

PATH OF LEAST RESISTANCE

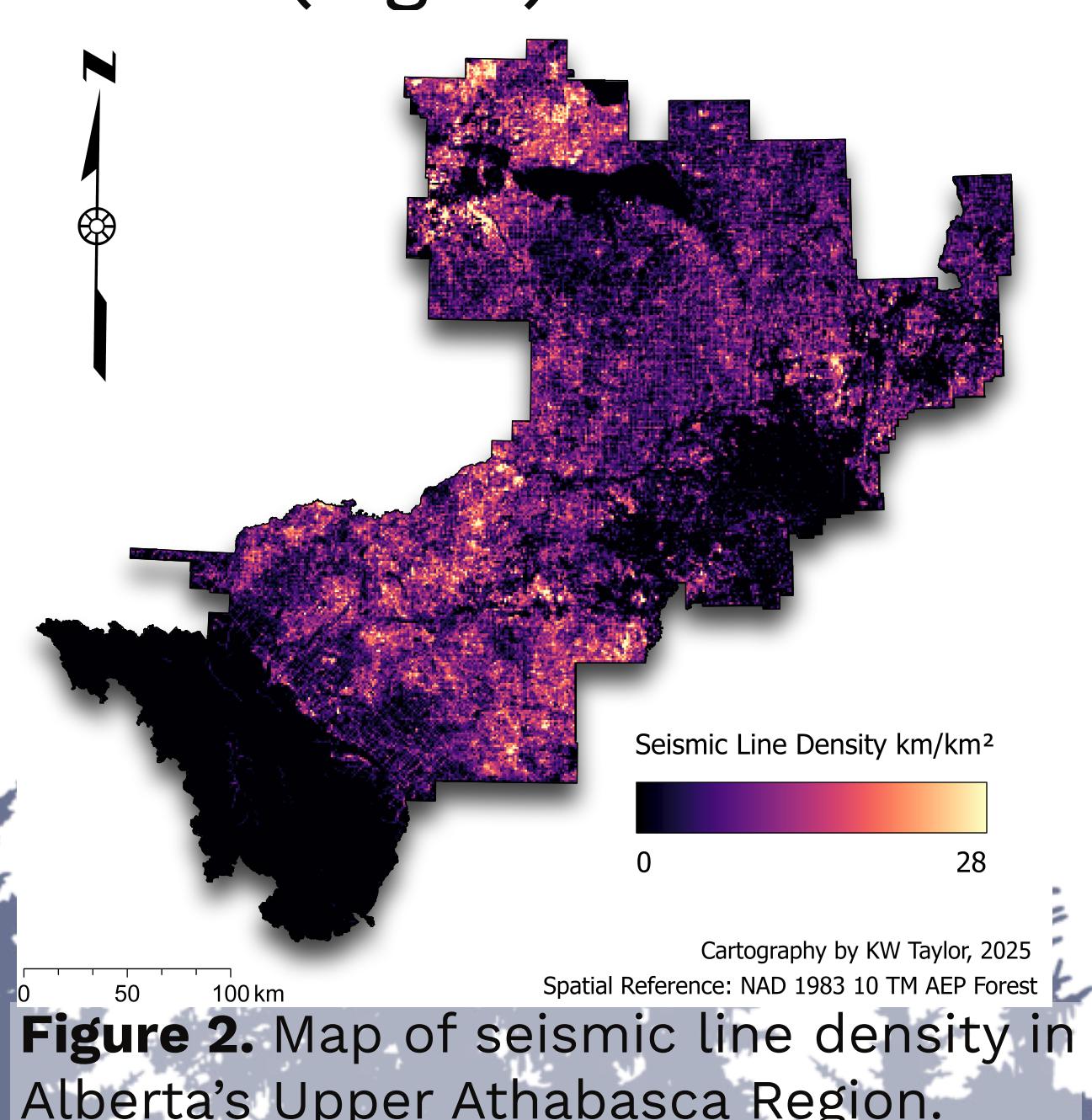
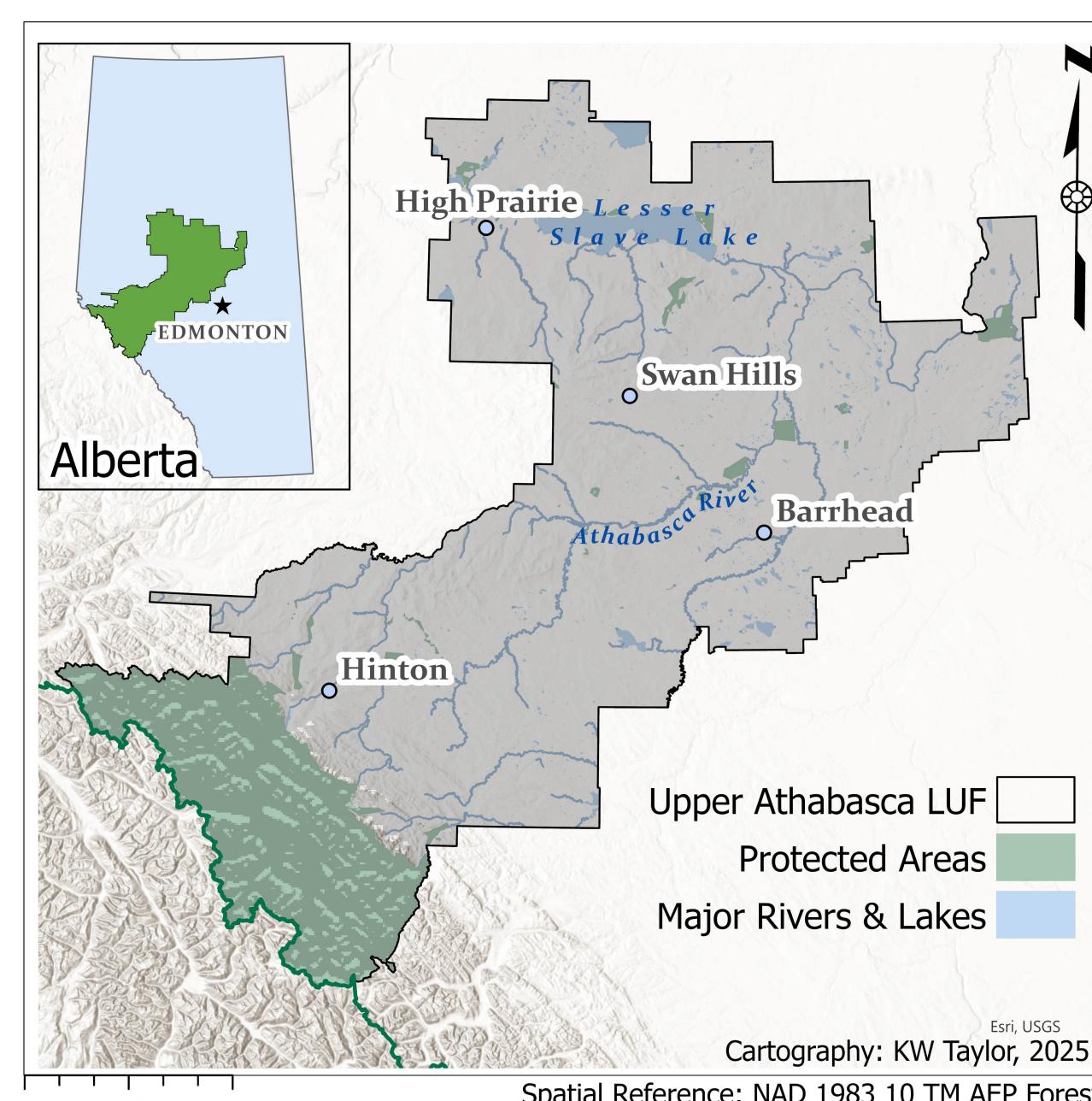
Prioritizing Avian Biodiversity Areas in a Highly Fragmented Boreal Ecosystem

