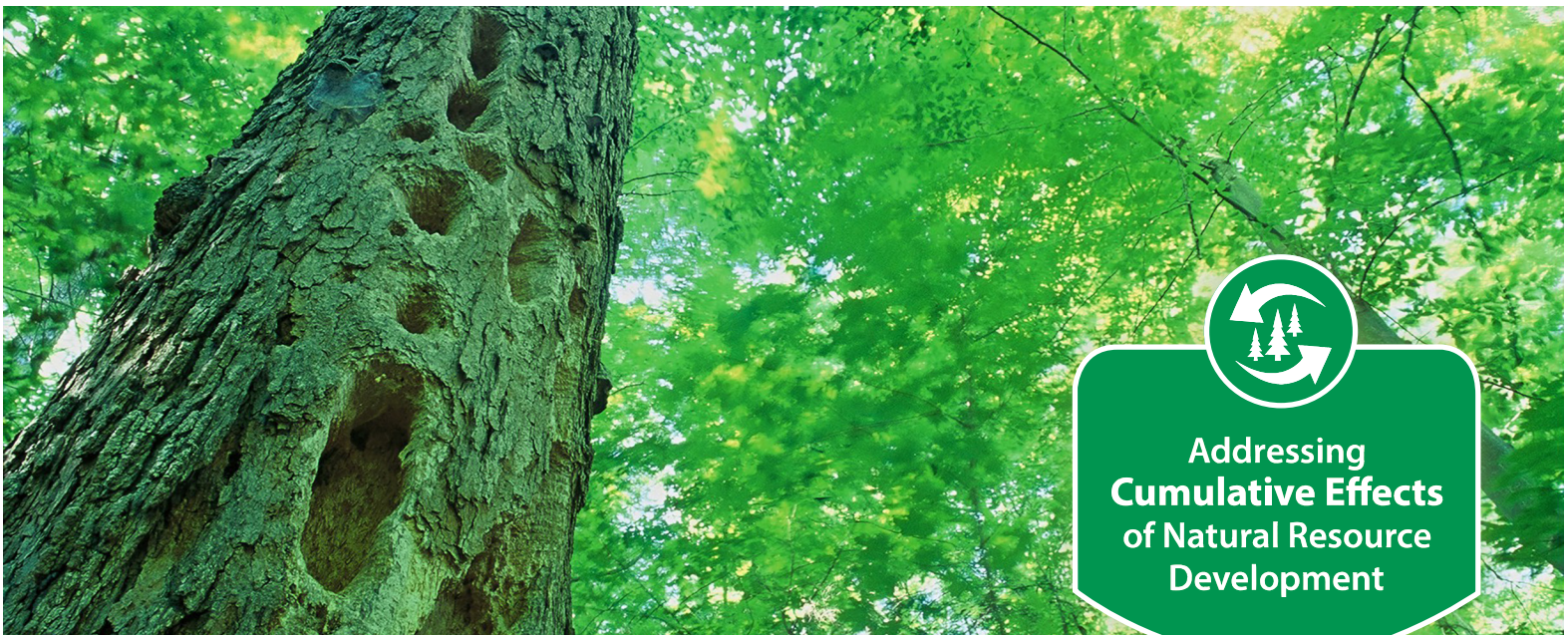# Research Connections: Cumulative Effects

The impact of mountain pine beetle infestation on caribou vulnerability to predation in the Canadian Rocky Mountains and foothills

Note 9

Lead Researcher: Devin Goodsman   **Project Type:** Caribou   **Project Status:** Active (2021–2022)

**Addressing
Cumulative Effects
of Natural Resource
Development**

Need/Drivers

Caribou are a critically threatened species that are extremely sensitive to habitat disturbance. Jasper National Park (JNP), an important protected area containing two key caribou herds, is currently experiencing a devastating mountain pine beetle (MPB) outbreak. There is little knowledge on how caribou are impacted by MPB and how they respond to the combined effects of MPB and fire in their habitat. Therefore, research to investigate the possible consequences of these disturbances on caribou populations would be beneficial. Together with Parks Canada, scientists working in Jasper National Park, and a wildlife ecologist working in the nearby West Fraser Forest Management Area, we will investigate the impacts of widespread MPB disturbance on caribou demography and distribution. It will study the influence of MPB outbreaks and forest fires on caribou population vulnerability to predation. A key aspect of the research involves studying the distribution and space used by caribou and other ungulates (hoofed mammals) in the study region. This will help determine any predation risk that caribou may experience due to the proximity of other ungulate species.

