Landscape Features Outperform Habitat to Explain Genetic Connectivity of Bighorn Sheep in Waterton-Glacier International Peace Park

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We evaluated bighorn sheep (*Ovis canadensis*) telemetry data and genetic samples collected in Glacier National Park, Waterton Lakes National Park, and the Blackfeet Reservation to estimate the influence of landscape features on bighorn sheep genetic connectivity. Over 168,400 GPS locations were collected between 2002 and 2011 for 97 bighorn sheep, and we generated genomic data for 95 individuals using the High-Density Ovine array. Using a machine-learning optimization approach, we conducted a landscape genetic analysis of genomic kinship between all pairs of individuals with GPS locations during the rut (November through December). We evaluated a local resource selection model to represent habitat and a suite of possible landscape characteristics predicted to influence genetic connectivity, including water bodies, tree cover, shrub cover, and other surface characteristics, such as slope and distance to steep terrain. We found that water bodies and tree cover were the most important predictors of resistance to genetic connectivity in the study area. We applied this information to predict how genetic connectivity of bighorn sheep may be influenced by current and future changes to the landscape, such as tree cover reduction due to wildfire. Our results provide insights regarding the spatial scale and landscape influences of gene flow in a native bighorn sheep population with no history of translocations. This information can be used to determine if certain habitat characteristics can be managed to facilitate or impede long-term connectivity among bighorn sheep populations and determine if genetic connectivity of bighorn sheep may be affected by climate change.