

# Insularity Problems in Rocky Mountain Bighorns

By Francis J. Singer

Most populations of bighorn sheep are small and isolated. Their populations in western U.S. are presently only a fraction (about 2-4%) of their estimated historic numbers. Most populations were extirpated in the late 1800s and early 1900s, due to overharvest (including extensive market hunting), habitat disturbances, and disease epidemics resulting from stressful contacts or transmissions from domestic livestock.

Eighteen of the NPS units (parks, monuments, and recreation areas) in the Rocky Mountain region historically supported bighorn populations. One of three subspecies inhabiting the region—the Badlands subspecies of the Dakotas and eastern Montana—was extirpated. Bighorns survived in only 5 of the 18 NPS units. Limited restoration efforts occurred over the past three decades until now some bighorns occupy 16 of the units. Many of the herds, however, occur in fragmented, isolated groups; 66 percent of the herds number fewer than 100 individuals. Five herds contain only 6-17 animals and are in immediate danger of extirpation (Fig. 1).

A few success stories exist. Bighorns survived the die-offs in Canyonlands and Rocky Mountain NPs and with some transplanting both parks are completely occupied by bighorn populations numbering about 1,000 each. Transplanted bighorns in Badlands NP tripled their numbers; they invaded the Stronghold unit on their own during the 1980s.

## Insularity and Fragmentation

Life history and habitat requirements of bighorns in concert with human disturbances tend to predispose the species to fragmentation and small population sizes. Bighorns occupy patchy habitat, consisting of open cliffs and nearby grasslands. The animals avoid forested and low flat terrain and are poor dispersers. Knowledge of migration routes through such dangerous terrain is passed among generations; knowledge of the routes, lost with extirpated herds, may never be reestablished by transplanted groups.

Bighorn populations are hypersensitive to disease pathogens that wipe out some herds, further isolating any surviving groups. A dominance hierarchy among the males limits participation in breeding to only the oldest (7+ years), largest-horned, and most dominant males. Restriction of successful breeding to as few as 10-25 percent of the males reduces the effective genetic size of the group. Extreme inbreeding has been shown to result



in smaller horn size in bighorns, and in reduced dominance, fecundity, and fertility in many mammals.

Factors likely responsible for failure of past restoration efforts include

- (1) too few transplants occurred and much occupiable habitat remains;
- (2) transplanted groups are notoriously poor dispersers and typically remain on or near the release site;
- (3) most transplant groups number fewer than 20, and if initial population growth is slow, inbreeding is likely;
- (4) small, sedentary groups of bighorns are easy for predators to relocate, thus increasing the relative impact of predation, and
- (5) transplanted bighorns may avoid historic habitats now overgrown with tall shrubs and trees due to fire suppression.

## The Regional Initiative

Bighorn needs, assessments, and planning are underway in FYs 1991-93, with a WASO NRPP funded initiative. The program's goal is to restore bighorns to all occupiable habitat in the region. A first step was visitation to 15 of the units by scientific advisory committees. This process was completed in 1991.

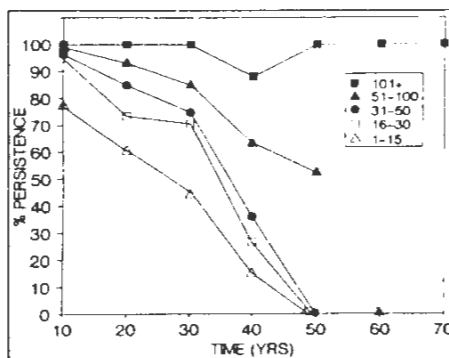


Figure 1. Persistence over time of bighorn populations of varying size (from Berger 1990). No population of less than 50 animals survived for 5 decades.

Secondly, GIS-based habitat assessments will be made of the suitability of potential transplant sites, to be accomplished by the end of FY 1993. Disease and genetic surveys will be conducted in all potential source herds for transplants and in any remaining resident groups.

A new census technique is being tested, the better to evaluate management programs. Experimental burning is being done in Badlands and Dinosaur in an attempt to enhance bighorn movements and recovery. Studies of the number of males participating in the rut and surveys of genetic heterozygosity will better define minimum viable population sizes. Interagency metapopulation restoration plans will then be drafted, source stock requested, any habitat improvements (e.g. prescribed burning) conducted, and then transplants and the follow-up monitoring conducted.

Ten interagency working groups have been convened. As a result of interagency cooperation, bighorn assessment expenditures on lands adjacent to NPS lands exceeds the original NRPP funding by a factor of 2.5 times. Most NPS areas are too small to support the entire metapopulation size necessary for long-term viability, thus cooperation with BLM, USFS, and various state agencies is essential. Restoration efforts are predicted to take another four years after the assessments and planning efforts are completed.

Two reports available from the author, at the NPS/CPSU, Natural Resources Ecology Lab, Colorado State University, Fort Collins, CO 80523, are:

*Bighorn Sheep in the Rocky Mountain Region*. Reports of Five Scientific Advisory Committees to the NPS. 39 pp. NPS, Natural Resource Publication Series, Denver, CO; and *Problems of Insularity of Bighorn Sheep in the Rocky Mountain Region*; a review of current status and success of transplant efforts, NPS Natural Resources Technical Report Series, Denver, CO.

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## Recommended Reading

Berger, J. 1990. Persistence of different sized populations; an empirical assessment of rapid extinction in bighorn populations. *Conservation Biology* 4:91-98.

Schwartz, O.A., V.C. Bleich, and S.A. Holl. 1986. Genetics and the conservation of mountain sheep. *Biological Conservation* 37:179-190.

Bighorn die-offs due to diseases severely hamper restoration efforts. The largest recent die-off occurred in southeastern Utah in Canyonlands NP, Glen Canyon NRA, and adjoining BLM lands. The die-off started in or near the Needles district of Canyonlands in 1985, and by 1989 it had traveled nearly 100 linear miles through the North and then the South San Juan herds. Where once 1,000 desert bighorns roamed, fewer than 100 now exist. No evidence of recovery has yet been observed. Lamb survival still is essentially non-existent each year, and as recently as 1992, 3 of 5 adults captured in the Needles district were sick. Cause of this die-off has not yet been determined.

In 1992, WASO NPS selected the highhorn problem for Servicewide program development. Objectives are to (1) sample select herds for disease organisms, especially those with recent history of infectious diseases outbreak and/or chronic poor recruitment; (2) survey diseases in herds for potential transfer to avoid introduction of a novel pathogen, and (3) develop protocols as a model for other regions with wildlife disease problems.

*From Bighorn Diseases in the Rocky Mountain Region: a Servicewide Wildlife Disease Surveillance Program.* By Drs. of Veterinary Medicine Sharon Taylor, Mike Miller, Terry Spraker and Beth Williams.