Canada

Approach

To be successful, our proposed research must be undertaken using an ecological approach. This approach considers changes in the populations of ungulates due to disturbances in addition to changes in caribou responses. These data are all collected, curated and available from JNP. We will focus on disturbances and ungulate responses to disturbances in JNP, Wilmore Wilderness Park and the nearby Crown lease managed by West Fraser. To investigate how disturbances impact caribou and other ungulate distribution on the landscape and their behavioral use of habitat, we will replicate observed disturbances within a spatially explicit computer simulation that represents Jasper National Park and the surrounding regions. Specifically, we will produce dynamic spatial representations of mountain pine beetle disturbance, prescribed burn footprints and harvest sequences. We will then overlay ungulate movement models to forecast species abundance resulting from disturbance. We will compare these models to spatial distribution predictions based on a variety of other modeling approaches. We anticipate that model comparisons will reveal context-specific advantages of using one approach over another and will provide us with critical insights. A key deliverable of this work is to publish a manuscript on selecting appropriate methods for forecasting caribou and other ungulate abundance under the influence of dynamic disturbances/climate change. Additionally, we hope to produce scenario analyses that will be used by forest managers to evaluate the merit of variations in locations or frequencies of prescribed fires and harvesting patterns.

Anticipated Impacts

This project will provide stakeholders in Parks Canada, Alberta Environment and Parks, and the forest industry with a variety of new information. This will include dynamic maps of future connectivity and usage of caribou habitat, specific descriptions of the implications of disturbance for caribou population viability, and a description of the mechanisms whereby caribou are affected by climate related insect and fire disturbances. This information will provide land managers with science-based data to use in policy decisions that relate to maintenance of biodiversity and caribou populations in the Rocky Mountain regions of Alberta and British Columbia.
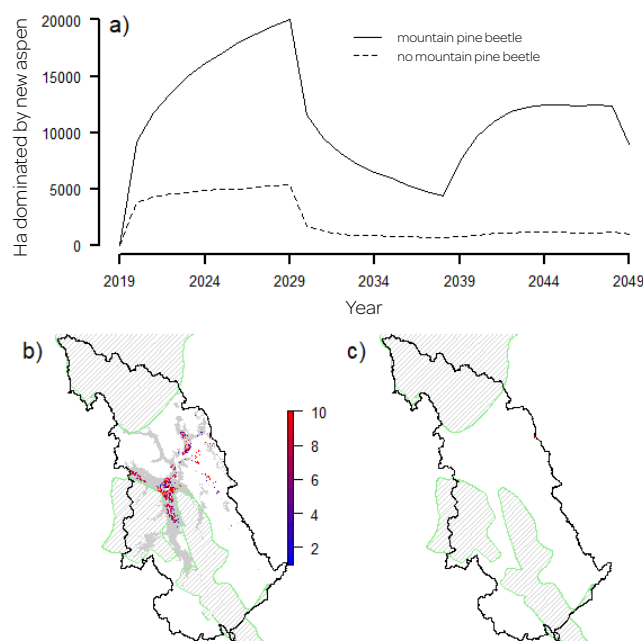
Fig. 1: Young aspen stands provide abundant forage for deer and elk. Because deer and elk attract predators including wolves, the presence of young aspen will further endanger local caribou populations in Jasper National Park. Using the Landis-II forest succession simulation model, we have produced dynamic maps of the locations where we predict that young aspen under 11 years old will establish as a result of MPB disturbance in Jasper National Park.

Figure a) After MPB disturbance, the area within the park dominated by new aspen will sharply increase relative to the (simulated) trajectory in the absence of disturbance.

Figure b) The areas colonized by new aspen will not be uniformly distributed across all regions that were heavily impacted by MPB in Jasper National Park (solid grey shaded regions). Instead, new aspen stands (average age between 1 and 10 years) are forecasted to be clustered near the park centre (red region).

Figure c) This is visibly different from the simulated succession scenario without MPB disturbance.

In both figure b) and c), diagonal hatch shading represents the caribou range boundaries in the Jasper National Park region.

Project Location

Jasper National Park, Willmore Wilderness Park and the West Fraser Forest Management Area north of Willmore

CFS Team Members

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Collaborators

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