

# IS HABITAT CONSTRAINING BIGHORN SHEEP DISTRIBUTIONS AND RESTORATION: A CASE STUDY IN THE GREATER YELLOWSTONE ECOSYSTEM

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We used GPS location data from 65 bighorn sheep (*Ovis canadensis*) in the Madison Mountain Range, located in the northwestern extent of the Greater Yellowstone Ecosystem (GYE), to develop and validate winter and summer resource selection function (RSF) habitat models. Two isolated populations of bighorn sheep occurred within the range, but had demonstrated little expansion into apparent habitat even during years of population growth. We hypothesized that habitat was not the primary factor limiting these populations and that the Madison Range could support a substantially higher abundance and broader distribution of bighorn sheep. We evaluated remotely-sensed landscape covariates expected to influence bighorn sheep resource selection and compared sets of biologically-plausible seasonal models with AICc. We validated our results using temporally- and spatially-independent GPS data and predicted potential habitat throughout the Madison Range. Our results indicate that approximately 82% of winter and 42% of summer habitat was unoccupied. Predicted winter habitat occurred in a non-contiguous distribution primarily along the low-elevation, southwest-facing aspects within the Madison Valley, and predicted summer habitat was concentrated along the high elevation ridgelines associated with steep slopes and reduced canopy cover. By linking our winter RSF to population estimates for the Taylor-Hilgard, we predicted the Madison Range may be capable of supporting 2 to 4 times the number of bighorn sheep currently estimated within the range. Our results support our hypothesis and suggest that a strategy focused on systematically restoring a metapopulation may greatly enhance the potential for bighorn sheep restoration within the Madison Mountain Range.