Ten Years of Geospatial Research for Alberta Grizzly Bear Conservation

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Abstract

We provide a brief overview of ten years' worth of geospatial research in the FRIGBRP, including strategies, progress, lessons learned, and current activities. In particular, we will focus on latest geospatial products used to map the 228,000 km^2 of Alberta grizzly-bear range, and their transformation to habitat maps and grizzly-bear conservation areas.

Background and Relevance

Contemporary strategies for to research and conservation of grizzly bears (*Ursus arctos*) rely strongly on a *spatial-information approach* to knowledge formulation that links animal data sets – observations related to grizzly bear location, abundance, health, and genetics, for example – to spatially explicit environmental variables derived from GIS and remote sensing. However, the approach depends in part on the availability of accurate, spatially-explicit information on vegetation, land cover, and other physical habitat elements, and is often limited by our capability to assemble such data layers over large, fast-changing landscapes. The Foothills Research Institute Grizzly Bear Research Program (FRIGBRP) has relied on remote sensing as its primary source of land and vegetation information since its inception in 1999. In this paper, we provide a brief overview of ten years' worth of geospatial research in the FRIGBRP, including strategies, progress, lessons learned, and current activities. In particular, we will focus on latest geospatial products used to map the 228,000 km^2 of Alberta grizzly-bear range, and their transformation to habitat maps and grizzly-bear conservation areas.

Methods and Data

We used a combination of 3890 field plots, 30 Landsat TM and ETM+ satellite images, and MODIS scenes (MOD-13Q1 data products) to create wall-to-wall models of land cover, crown closure, tree-species composition, and phenology. The baseline mapping strategy begins with an image selection process designed to favour clean, cloud-free imagery from the summer growing season of the target year of interest. If no high-quality scenes were available for the target year of interest, then we used alternative summertime scenes from previous years in the archive. Once assembled, the base map was updated to the target year of interest by identifying change features – roads, well sites, cut blocks, mine expansion, urban development, and forest fires – that represent the bulk of disturbance events occurring on the landscape. We followed a design III approach (Thomas and Taylor, 1990) to RSF modeling to represent grizzly bear habitat selection, with available resources defined for each animal using a minimum convex polygon home range and habitat use defined from radio-telemetry locations (Manly et al., 2002). We modeled mortality risk mortality using the spatial patterns of 297 human-caused mortality (kill) locations from the Central Rockies Ecosystem (Benn and Herrero, 2002) and landscape characteristics at human-caused mortality locations compared to random and telemetry locations.

Results and Summary

The major value of the geospatial products developed in this work lies in their capacity to characterize the spatial arrangement of key structural and phenological habitat over an enormous area of the province, at relatively high spatial and temporal detail and in a manner that is consistent across multiple management jurisdictions. Habitat selection and mortality models provided indices of attractive sink (sink-like habitats) and safe harbor (source-like habitats), and contributed to the identification of grizzly bear conservation areas in the province, following the Alberta Grizzly Bear Recovery Team (2008) guidelines. The research highlights the value of geospatial products in grizzly bear conservation, and provides a template for other wildlife-conservation priorities in western Canada.

References

Benn, B. and Herrero, S. 2002. Grizzly bear mortality and human access in Banff and Yoho National Parks, 1971–1998. *Ursus*, Vol. 13, pp. 213-221.

Manly, B.F.J., McDonald, L.L., Thomas, D.L., McDonald, T.L., and Erickson, W.P. 2002. *Resource selection by animals: Statistical design and analysis for field studies*. Springer. 221p

Thomas, D., and Taylor, E. 1990. Study designs and tests for comparing resource use and availability. *Journal of Wildlife Management*, Vol 54, pp. 322-330.