Establishing an Industrial Land Use Target for Boreal Ecotype Woodland Caribou Range in Alberta to Determine Allowable Levels of Cumulative Effects

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Abstract: The Alberta *Wildlife Act* and the national Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2002) have designated the boreal ecotype woodland caribou (*Rangifer tarandus caribou*) as Threatened. Direct and indirect effects of industrial development are believed to have contributed, in part, to the current status of this species. Our goal was to identify a landscape-level target or threshold for industrial activity on caribou range to guide future industrial work and to ensure resource extraction is compatible with caribou conservation. We tested the hypothesis that a relationship exists between functional habitat loss resulting from cumulative effects of natural and anthropogenic habitat change and the finite rate of population increase (λ) for six subpopulations of boreal ecotype caribou in northern Alberta. We defined functional habitat loss according to two variables for which we had *a priori* research-based reasons to suspect causative associations with λ: (1) percent area of anthropogenic footprint (buffered on all sides by 250 m) within caribou range, and (2) percent area burned by recent (≤ 50 yrs) wildfire.

A two-predictor model was developed: caribou population trend (λ) = (-0.258 x [% habitat within 250 m of industrial features]) + (-0.212 x [% habitat burned within past 50 yrs]) + 1.140. Partial regression coefficients for both independent variables indicated significant effects on λ. The two-predictor model explained 86.8% (r^2) of observed variation in λ among population units ($F_{2,3}$ = 9.88, P = 0.048). The multiple regression equation predicts caribou population increase based on landscape condition, and can be used to prescribe or evaluate given amounts of natural and anthropogenic habitat change in relation to goals for rate of caribou population increase.

In Alberta, the Boreal Caribou Committee, a multi-stakeholder committee composed of government and industry personnel, has developed a planning system (Caribou Range Planning), which uses the regression equation to provide landscape prescriptions for managing forecast future levels of industrial development and natural disturbance. This planning system begins with establishing a finite rate of caribou population increase goal for each caribou range. Alternative

scenarios of future industrial development and natural disturbance can then be independently or collectively evaluated with respect to potential achievement of the selected caribou population increase goal. This process provides a quantitative basis for altering future industrial development and forest fire fighting priorities and practices. The regression equation is also being used to evaluate options for, and to guide, reclamation of existing industrial features, towards improving landscape condition as it might affect caribou population trend. Identifying landscape level targets or thresholds of disturbance can supplement project level guidelines and mitigation for industrial work, and may enable managers to target maximum levels of cumulative effects that permit exploitation of natural resources with acceptable levels of risk to woodland caribou.

This model for assessing and managing cumulative effects on boreal caribou range may have application to caribou ranges in other jurisdictions, although caution is warranted. In particular, we recommend that the regression equation should only be applied very cautiously to pristine boreal caribou ranges. Where other options exist, it would not be prudent to manage caribou ranges towards predicted nonsustainability of resident populations. As well, caution should be exercised since the accumulation of all negative population effects related to current landscape condition may not have yet occurred for Alberta's boreal caribou populations.

References

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2002. COSEWIC assessment and update status report on the woodland caribou *Rangifer tarandus caribou* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. xi + 98 pp.