



PROJECT SUMMARY

The ecosystem management component of the Morice & Lakes IFPA has embarked on several projects that assess biodiversity, ecological attributes, and fish and wildlife habitat. These projects provide important ecological data used in learning scenario development for the IFPA.

Ecosystem Management

Forest Productivity

Public Involvement

Adaptive Management

The Response of Caribou Terrestrial Forage Lichens to Mountain Pine Beetles and Forest Harvesting in the East Ootsa and Entiako Areas

Introduction

The Tweedsmuir-Entiako caribou (*Rangifer tarandus caribou*) population winters in the Entiako and East Ootsa areas. During winter, caribou select mature lodgepole pine (*Pinus contorta*) forests on poor sites and forage primarily by cratering through the snow to obtain terrestrial lichens (Cichowski 1993). This study was initiated in 2001 to examine the effects of the current mountain pine beetle (*Dendroctonus ponderosae*) epidemic and forest harvesting on caribou terrestrial forage lichens in the East Ootsa and Entiako areas. This year, 2007, marks the seventh year of the study and documents changes over six growing seasons. The Tweedsmuir-Entiako caribou population is the first caribou population to experience epidemic levels of mountain pine beetles on their range, so no information on the effects of mountain pine beetles on caribou was available prior to this study.

Objective

The objective of this project is to gain an understanding of how caribou terrestrial forage lichen species respond to mountain pine beetle and forest harvesting disturbances in the East Ootsa and Entiako areas.

Although the focus of this project is on disturbances created by mountain pine beetle and forest harvesting, a wildfire in 2004 provided an opportunity to also assess disturbance created by fire.

Methods

In 2001, we established 56 permanent plots in mountain pine beetle attacked stands and 24 permanent plots in clearcuts in seven biogeoclimatic/site series. The mountain pine beetle treatment was considered a gradual change in canopy cover, while the forest harvesting treatment was considered a rapid change in canopy cover. Clearcut sites were selected where ground disturbance was minimal to avoid confounding effects of mechanical disturbance and change in canopy cover. In 2004, a wildfire burned six plots (4 mountain pine beetle and 2 logged). Each plot included 6-12 permanently marked lichen photoplots, coarse woody debris measurements (as an index of obstruction to caribou mobility), basic site information (stand density, tree status, regeneration), and canopy photographs (to measure light availability). Annual growth rates of Cladina, kinnikinnick (*Arctostaphylos uva-ursi*) and red-stemmed feathermoss (*Pleurozium schreberi*) were also measured at three sites. Plots were re-measured in 2003, 2005 and 2007.

Results and Discussion

By 2007, most attacked trees were in the "grey" phase of the attack and average residual live stem densities ranged from 90 to 329 stems/ha. Overall live stem density and basal area in 2007 were lowest in ecosystems where lodgepole pine was the domi-



Fraser Lake Sawmills



nant species. Advance regeneration was highly variable depending on site type and ranged from 200 stems/ha in the SBSdk/03 to 15,100 stems/ha in the ESSFmc/03.

Over the entire study, lichen abundance on mountain pine beetle affected forested ecosystems declined from 16% in 2001, to 13% in 2003, to 11% in 2005 to 10% in 2007. The rate of decline in lichen cover diminished or stopped in most site series after 2005 (Figure 1). The SBSmc2/01c was an exception as lichen decline in this site series continued at roughly the same rate throughout the study. The decline in lichens was correlated with an increase in abundance of other ground-layer vegetation, especially kinnikinnick. The cover of kinnikinnick increased rapidly from 2001 to 2005 but increases slowed between 2005 and 2007. Some of the leveling off may have been due to die-back that was observed on some plots (Figure 2). In the SBSmc2/01c, although kinnikinnick abundance leveled off between 2005 and 2007, total ground cover of vegetation continued to increase, primarily due to an increase in twin-flower. In mountain pine beetle affected stands, the ESSFmc/03 differed from other sites series in that there was no change in lichen abundance between 2001 and 2005, but a significant decrease between 2005 and 2007. This may be due to the very low abundance of kinnikinnick in the ESSFmc/03, a

greater volume of residual live trees, and a possible delay in the onset of the mountain pine beetle attack. The decline in lichens in the ESSFmc/03 corresponded to a sharp increase in mosses and moderate increases in crowberry (*Empetrum nigrum*) and twin-flower (*Linnaea borealis*). Except in the ESSFmc/03, there were no significant changes in moss abundance between 2001 and 2007.

