

## Evaluating Response of Reintroduced Bighorn Sheep in the Seminoe Mountains to Habitat Change

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Wyoming's wide open spaces, pristine wilderness areas, and abundant wildlife on public lands create an ideal setting for a sportsman's paradise. Bighorn sheep rank near the top of the list for viewing and hunting opportunities. Although Wyoming has strong bighorn sheep populations, this is only possible through a combination of proper management strategies and hard work, to ensure individual populations thrive. Translocation efforts to supplement or reintroduce bighorns into historic range throughout the state play a major role in bolstering bighorn sheep populations. However, the success of translocated bighorn sheep is highly variable, with many efforts less than successful. Undaunted by previous attempts, we continue to learn from our mistakes, adapt, and use the best science available in efforts to restore bighorn populations. An excellent example of applying scientific information to ensure success when translocating sheep occurred during the past decade when wildlife managers in Wyoming translocated bighorns into habitats that better matched the source animal's life-history strategies (e.g., lambing chronology, migratory tendencies, etc.). These attempts have resulted in marked improvements in restoring isolated, non-migratory bighorn sheep in our state. However, managers are still aware of the obstacles these newly established populations face, including susceptibility to disease and predation, as well as restricted habitat availability. Thus, additional research plays an important role to gain knowledge about what strategies can be implemented to improve the success of bighorn translocations.

Fifty-two bighorns were translocated to the Seminoe Mountains in December 2009 and December 2010 from source herds in Oregon (Diablo Rim, John Day River Canyon) and Devil's Canyon near Lovell, Wyoming, where habitats are similar to those in the Seminoe Mountains. The Wyoming Game and Fish Department released and monitored these animals for 2 seasons, creating an opportunity to investigate variables that influence transplanted bighorn sheep. Findings from a preliminary study provide insight into the translocated population, including higher lamb recruitment being documented than in previous translocation attempts, and findings that bighorns only occupied portions (specifically the perimeter) of the "high quality" winter habitat modeled for the Seminoe Mountains. Other research has shown that small populations of isolated bighorn sheep that are tightly concentrated have higher probabilities of extirpation due to factors including disease, predation, and genetic drift, compared to populations spread across a larger landscape, in multiple subgroups.

A fundamental question for bighorn sheep inhabiting the Seminoe Mountains is what management practices can be implemented to promote expansion of the reintroduced herd within the mountain range, as well as potential expansion to other nearby ranges? An analysis of bighorn habitat selection during the first 6 months following the December 2009 release indicated that these sheep may have been restricted from good quality winter range by snowpack or dense vegetation and timber encroachment. Previous research indicates that dense vegetation and timber encroachment can create visual barriers that restrict suitable habitat for bighorn sheep. The Rawlins BLM office designed a prescribed burn on the Seminoe Mountains to improve forage quality and reduce timber-encroached areas of the mountain. Information on the location and extent of the fire will be valuable to couple with over 2 years of GPS and observational data on lambing for these sheep. We contracted with a helicopter company to capture a new sample of 25 bighorns (20 adult



ewes and 5 adult rams) on December 2 and 3, 2011 to provide additional data useful to evaluate the response of bighorn sheep to prescribed burning on the Seminoe Mountains. The capture crew collected biological samples for disease testing, determined age of each sheep, provided a dosage of Ivermectin to treat each sheep for worms, and equipped each animal with a GPS transmitter collar. Most prescribed burning was completed in May 2011, with a follow-up burn conducted in March 2012. However, a wildfire in July 2012 increased the area burned. Justin Clapp is using this large data set as the basis for his thesis as part of the degree requirements for his MS program in Rangeland Ecology and Watershed Management, which he began in August 2012 at the University of Wyoming. Justin brings 2 years of experience monitoring the Seminoe Mountains sheep as a technician with the Wyoming Game and Fish Department to his graduate program. Justin is being advised by Dr. Jeff Beck, wildlife habitat restoration ecologist in the Department of Ecosystem Science and Management at the University of Wyoming. Dr. Beck has conducted work on a variety of wildlife species and habitat issues in several western states.



The first objective of our study focuses on the effects of habitat alteration on the reintroduced herd. We first plan to conduct a resource selection function (RSF) analysis across seasons throughout the study. Resource selection modeling is very useful in identifying specific factors such as topography and vegetation communities that wildlife populations select on a seasonal basis. We will compare before and after burning RSFs to detect changes in habitat selection that may be related to fire effects. Next, we will compare bighorn distributions before and after fires to define areas of spatial overlap and expansion. This information will be very useful to identify whether the reduction of dense vegetation and timber encroachment led to expansion of the herd into previously unused portions of the Seminoe Mountains. A second and related objective of our research is to use lamb observation data to detect demographic changes (lambing success and survival) before and after the fires. Results from this aspect of our research are intended to provide managers additional insights about the potential effects of habitat alterations for bighorns in similar habitats, as well as to implement effective habitat management strategies prior to translocations.

Our third research objective is to assess acclimation time for translocated bighorn sheep after release. Previous research suggests that typical animal movements are interrupted by stressful events including capture, immobilization, and especially translocation. Acclimation after translocation represents the time it takes for animals to localize into an area, reduce sporadic movements, and settle into new surroundings. This assessment has the potential to greatly improve release strategies in future translocations. For example, research shows that newly translocated individuals have a higher risk of mortality as they acclimate to novel, unfamiliar environments. By predicting the time it takes for bighorns to acclimate after release, managers may maximize the efficiency of post-release monitoring protocols, as well as the timing of predator control efforts. Comparisons of acclimation time will be conducted by comparing similar low-elevation bighorn sheep translocations across the state, including those in Laramie Peak and Devil's Canyon. Finally, since the Seminoe herd consists of 3 translocation efforts, we will also compare acclimation time of the initially translocated animals to supplemental releases. It is likely that the gregarious nature of bighorn sheep leads them to join other animals that have already settled into the area. This information is valuable because it could alter release strategies in the future to reduce the time of acclimation, thereby reducing mortality risk.



Progress reports provided by the Wyoming Game and Fish Department through spring 2011 indicate that lambing success and survival was substantially higher in comparison to previous translocation efforts in the Seminoe Mountains. Most translocated ewes successfully bred before translocation and thus showed high lambing success. In addition, subsequent fall observations in the Seminoe Mountains consistently show groups of ewes with rams present during the rut. Monitoring efforts in 2012 reported an estimated lamb survival rate of 62.5%; greater than previous translocation efforts where as few as 1 lamb was identified during fall observations. Also, no mortalities have been observed from individuals captured in December 2011. Monitoring of bighorn sheep will continue in the Seminoe Mountains through spring 2013, when we will conduct lamb observations and retrieve GPS collars. The Wyoming Wild Sheep Foundation has been a valuable partner through all stages of our research including providing funds to conduct aerial and ground monitoring, cover travel expenses, and support project personnel. With continued support, knowledge gained from our study will provide managers the tools to maximize bighorn translocation success, and ultimately “put more sheep on the mountain.”