

Extension Note 9

Tweedsmuir-Entiako Caribou Project: Effects of a Mountain Pine Beetle Epidemic on Northern Caribou Habitat Use

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Mountain pine beetle attack on the Tweedsmuir-Entiako caribou winter range (looking southeast to Mt. Swannell in the Fawnie Range), September 2007.

Introduction

During winter, Northern Caribou in the Tweedsmuir-Entiako population in west-central British Columbia use mature lodgepole pine forests at low elevations where they forage primarily on terrestrial lichens. In the mid 1990s, mountain pine beetle numbers began increasing in west-central British Columbia, and by 2006 over 200,000 ha of the Tweedsmuir-Entiako caribou population's annual range were heavily attacked. By then, most of the attacked trees had lost their needles and were in the "grey" phase of the attack (MPB-Grey). Since this scale of mountain pine beetle attack was unprecedented on caribou ranges in recent history, no information was available on the effects of mountain pine beetles on caribou.

The "Tweedsmuir-Entiako Caribou Project – Effects of a Mountain Pine Beetle Epidemic on Northern Caribou Habitat Use" study was initiated in 2005/06 to assess the effects of the current mountain pine beetle epidemic during the "grey-attack" phase (MPB-Grey) on Northern Caribou seasonal movements, habitat use and winter feeding site and forage selection for the Tweedsmuir-Entiako caribou population in west-central British Columbia. The Tweedsmuir-Entiako caribou population is the first Northern Caribou population to experience the current mountain pine beetle epidemic.

Study area

The study area is centred around northern Tweedsmuir Park and Entiako Park in west-central British Columbia, and is located approximately 200 kilometers southwest of Smithers. The eastern portion of the study area is made up of mostly flat or gently rolling terrain and is dominated by mature lodgepole pine forests with scattered wetlands, lakes and rivers; spruce and subalpine fir are found primarily on moister sites. The western part of the study area lies on the eastern edge of the Coast Mountains with mountains rising up to 2800 meters. Climate in the western portion of the study area is influenced by coastal weather patterns and is generally wet and very snowy with a short, cool summer. The eastern portion of the study area has a dry, continental climate, with generally cool, short and dry summers, and long, cold and dry winters. Much of the area is remote and unroaded.

Methods

This study was based on radio-collared caribou and winter snow tracking. Fieldwork was conducted for 3 years from April 2006 to March 2009. A total of 38 adult female caribou were captured and fitted with 19 VHF and 19 GPS collars to supplement 13 already active VHF collars.

Radio-collared caribou were located from fixed-wing aircraft approximately monthly from April to November, and approximately bi-weekly from December to March each year. VHF and GPS caribou locations were used to assess selection of Caribou Habitat Types and forest cover classes.

During winter, 3-4 day site investigations sessions were conducted each month. Fresh caribou tracks were backtracked or followed and

habitat (tree species, age, stand density, mountain pine beetle status) and feeding site type (crater, arboreal lichen, browse) were recorded. In addition, snow was excavated every 100 steps where caribou were traveling and not cratering (non-crater sites). Snow depth, snow penetrability, percent canopy closure and percent vegetation cover were recorded at each crater and non-crater site. Caribou sinking depth, snow depth and snow penetrability were opportunistically recorded for caribou tracks in different habitat types. Multiple logistic regression was used to examine caribou crater site selection at the stand and site levels.

Population status was assessed based on mortality rate of radio-collared caribou, and on calf recruitment rates determined during calf survival surveys. Cause of adult mortalities was investigated when feasible.

Caribou locations and winter site investigations data from 1983 to 2003 (pre-MPB) were compiled and compared to data from the current study.

Winter snow conditions

Winter snow conditions varied between the 3 years of the study. In 2006/07, a significant snow fall in late October led to a deep early winter snowpack. Frequent freeze/thaw conditions that year resulted in a consolidated snowpack in mid and late winter. In 2007/08 and 2008/09, snow accumulated gradually in early winter and generally cooler temperatures resulted in a relatively unconsolidated snowpack both years.

Results and Discussion

Seasonal movements, range use and habitat use from 2006/07 to 2008/09 during the MPB-Grey attack stage were similar to seasonal movements, range use and habitat use prior to the mountain pine beetle epidemic. Caribou continued to use summer ranges in northern Tweedsmuir Park and in the area to the west, and returned to winter range in the Entiako Park area. During spring migration, caribou travelled through low elevation mountain pine beetle-attacked stands along the Chelaslie River to reach summer ranges in northern areas, and along low elevation routes along Eutsuk Lake to reach the western part of the summer range. From June to October, caribou used a variety of habitats ranging from low elevation forests to alpine habitat, with greater use of high elevation habitats during calving (June) and rut (October).

