

## Climate refugia for boreal birds in Alberta

Climate models project major shifts in Alberta ecosystems, particularly in the boreal forest region, where future increases in temperature are likely to result in the eventual transition of large regions of forest to parkland or even grassland ecosystems. Although losses of current forest habitat will be partially offset by gains in northern areas and at high elevations, vegetation lags and barriers to movement may place forest wildlife at risk — especially species that depend on mature forest. Species must also contend with habitat disturbances from industrial development that may reduce population viability and hinder their ability to adapt.

Given the challenges species face in adapting to climate change, opportunities for providing assistance need to be explored. One important adaptation strategy is to identify and protect climate refugia — areas in which suitable habitat conditions will be maintained far into the future. For forest species, these will generally be areas that remain wet and cool enough to remain fully forested. At the regional scale, such areas will generally consist of hill and mountain regions, where temperatures are cooler and precipitation is higher than in the neighbouring plains.

Applying methods from a recent continental-scale study<sup>1</sup>, we identified climatic refugia in Alberta for 53 boreal forest songbird species, based on bioclimatic niche model projections for the next 90 years. We used the Zonation conservation planning software to prioritize sites, adjusting for seral stage, in order to identify refugia common to all species (Fig. 1). Prioritization maps were generated for three time periods (2011-2040; 2041-2070; 2071-2100) and account for several sources of uncertainty. By the end of this century, forest bird conservation priorities are squarely centered on the hill and mountain systems. The central Alberta foothills and associated hill systems (i.e., the Marten, Pelican, and Swan Hills) are of particular importance because they provide core climatic refugia for birds of upland mixedwood and white spruce forests in both the near term and the long term. As such, these areas represent priorities for protection under regional land-use planning processes. The northern hill systems will also play an important role as refugia for boreal species, though it will take many decades before these areas are warm and dry enough to support the forest ecosystems typical of the boreal plain.

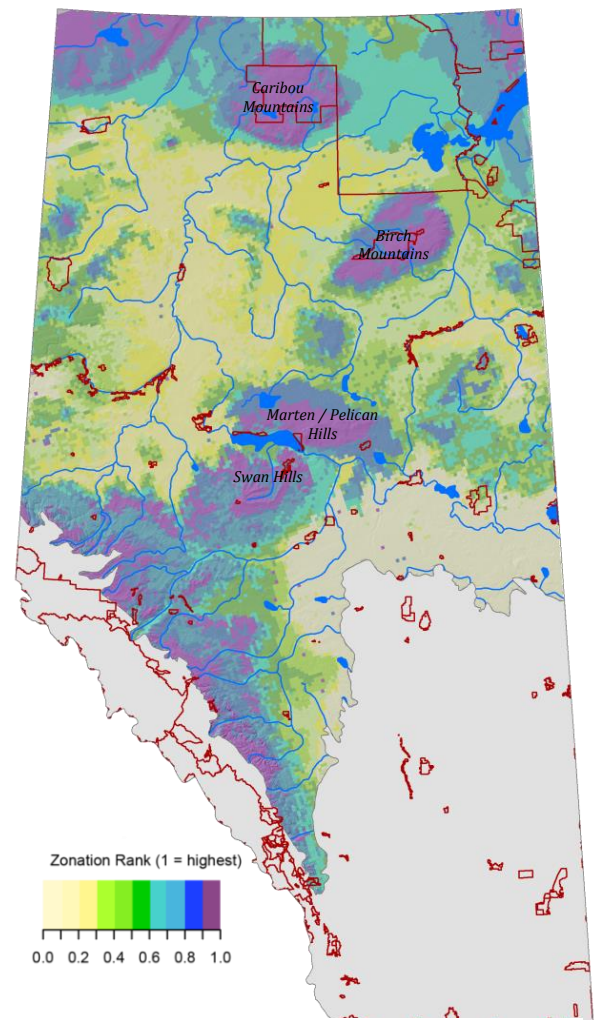


Figure 1. End-of-century conservation priorities for boreal forest songbirds based on climate refugia. Existing protected areas shown in red outlines.

<sup>1</sup>Stralberg, D., E. M. Bayne, S. G. Cumming, P. Sólymos, S. J. Song, and F. K. A. Schmiegelow. in review. Conserving boreal forest birds in a rapidly changing climate: a modified refugia approach. *Diversity and Distributions*.