Breeding ecology and habitat selection of sandhill cranes (*Grus canadensis*) in eastern Canadian boreal forests

The boreal forests cover almost 30% of North America's land mass[1] and support a wide diversity of wildlife within Canada, providing important habitats for species such as bears, caribou, moose, and resident and migratory bird species[2]. The availability of natural resources also provides economic opportunities through industrial development (e.g., logging, oil and gas, hydroelectricity, mining), which subsequently threaten the preservation of these landscapes[2], leading to the loss of natural habitat and consequent declines of wildlife biodiversity[3-5]. These cumulative impacts can have cascading trophic effects that negatively alter animal behaviour, community composition, and species interactions[6]. Conservation research within the boreal forest has primarily focused on the preservation of large charismatic species such as caribou and grizzly bears[1,7,8]. While these species are often used in the development of conservation planning, their effectiveness relies on the assumption that co-occurring species have analogous habitat requirements and react similarly to disturbances[9]. However, sensitivity to environmental and anthropogenic stressors can vary among species[10]. Thus, variation in species-specific responses requires a species-level approach to determine how individual species interact with environmental and anthropogenic features within the boreal forest. Little work has been done to address the effects of anthropogenic development on other species of conservation concern, such as migratory birds[11].

Sandhill cranes (*Grus canadensis*; "cranes"), are a migratory bird species of conservation concern[12]. Nearly extirpated in the 1900's, recent conservation efforts have assisted with population recovery and enabled the reoccupation of historical breeding ranges in Canada's boreal forests[12]. Breeding habitat is a key resource for cranes and nest success is vital for regulating crane abundance and population persistence[13]. Anthropogenic disturbances throughout this critical life-history stage may lead to declines in population size, survivorship, and nest viability through nest abandonment, intraspecific competition, and nest predation[14,15]. Given their recent expansion, our knowledge of breeding ecology remains limited, and therefore research is required to understand spatial and temporal drivers of breeding territory selection for conservation planning.

To address our knowledge gaps and ensure sustainable crane management, between 2019-2022 we deployed GPS-GSM transmitters on 124 adult cranes across Eastern Canada to estimate population distribution and patterns of habitat use. These efforts constitute one of the largest datasets collected on crane populations across a range of ecological, climatic, and land-use contexts and provides a unique opportunity to investigate a variety of ecological and conservation-based questions across multiple scales. Leveraging this unique dataset, my research objectives are to: (1) determine trends in breeding phenology of cranes within the boreal forest; and (2) identify anthropogenic and natural landscape features that influence spatial and temporal variation in breeding habitat distribution at the home range level[16], in Ontario and Quebec. I will use high frequency, high accuracy, location data to develop resource selection function (RSF) models[17,18], to examine the combined effects of native vegetation, land-cover, and anthropogenic features on crane distribution and habitat selection across their respective breeding ranges within the boreal forest. RSF models are a recommended approach for exploring patterns of habitat use and provide robust estimates describing movement patterns in response to site-specific characteristics across heterogeneous landscapes[18,19].

My research will allow us to discriminate the effects of anthropogenic and environmental variables, allowing for fine-scale analysis of factors that impact breeding ranges of cranes, which is critical for advancing our knowledge of crane conservation in increasingly human-modified landscapes and subsequently for guiding conservation and management. Results from my study can be used to guide land-management practices to prioritize protection of breeding habitats as well as predict future impacts from climate and land-use changes on cranes breeding within the boreal forest. This approach can also be applied to a variety of species across diverse landscapes to assess how ecological processes differentiate across spatial scales and can therefore contribute to improving the reliability of telemetry studies and support of large-scale conservation on a global scale.

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