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Heading for the hills? Caribou ranges shift in response to the growing anthropogenic disturbance footprint

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Widespread landscape disturbances like roads, oil and gas wells, and forestry harvest blocks in east-central British Columbia and west-central Alberta have led to declining woodland caribou populations. Caribou may shift their ranges into lower quality habitat to avoid anthropogenic disturbance, but this can result in decreased nutrition, reproduction, and survival.

The central mountain woodland caribou of the Narraway and Redrock Prairie Creek herds migrate between high elevation summer range in the mountains and low elevation winter range in the foothills along the border of British Columbia and Alberta. Anthropogenic disturbance in this area is increasing over time, and understanding how caribou ranges are related to landscape disturbance could provide important information for conservation planning.

Objectives

We looked at changes in caribou distribution on the landscape in relation to anthropogenic disturbance. Our specific goals were to assess the amount of overlap between caribou ranges and disturbance, changes in caribou distribution over time, and changes in the overlap of caribou ranges and alpine habitat. We also wanted to determine if climate patterns might explain any changes in overlap of caribou ranges and alpine habitat.

Methods

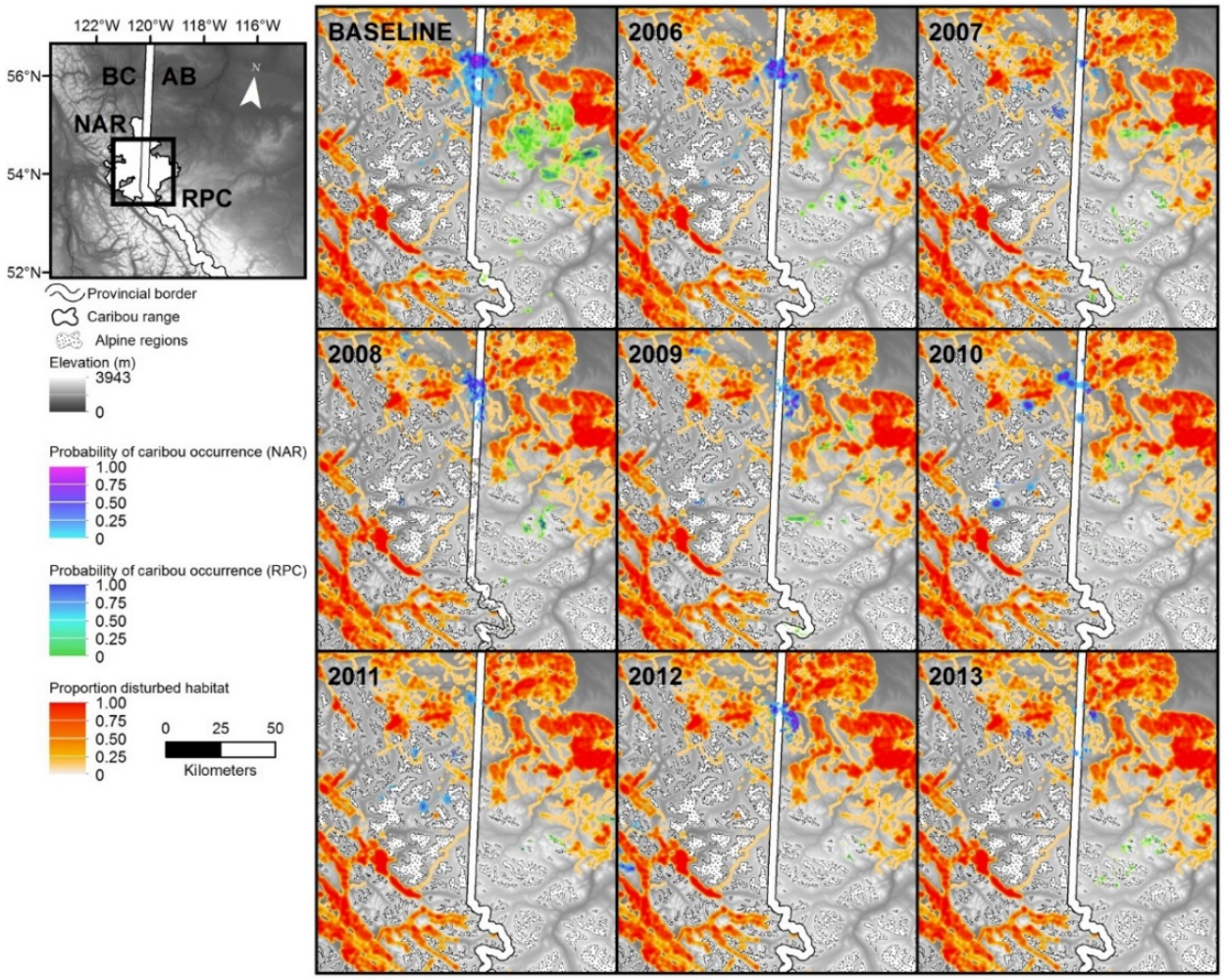
We used caribou GPS collar data from 1998–2013 to generate annual, seasonal caribou ranges as "utilization distributions" (UDs), based on the intensity of caribou habitat use on the landscape. We determined seasons (spring, calving, summer, fall, early winter, and late winter) based on movement rates. To establish a baseline caribou distribution for comparison, we combined the UDs from 1998 to 2005. We then calculated the amount of overlap between: annual caribou UDs and the anthropogenic disturbance footprint, annual UDs from 2006–2013 and baseline UDs, and annual UDs and alpine habitat. We also analyzed trends in relation to a climate index.

Results

The amount of overlap between caribou UDs and the disturbance footprint remained the same or decreased for all seasons other than early winter in the Narraway caribou range. Overlap between Narraway UDs and baseline range decreased during spring, early winter, and late winter, and overlap between Redrock Prairie Creek UDs and baseline range decreased during spring, summer, fall, and late winter. Overlap between Narraway UDs and alpine habitat increased during spring, and overlap between Redrock Prairie Creek UDs and alpine habitat increased during spring, fall, and late winter. Overall, climate did not explain changes in caribou distribution over time.

Conclusions

Despite a substantial increase in the anthropogenic disturbance footprint in Narraway and Redrock Prairie Creek caribou ranges (from 501 to 1177 km^2), the overlap between caribou UDs and disturbance remained low. Caribou ranges also shifted away from their 2006 – 2013 baseline ranges and toward alpine regions. This indicates that car-



Baseline (1998-2005) and annual (2006-2013) UDs for Narraway and Redrock Prairie Creek caribou during late winter, showing minimal overlap between caribou ranges and anthropogenic disturbance.

ibou adjusted their range to avoid disturbed areas, and these changes in distribution were not explained by climate patterns. This shift could provide short-term benefits (e.g., reducing the stress associated with human disturbance), but the long-term consequences could include a higher risk of predation from bears or cougars and increased exposure to avalanche events in alpine areas. In addition, a shift away from previous ranges could result in reduced access to food resources, as caribou may be pushed into lower quality habitat. Our results highlight the importance of including long-term caribou ranges in recovery planning and the importance of habitat restoration in caribou ranges.

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