OBJECTIVES

Seismic lines represent a major source of habitat fragmentation in Alberta's Upper Athabasca Region (Fig. 1), disrupting ecosystem structure and function by reducing connectivity, increasing edge effects, and altering bird behaviour [1,2,3]. With nearly 168,000 km of linear features within the study area (Fig. 2), representing \$1.7B in reclamation deficit, prioritizing restoration efforts is essential to maximize conservation impact within financial constraints. Our objective is to identify areas of high conservation value with and without seismic cost considerations and to develop a simple strategic classification of Protect, Restore, and Manage to inform conservation planning and land use management.

METHODS

Over 1 million Alberta bird occurrence records from eBird were used to build 46 Maxent species distribution models (SDMs) for Alberta. These complemented 87 songbird models from ABMI, totalling 133 species out of the 304 native breeding birds, including 13 species of concern (Fig. 3).



These SDMs were used as conservation features in Zonation, using a hierarchical mask for existing protected areas, and excluding aquatic, developed & agricultural land cover. The prioritization model was run once with seismic line density as a cost function and once without (Fig. 4).

RESULTS

The resulting prioritization models (maps) showed the distribution of the diversity value within the study region, with the seismic line density being used to show how priority is effected when considering their reclamation cost.

We then created bivariate maps to analyze the overlap between cost and no cost conservation strategies (Fig. 5).