By November, caribou began moving back to the winter range. During winter, caribou used mostly mountain pine beetle-killed and mixed mountain pine beetle-killed/live pine stands at low elevations on the south side of Tetachuck Lake. On the low elevation winter range, areas of use varied slightly between winters. In 2006/07, caribou concentrated in the area just west of the Fawnie Mountains and in 2007/08 and 2008/09, caribou primarily used the area just south of Tetachuck Lake. Caribou used subalpine and alpine habitat in the Fawnie Mountains in late February and early March in 2006/07 in response to a hard snowpack in low elevation forests that made cratering difficult.

During winter, radio-collared caribou in low elevation habitat selected Caribou Habitat Types with abundant terrestrial lichens: Dry Lichen/Lichen Moss (DLLM) in early and mid winter; and Lichen Moss (LM) in late winter. Caribou also selected Caribou Habitats with abundant terrestrial lichens from 1983 to 2003, prior to the MPB-Grey attack stage. Caribou were found most frequently in and selected mature pine stands throughout the winter both during the MPB-Grey attack stage and pre-MPB. Most mature pine stands on the winter range sustained high levels of attack; selection of mature pine stands during the MPB-Grey attack stage suggests that caribou were not avoiding mountain pine beetle-killed forests during winter.

In 2006/07, forest snow depths during site investigations on the winter range averaged 69 cm in January then dropped to 50-55 cm in February and March. Caribou sinking depths dropped from 44 cm to 12-15 cm during that same period. In 2007/08 and 2008/09, snow depth increased slightly as the winter progressed and averaged between 40 and 60 cm. Caribou sinking depth remained relatively constant throughout both winters and averaged 26-31 cm in 2007/08 and 19-24 cm in 2008/09.

Caribou foraged primarily by cratering for terrestrial lichens and foraging on arboreal lichens. Caribou cratered most frequently in pine and pine/spruce stands and foraged for arboreal lichens in all stand types. Cratering frequency decreased and arboreal lichen feeding frequency increased as winter progressed. Cratering frequency was lower in 2006/07 (harder snowpack) than in 2007/08 and 2008/09. In subalpine forests, caribou fed exclusively on arboreal lichens.

Crater sites had greater terrestrial lichen cover, more open canopies, higher snow depths and higher percent snow penetrability than non-crater sites.



An example of a crater in a very open MPB-Grey attacked stand.

Crater site selection models showed that caribou crater site selection at both the stand and site levels were similar during the MPB-Grey attack stage and pre-MPB. Crater site selection models at the stand level indicated that caribou were more likely to crater in stands with less spruce both pre-MPB and during the MPB-Grey attack stage. During the MPB-Grey attack stage, when estimated stand density was also recorded, the model indicated that caribou were also more likely to crater in more open stands. In pine-dominated stands, percent cover of MPB-Grey attacked trees did not affect crater site selection. Site level models indicated that caribou were more likely to crater where lichen cover was greater, where moss cover was lower, and where snow penetrability was higher during both pre-MPB and MPB-Grey attack stages. The pre-MPB site level model indicated that caribou were also more likely

to crater where snow was deeper and the MPB-Grey attack site level model indicated that caribou were also more likely to crater at sites with more open canopies.

In addition to traditional terrestrial lichen craters, caribou also cratered in spruce stands at the base of spruce trees for horsetails. They also cratered at the base of MPB-Grey attacked trees, possibly for mushrooms associated with tree decay. "Tree craters" were relatively uncommon compared to terrestrial lichen craters.

During the 3-year study, adult female mortality rates and calf recruitment rates were consistent with pre-MPB rates. Moderate to high adult female mortality and low to moderate calf recruitment during each year suggest a declining population trend.

During the MPB-Grey attack stage, Tweedsmuir-Entiako caribou range use, seasonal movements, winter habitat use and winter feeding site selection patterns were consistent with patterns documented prior to the mountain pine beetle epidemic. Continued use of mature pine forests by Tweedsmuir-Entiako caribou on the Entiako winter range suggests that despite needle loss, mature pine forests in the Entiako are continuing to function as winter range and as winter habitat for the Tweedsmuir-Entiako caribou population. Because MPB-Grey attacked stands still function as winter habitat, management strategies developed for caribou winter ranges prior to the mountain pine beetle epidemic are still relevant for managing caribou winter ranges during the MPB-Grey attack stage.

Final Report

A copy of the final report can be downloaded from the Bulkley Valley Research Centre website or from the BC Ministry of Forests and Range library website at:

<http://www.for.gov.bc.ca/hfd/library/FIA/HTML/FIA2010MR291.htm>

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The Bulkley Valley Centre for Natural Resources Research & Management

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