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Spatial Analysis Predictive Model Map for Reintroduced Bighorn Sheep Winter Range Areas along the Wasatch Front Mountains

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Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) are native to the central and northern mountain ranges in Utah. They were historically abundant and extensively used by the resident Native Americans. Due to various anthropological influences, most northern populations were presumed extinct by the 1930s with only several scattered sightings reported until the 1960s (Karpowitz and Stewart 2000).

Since January 2000 the Utah Division of Wildlife Resources (UDWR), Utah Foundation for North American Wild Sheep (UFNAWS), and other organizations have transplanted 66 Rocky Mountain bighorn sheep along the Wasatch Front Mountains. In three successive years, 44 bighorns were released at the base of Mount Timpanogos and another 22 sheep were released at the mouth of Rock Canyon east of Provo.

Reintroductions are the impetus of a program designed to re-establish bighorn populations in the historically inhabited mountains of northern Utah. With certain transplants exceeding a hundred thousand dollars, the UDWR, FNAWS, and other organizations will continue to spend a great deal of money relocating bighorns throughout the state.

Of the 66 bighorns released, 41 were radio instrumented. Beginning June 2000, using a radio

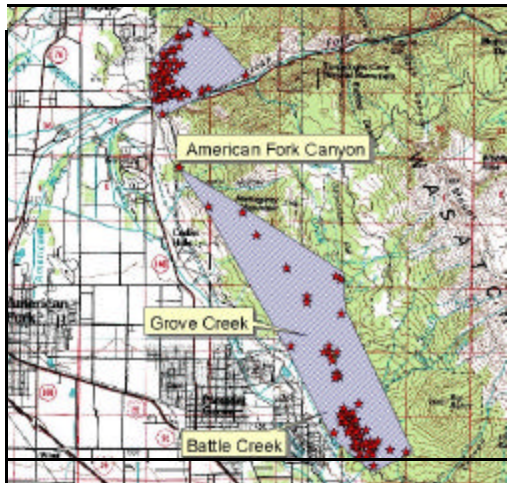


Figure 1. Shown is a computerized map with data locations and polygons depicting winter range use areas of reintroduced bighorns near Mount Timpanogos.

receiver and high-powered optics, I monitored sheep dispersal, migrations, and seasonal range use patterns. Bighorns were located on 533 different occasions. These locations were imported into ArcView 3.2 computerized mapping program and displayed on 7.5' topographical maps. Then using the minimum convex polygon method (Bookhout 1996) the outer most points were connected forming range use area polygons (Figure 1).

These maps depict specific range use areas and habitat selection sites. From this analysis winter range use areas were identified as the most restricted. With increasing snow depth, bighorns migrate to lower elevations and spend the winter and early spring months on sun exposed southwest facing slopes—a much more constricted range than their larger summer alpine mountain habitats. The project objective is to create a computerized predictive model map showing available

winter range habitat areas of potential bighorn reintroduction sites along the Wasatch Front Mountains using more sophisticated maps and mapping software.

To accomplish the objective, digital elevation models (DEMs) will be superimposed over the computerized 7.5´ topographical range use area maps (Figure 1). DEMs are 3-D map projections that display map contour characteristics—slope, aspect and elevation. All collected data points will be imported and projected on the DEM overlaid 7.5´ topographical maps. For each imported data point elevation, slope and aspect data will be extracted. A list of these attributes will be compiled for all winter range use area sightings. This list will then be queried to find the minimum and maximum values for each feature. Next, computerized 7.5´ topographical maps will be queried for these same parameters and areas with similar characteristics will be highlighted. To further refine the search, vegetation type maps will be overlaid onto these highlighted areas and locations with vegetation type suitable for bighorn sheep will be shown. These areas will appear as polygons representing locations with suitable winter range habitat.

By employing this model, UDWR, UFNAWS, and other organizations can identify expansion areas adjacent to recently established populations, as well as delineate the most appropriate locations for future reintroductions, or areas with adequate amounts of suitable winter range habitat.

Often inherent with computer projects that manipulate and query data there have been setbacks. Several weeks were spent trying to transfer and re-project the DEMs from a mapping program to one that we were using—to no avail. The needed DEMs were then purchased and received on June 27. Work will continue in the ensuing weeks. Once the maps are finished a report will be produced and given to those who oversee bighorn transplants, to facilitate reintroduction decision making. Next spring the data will be published and presented at the Fourteenth Biennial Symposium of the Northern Wild Sheep and Goat Council meetings in Salt Lake City.

Literature cited

- Bookhout, T. A. 1996. Research and management techniques for wildlife and habitats. Allen Press, Lawrence, Kansas.
- Karpowitz, J. and R. Stewart. 2000. Bighorn Sheep (*Ovis canadensis*). Wildlife Notebook Series number 16:2.