

Predictive Map of Calving Habitat for Boreal Caribou in Northeast British Columbia

Overview

This vignette accompanies the GIS map of predicted calving habitat for boreal caribou in northeast British Columbia. The map is available in a raster data format.

Displaying the Map

The map is best displayed within ArcGIS using a colour gradient to represent the continuum of relative habitat suitability. This continuum is represented by 10 categories (Predicted Values of Selection) with 1 representing low suitability and 10 high suitability. If desired, the colour gradient can be changed from the default to provide an optimal visual representation of the continuum. This can be done by right-clicking on the raster data layer, going to Properties, selecting Symbology, then choosing a Color Scheme from the drop-down menu. A recommended starting point is to choose a scheme that grades from red (low suitability) to blue (high suitability).

Map Development

The map represents a visual model of relative habitat suitability for female boreal caribou during calving. The map was developed using GPS location data from 43 female boreal caribou that were known to have calved at least once during the years 2011 – 2014. GPS locations were specific to the time period where females were accompanied by neonate calves (≤ 4 weeks old).

Habitat suitability reflects the combined response of caribou to a suite of environmental attributes (or variables). The following environmental attributes were used to model caribou calving habitat:

1. Land cover (the dominant vegetation type at a given location)
2. Slope
3. Normalized difference vegetation index (an index of plant greenness that is often used to model food quality and/or quantity)
4. Distance to nearest river
5. Distance to nearest lake
6. Distance to nearest cut block or forest fire < 50 years old
7. Distance to nearest well site
8. Linear feature density in a 400-m radius (linear features are seismic lines, pipelines and roads)

To assess relative habitat suitability, the environmental attributes associated with caribou GPS locations were compared to the environmental attributes associated with random locations within a herd's range. Note that "locations" equate to pixels (30 m x 30 m resolution) within the map. Areas with high suitability reflect pixels with environmental attributes that were highly used by caribou relative to the availability of these attributes within the herd's range. For example, if 80% of all caribou locations were within treed bog (a type of land cover) yet the area of treed bogs comprised only 50% of a herd's range, caribou would be interpreted as "selecting" treed bogs (i.e. caribou use of treed bogs was greater than the availability of treed bogs). Conversely, if 10% of all caribou locations were within aspen forest and the

area of aspen forest comprised 30% of the herd's range, then caribou would be avoiding aspen forests (e.g. caribou use is less than availability). In the final map, then, pixels of treed bog would be given a higher suitability rating than pixels of aspen forest, all else being equal. The statistical model used to develop the map simultaneously repeats this process for all eight environmental attributes. For each pixel in the final map, the habitat suitability value represents the summed weights for all eight environmental attributes associated with that location.

Primary Usage

As noted above, the map depicts a continuum of relative calving habitat suitability within caribou range in northeast BC. Higher RSF values represent higher suitability and the map is therefore best used for comparing areas within caribou range in terms of their suitability as calving habitat. Analyses during map development suggested caribou disproportionately use areas with RSF values ≥ 6 ; however, this value should not be viewed as an absolute threshold.

Caveats

1. To further emphasize, this predictive map represents a continuum of relative calving habitat suitability. It does not represent the absolute probability that a caribou will occur at a given location.
2. Even in areas with apparently high suitability, the actual probability of caribou occurrence will be relatively low because boreal caribou normally occur at low densities throughout their range (e.g. ~ 3 caribou / 100 km²).
3. Caribou can – and probably do – occur in areas with relatively low suitability. Female caribou show considerable individual variation in how they select calving habitat and this variation is difficult to depict visually on a map.
4. An increase in habitat suitability does not necessarily equate to an increase in the probability of calf survival. Other factors, such as the number of predators and disease, can influence calf survival in addition to habitat suitability.
5. The map does not yield inferences on the spatial requirements of caribou during calving. Females use space to distance themselves from predators and other ungulate species (e.g. moose) during calving and therefore space likely interacts with habitat to influence predation risk. The amount of space – or the areal extent of habitat with high suitability – required by females to effectively reduce predation risk is not currently known.

Further Information

For further information on map usage, interpretation and development, please contact Steve Wilson, research director for the Research Effectiveness and Monitoring Board (steve.wilson@ecologicresearch.ca) or the map developer, Craig DeMars (cdemars@ualberta.ca).

More detailed information on the modelling framework used to develop the map can also be found in the following technical reports:

DeMars, C. and S. Boutin. 2015. Calving Area Selection by Boreal Caribou in Northeast British Columbia. December 2015 Update. 61p.

DeMars, C. and S. Boutin. 2014. Assessing Spatial Factors Affecting Predation Risk to Boreal Caribou Calves: Final Report. 157p.

The reports can be downloaded from the BC Oil and Gas Research and Innovation Society website (www.bcogris.ca).