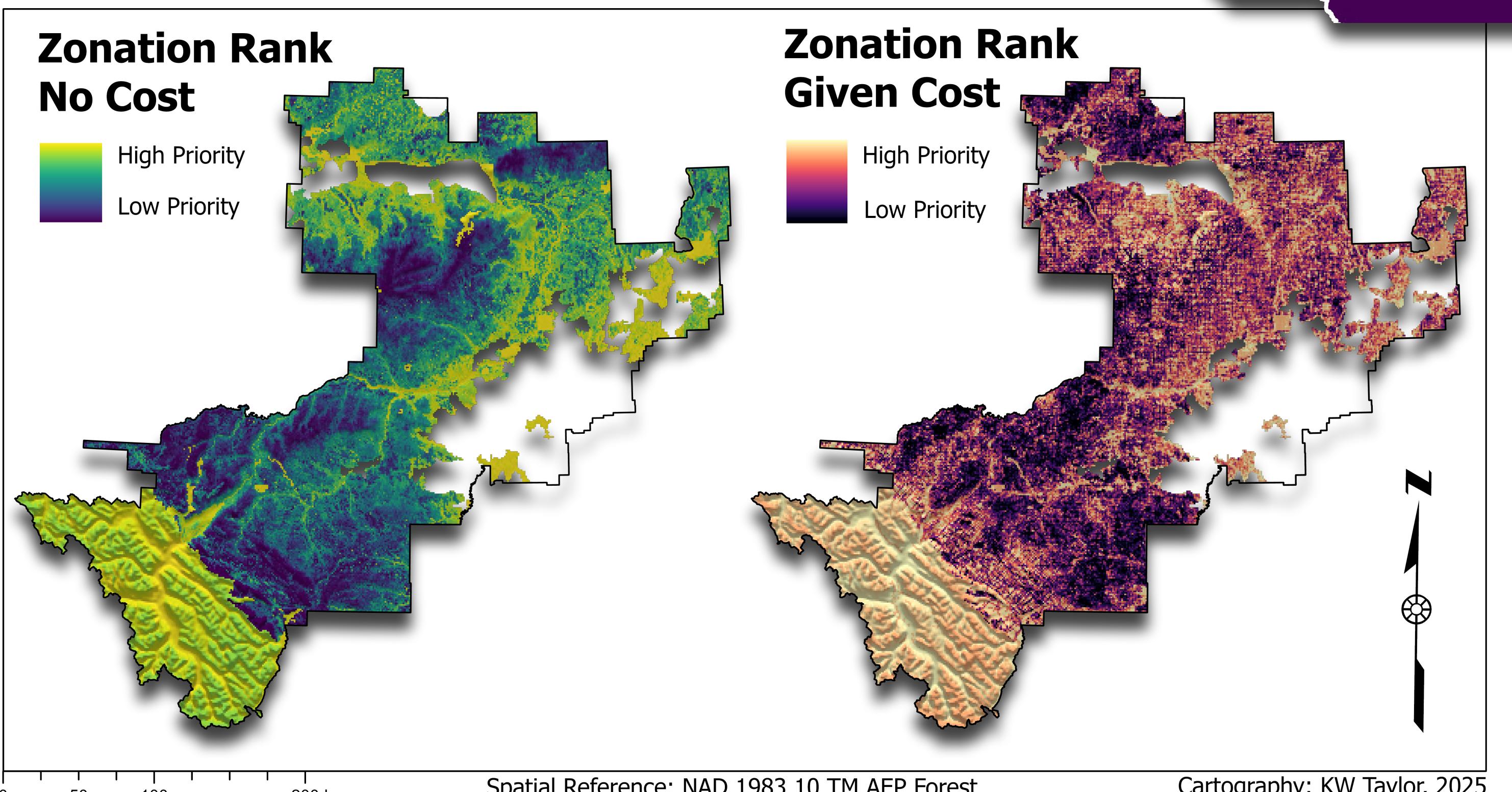


Figure 4. (Bottom) Zonation analysis is shown with no cost prioritization (left) and with seismic line cost prioritization (right). Each zonation model ranks each 1 square km cell sequentially from highest conservation value to lowest, considering complementarity. With cost prioritization, the algorithm selects lower cost cells of equal value over those with higher costs.

