THE WILDLIFE SOCIETY

FACT SHEET

Impacts of Disease on Bighorn Sheep Management

A Rocky Mountain bighorn ram near Flathead Lake in Montana. Bighorns, once ubiquitous throughout the West, are threatened by disease introduced from domestic sheep (Credit: William Mullins).

WHY ARE BIGHORNS VULNERABLE TO DISEASE?

Bighorn sheep evolved in North America thousands of years before domestic sheep were introduced by European settlers. The domestic sheep brought novel diseases to which native sheep had never evolved a resistance. Bighorns also venture widely in search of resources and other herds. These journeys increase the chance of contact with domestic sheep.

Bighorn sheep (*Ovis canadensis*) are an iconic species of the American West. Wildlife managers have used reintroductions to restore wild sheep populations in response to declines over the past 150 years. However, diseases introduced by domestic sheep and goats have negatively impacted the size and viability of bighorn populations, reducing the effectiveness of reintroductions throughout public lands. Government agencies and nonprofits are exploring new management strategies to manage wild bighorn sheep and protect them from disease.

History of the Bighorn Sheep

Bighorn sheep (*Ovis canadensis*) are large, wild ungulates native to western rocky and arid land. Their preferred habitats are barren and rugged areas containing steep hillsides or rocky outcrops that can be used to avoid predators.[1]

Bighorns were one of the most abundant wild ungulates in the west. Population estimates range from 1.5 million to 2 million at the onset of the 19th century.[2,3] Populations declined with westward expansion of human populations due to overhunting, introduction of domestic sheep and goats, and overgrazing of rangelands. Bighorns were extirpated from Washington, Oregon, southwestern Idaho, northeastern California, Nebraska, the Dakotas, northern Nevada, Texas, and drastically reduced in other states and Canadian provinces by the end of the 19th century. [4,5]

Restoration and Obstacles

State and federal wildlife agencies have used translocations and federal protections to repopulate bighorn sheep habitat.[4,6,7] The Sierra Nevada subspecies (*O. c. sierrae*), and the peninsular Distinct Population Segment (DPS) of the desert subspecies (*O. c. nelsoni*) are listed as endangered under the Endangered Species Act.[8] Restoration and protection have allowed North American populations to grow from an estimated 25,000 in 1955[9] to 70,000 in the 1990's[10], but growth has stagnated since despite continued efforts. There are currently an estimated 80,000 bighorns in North America.[11]

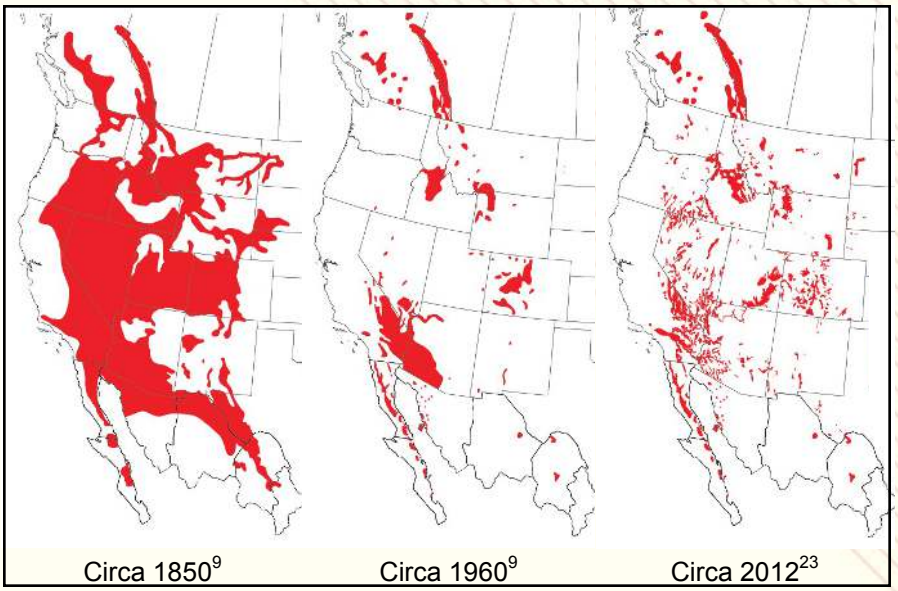
The main obstacle to restoring populations is bacterial pneumonia.[5,12] Disease outbreaks have plagued bighorns for at least a century with reports from Colorado as early as 1885.[13] Evidence from wildlife scientists and managers associates contact with domestic sheep and goats and subsequent transfer of bacteria as the root cause for disease-caused mortality events.[4]

A bighorn lamb. Lamb recruitment is reduced for several years after initial mortality events in herds affected by pneumonia infections (Credit: Tony Bynum).

Domestic Sheep and Pneumonia

Domestic sheep, originally from Europe, have evolved resistance to several forms of respiratory diseases and are able to carry the disease-causing bacteria without clinical symptoms.[14] Several studies have shown that these bacteria are highly virulent in wild bighorn sheep and prove lethal after transmission from domestic sheep herds.[2,14]

Numerous controlled experiments have shown more than 90% mortality in bighorn populations due to respiratory diseases within two months after exposure to domestic sheep.[15,16,17] Several disease-caused mortality events have been recorded in wild populations immediately after contact with domestic sheep in northeastern Oregon, central Colorado, Washington, California, Nevada, Montana, the Dakotas, British Columbia, Alberta, and other locations.[12,16,18,19,20] The disease persists following mortality events and reduces reproductive success, preventing regrowth of the population.[12]



The estimated ranges of bighorn sheep over time in western North America. The introduction of domestic sheep and goats, and historic overhunting led to large reductions in range size and local extirpations (Credit: Wild Sheep Foundation[22], WAFWA[3]).

Management Implications

State wildlife managers, federal officials, and bighorn advocates have emphasized the need to reduce contact between wild and domestic sheep species, citing evidence of disease transfer.[3,21] But federal and state lands – where most of the bighorn populations reside – are also allotted for domestic sheep grazing. Land managers are tasked with balancing the needs of the domestic sheep industry with the conservation of the wild bighorns while accounting for several compounding factors. The "foray" behavior of wild sheep, where individuals will travel up to 50km searching for food and other herds, facilitates the spread of disease[22] while domestic sheep strays are common and increase interaction. Experimental trials to develop and test vaccines are underway, but are far from conclusive. If successfully developed, vaccinations would be logistically difficulty and expensive to administer[4]

Separating domestic sheep allotments and wild sheep habitat is the most viable current management option.[3,5,16,21,22] U.S Forest Service and Bureau of Land Management personnel have developed a data-driven Risk of Contact Assessment tool which identifies and evaluates interspecies contact to help land managers make land use decisions that reduce the risk of contact.

Close contact between a wild bighorn and a flock of domestic sheep grazing near Yellowstone River in Montana. Research has shown that the bighorns contract pneumonia-causing bacteria that the sheep carry and then spread the disease rapidly among their own herds leading to high levels of mortality in addition to low reproductive capacity for several years (Credit: Kevin Hurley).

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