

IDENTIFYING LANDSCAPES FOR DESERT BIGHORN SHEEP TRANSLOCATIONS IN WEST TEXAS

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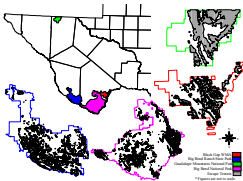
Abstract—To identify landscapes for future desert bighorn sheep (*Ovis canadensis*) translocations in west Texas, this study used a GIS-based evaluation of escape terrain. Using a 30-m digital elevation model, the quantity and heterogeneity of escape terrain (i.e., slopes $\geq 60\%$ with a contiguous 150-m buffer) were quantified for Big Bend National Park, Guadalupe Mountains National Park, Big Bend Ranch State Park, and Black Gap Wildlife Management Area. Big Bend National Park had the largest amount of escape terrain (501 km²) of the 4 study areas but had the largest perimeter-to-area ratio (4.9). Guadalupe Mountains National Park had the smallest amount of escape terrain (112 km²) but also had the smallest perimeter-to-area ratio (2.8). Although other factors (e.g., vegetation, water availability, predators, and interspecific competitors) should be considered prior to translocation, the GIS-based evaluation offers an efficient, preliminary, and quantitative method for evaluating desert bighorn sheep habitat. Based on the results of this study, biologists should further evaluate Big Bend National Park and Big Bend Ranch State Park for future desert bighorn sheep translocation sites in Texas.

Justification

- Desert bighorn sheep translocations are expensive, time consuming, and politically challenging.
- Desert bighorn sheep population sizes were correlated to area and configuration of escape terrain and recommended translocation sites contain ≥ 15 km² of escape terrain.
- Evaluation of the quantity and heterogeneity of escape terrain prior to translocation is critical for successful restoration.
- GIS provides a preliminary and efficient method for evaluating escape terrain on a landscape level.

Objectives

- Evaluate the quantity and heterogeneity of escape terrain on public lands in west Texas.
- Assess each site for the potential to have a successful translocation and sustain viable populations of desert bighorn sheep.



Methods

- Calculated escape terrain for study areas in a GIS using a 30-m DEM.
- Escape terrain was defined as slopes $\geq 60\%$ with a contiguous 150-m buffer.
- Elevations $\geq 1,600$ m and $\geq 2,200$ m at BBNP and GMNP, respectively were excluded from analysis due to the dense conifer forests.
- Ratio of perimeter (km) to area (km²) of escape terrain was calculated to indicate a measure of patchiness or edge effect in the habitat.

Results

- BBNP had the largest amount of escape terrain of the 4 study sites and the second largest perimeter-to-area ratio (Table 1, Figure).
- BBRSP had the second largest amount of escape terrain and the largest perimeter-to-area ratio.
- BGWMA and GMNP had the third and fourth most escape terrain, respectively.
- Each study sites exceeded the minimum amount of escape terrain (15 km²) recommended and reasonable perimeter-to-area ratios indicating quality sites for translocation.

Table 1. Area and perimeter-to-area ratios of escape terrain located at Big Bend National Park (BBNP), Big Bend Ranch State Park (BBRSP), Black Gap Wildlife Management Area (BGWMA), and Guadalupe Mountains National Park (GMNP) in Texas.

Study Area	Escape terrain (km ²)	P:A*
BBNP	501	4.9
BBRSP	324	5.0
BGWMA	135	4.6
GMNP	112	2.8

*P:A = Perimeter (km) to area (km²) ratio of escape terrain.

Discussion

- Large blocks of habitat can support larger populations of desert bighorn sheep.
- Larger habitat patches have been positively correlated with population persistence.
- Translocating desert bighorn sheep into historic range sites can be an effective management tool.
- Evaluating the area and configuration of escape terrain is a critical, yet preliminary step to translocation and other variables should be considered:
 - Water availability
 - Vegetation
 - Predator abundance
- Based on our findings we recommend BBNP, BBRSP, and BGWMA be further evaluated for future translocations.

