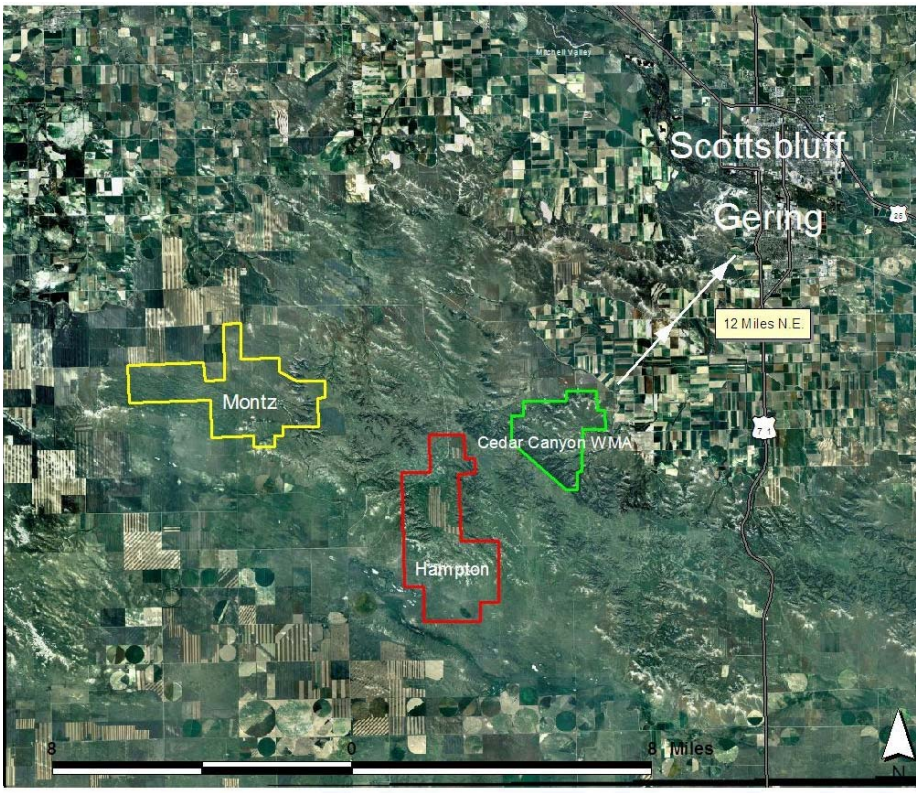

Figure 1. Bighorn sheep hoof deformity study locations in the Wildcat Hills, Nebraska

data and habitat assessment of the Wildcat Hills (Forbes 1999). Trapping and wildlife immobilization are the preferred methods utilized to obtain blood, tissue, and hoof samples from as many different bighorns as possible (Kock et al. 1987). Blood and tissue samples collected from captured bighorns are being tested for EHD and BT viruses (Washington Department of Fish and Wildlife 1999, Howerth and Stallknecht 2000, Michigan Department of Natural Resources 2003), and assessed for levels of selenium, copper, zinc, molybdenum, and possible anaemia (Thorne et al. 1982, Meyer and Harvey 1998, Jurgens and Bregendahl 2002) to establish baseline data from affected and unaffected sheep. For comparison and control, blood and tissue samples will be collected from the Pine Ridge herd and from newly-introduced sheep from Montana in 2005 and/or 2007. These herds are located approximately 160 km north of the Cedar Canyon herd, but occur on range with similar geology and vegetation. Although consistent monitoring of this herd continues, no evidence of the hoof deformity has shown up thus far. They also will provide valuable data in documenting trace mineral levels for bighorns and allow comparison with the Wildcat Hills herd.

Diet is being determined through microhistological analysis (Todd 1975, Fairbanks et al. 1987) of fecal pellets. This type of analysis is a quantified account of the diet through inspection of plant material in fecal samples. Fresh fecal samples from a minimum of 10 sheep (5 ewes and 5 lambs) were collected every month from November 2004 to November 2005. Samples were collected randomly from the ground within 4 hr of observed defecation. To determine plant species consumed and percentage consumed by selected ewes and lambs, bite counts (Canon et al. 1987, Ruckstuhl et al. 2003) were conducted for 2 wk each month

Figure 2. Hoof deformity on lamb in 2003. Photo by Bob Grier.

Figure 3. Hoof deformity on 3 yr old ewe (developed as a lamb). Photo by Nebraska Game and Parks Commission.

focusing on 4-6 different sheep. Actual bite counts were confirmed by collecting samples from grazed plants (Canon et al. 1987, Ruckstuhl et al. 2003). Plant samples collected are being tested for selenium, molybdenum, copper, and zinc content following established forage analysis techniques (Bauer 1997, Davis et al. 2002).

Past bighorn observational data were analyzed to identify range occupancy and distribution. From these data, four transects were established. The vegetative transects will provide evidence of seasonal forage production and plant species composition for the area. Soil samples will be gathered from the study area to determine trace mineral levels (Bauer 1997, Davis et al. 2002) and identify any correlation between trace minerals in plants and soils.

As of this writing, data analysis and results are pending. However, early indicators suggest that selenium, molybdenum, zinc, EHD, and BT may not be associated with the hoof deformity.

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