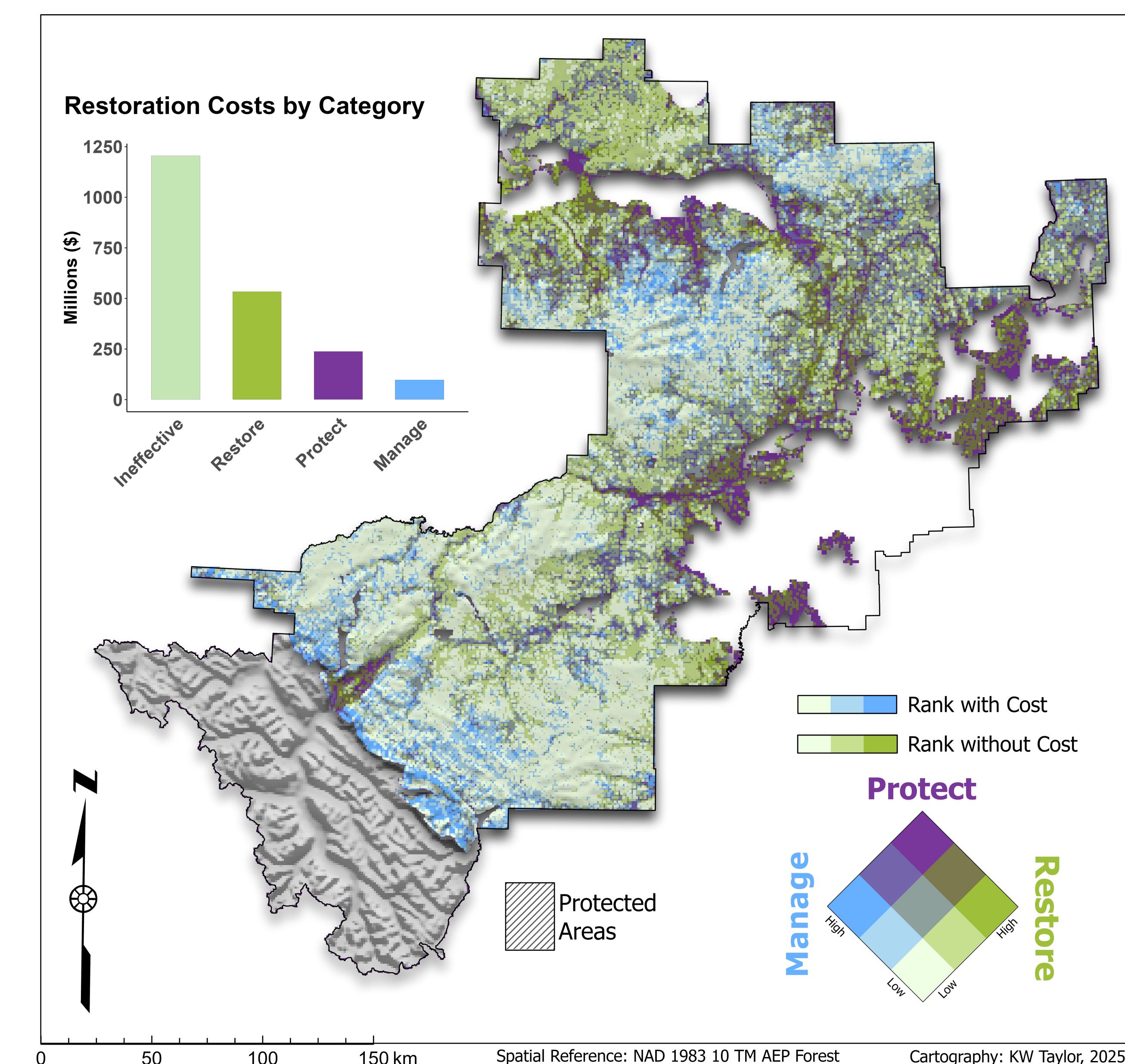
RESOURCES

- [1] Bayne, E. M., S. L. Van Wilgenburg, S. Boutin, and K. A. Hobson. 2005. Modeling and field-testing of Ovenbird (*Seiurus aurocapillus*) responses to boreal forest dissection by energy sector development at multiple spatial scales. *Landscape Ecology* 20:203–216.
- [2] Dabros, A., M. Pyper, and G. Castilla. 2018. Seismic lines in the boreal and arctic ecosystems of North America: environmental impacts, challenges, and opportunities. *Environmental Reviews* 26:214–229.
- [3] Lee, P., and S. Boutin. 2006. Persistence and developmental transition of wide seismic lines in the western Boreal Plains of Canada. *Journal of Environmental Management* 78:240–250.
- [4] Filicetti, A., M. Cody, and S. Nielsen. 2019. Caribou Conservation: Restoring Trees on Seismic Lines in Alberta, Canada. *Forests* 10:185.

DISCUSSION

Our prioritization approach integrates SDMs with restoration cost to identify areas where habitat restoration has the greatest benefit for bird conservation per unit cost. This allows us to better understand where in the Upper Athabasca Region protection, restoration, and management is best suited.

The zones selected as the most effective areas for protection are riparian zones and parkland remnants in the agricultural fields of the southeast.



ACKNOWLEDGEMENTS

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