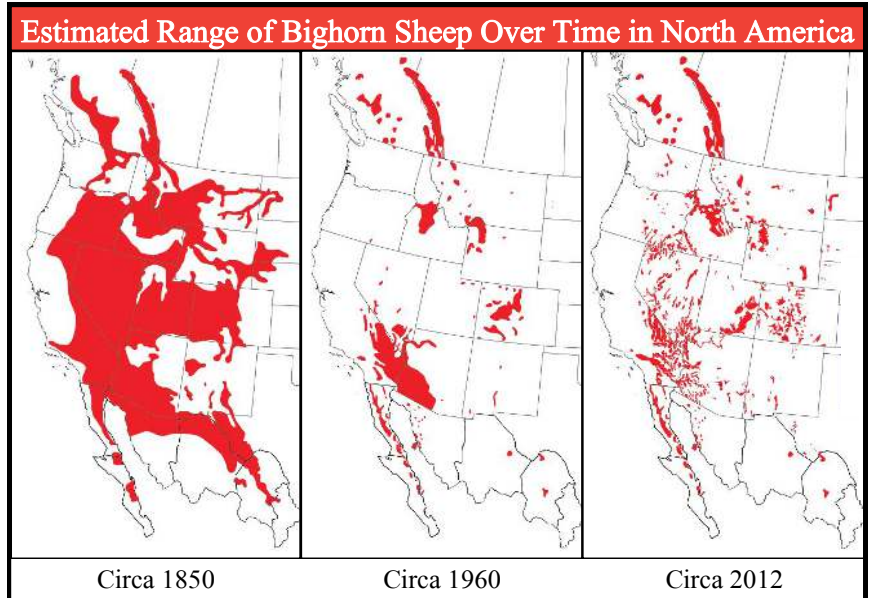




Effects of Disease on Bighorn Sheep Management

Bighorn sheep (*Ovis canadensis*), a once common and iconic species of the American west, have experienced **significant population declines** over the past 150 years.¹ Despite continued restoration efforts, periodic disease outbreaks resulting from contact with domestic sheep and goats have hampered bighorn sheep recovery.²

With high disease mortality rates and no effective vaccines, wildlife managers must now focus on minimizing disease transmission and spread.



There are an estimated 87,000 bighorns currently in North America (Credit: WSF, WAFWA).³

Why are bighorn sheep vulnerable to disease?

Bighorn sheep evolved in North America thousands of years before the introduction of domestic sheep by European settlers. The **domestic sheep brought novel diseases** to which native sheep had never evolved a resistance. Moreover, bighorn sheep venture widely in search of resources and other herds, thereby increasing contact with domestic sheep and facilitating the spread of disease.²



Some subspecies & distinct population segments of bighorn sheep are federally listed as endangered species (Credit: Alan D. Wilson).

History of Bighorn Sheep

Once one of the **most abundant wild ungulates in the west**, bighorn sheep populations numbered from 1.5 to 2 million at the onset of the 19th century.⁴ However, unregulated hunting, disease, competition for forage with domestic livestock, and habitat loss/fragmentation led to precipitous declines in distribution and abundance through the early 1900's.⁴ By 1955, the estimated bighorn population had dropped to 25,000—with **extirpations occurring in many regions**.⁵

Obstacles to Population Recovery

Wildlife managers have used translocations, habitat enhancement, and habitat protection to restore wild sheep populations. Despite their continued efforts, population growth has stagnated since the early 1990's as a result of periodic disease outbreaks.⁶ **Bacterial pneumonia** associated with domestic sheep and goats remains the primary obstacle to bighorn sheep recovery.⁷

Disease in Domestic and Bighorn Sheep

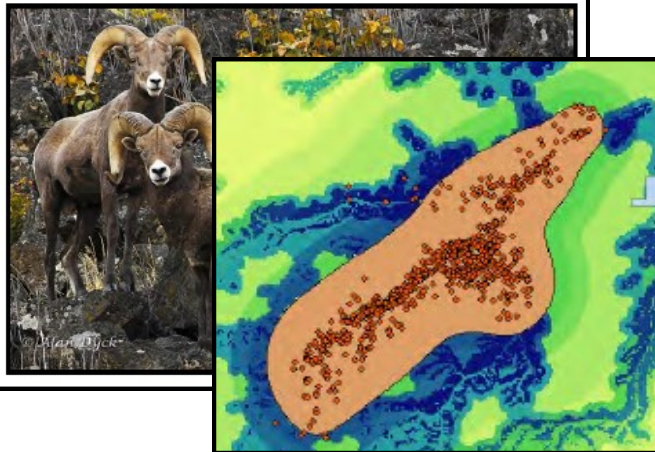
Disease outbreaks have plagued bighorn sheep populations since as early as 1885.⁸ Wildlife scientists associate the primary source of fatal diseases among bighorn sheep with the transfer of bacteria resulting from the direct comingling of bighorn sheep with domestic sheep and goats.⁹

While domestic sheep have evolved resistance to diseases like bacterial pneumonia, bighorn sheep have not.¹⁰ This makes bighorn sheep highly susceptible to disease and death following direct contact with domestic sheep. Experiments have indicated up to a **90% mortality rate** in bighorn sheep populations within two months of exposure to domestic sheep.¹¹



Domestic sheep are immune to the same diseases that can quickly kill large populations of bighorn sheep¹⁰ (Credit: Creative commons).

Bighorn Sheep Risk of Contact Tool v2 User Guide



U.S. Forest Service and BLM Risk of Contact Tool User Guide and example spatial analysis of bighorn locations (Credit: USFS/BLM).¹³

Management Implications

Currently, no effective vaccine or treatment for bacterial pneumonia exists for bighorn sheep.¹² **Maintaining appropriate and reasonable spatial and temporal separation** between wild sheep and domestic sheep remains the most effective tool for minimizing the risk of disease transmission between species.¹⁰ However, complete separation of bighorn and domestic sheep is a challenge for land managers due to range overlap between wild bighorn sheep and grazing areas for domestic sheep.

The U.S. Forest Service and Bureau of Land Management have developed a **Risk of Contact Assessment** tool to identify and evaluate inter-species contact for better **proactive management** of disease transmission, but the continued success of bighorn sheep conservation efforts will require increased awareness, cooperation, and communication among all stakeholders and the public.¹³

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