On logged sites, there was no clear trend in lichen abundance due to high year to year oscillations. These oscillations may have been a byproduct of variation in weather conditions during sampling years. Because lichen colonies often appear larger when wet than dry, lichen abundance may have appeared to be higher during wet years. Overall, lichen abundance in 2007 was higher on logged sites than in mountain pine beetle-attacked stands. Kinnikinnick and other vegetation increased in abundance from 2001 to 2007 on logged sites, whereas moss abundance did not differ significantly over time, or by ecosystem.

A wildfire in 2004 consumed all lichens on plots that were fully burned. Twin-flower was the most abundant species on plots following fire. Although we originally expected that kinnikinnick would be fully consumed by fire, some re-sprouting was observed in 2007.

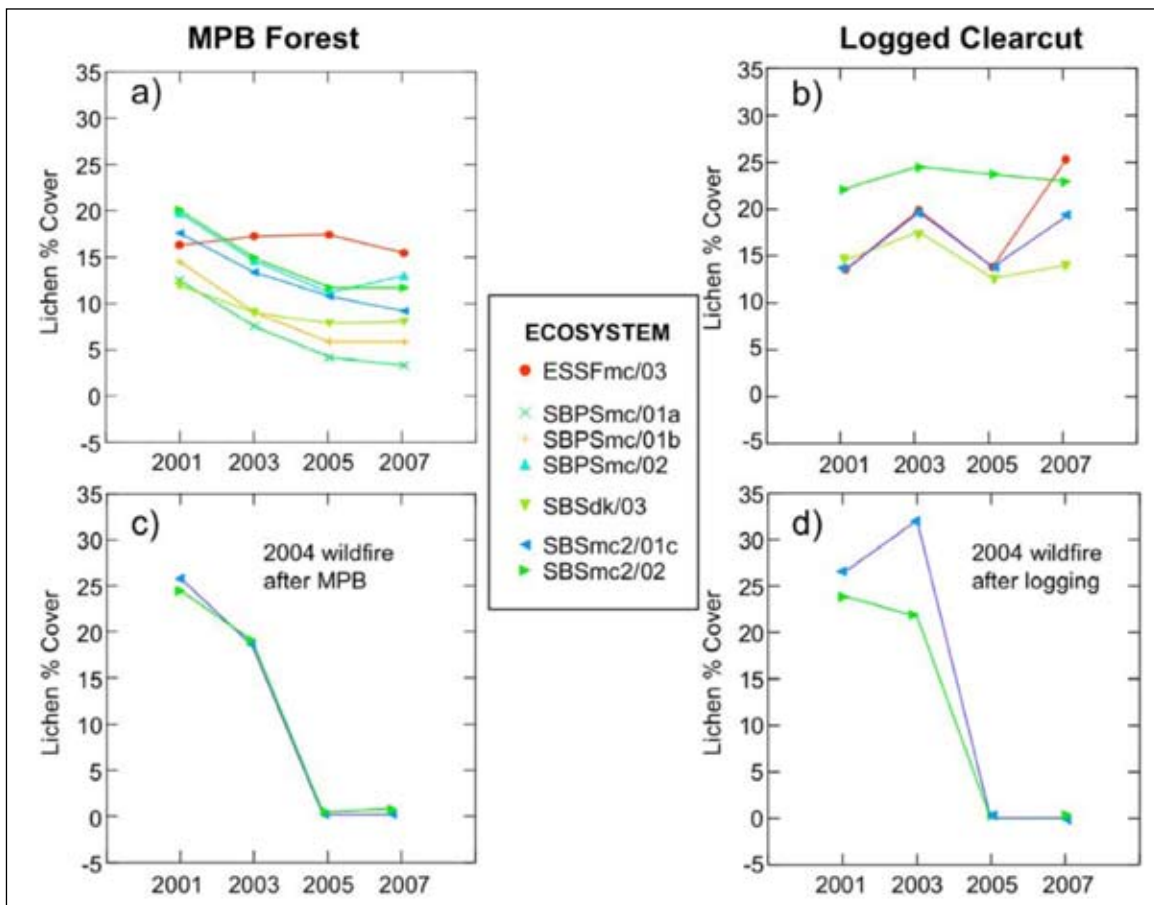


Figure 1. Changes in *Cladina* lichen abundance following mountain pine beetle, forest harvesting and fire disturbance in the East Ootsa and Entiako areas (2001-2007).

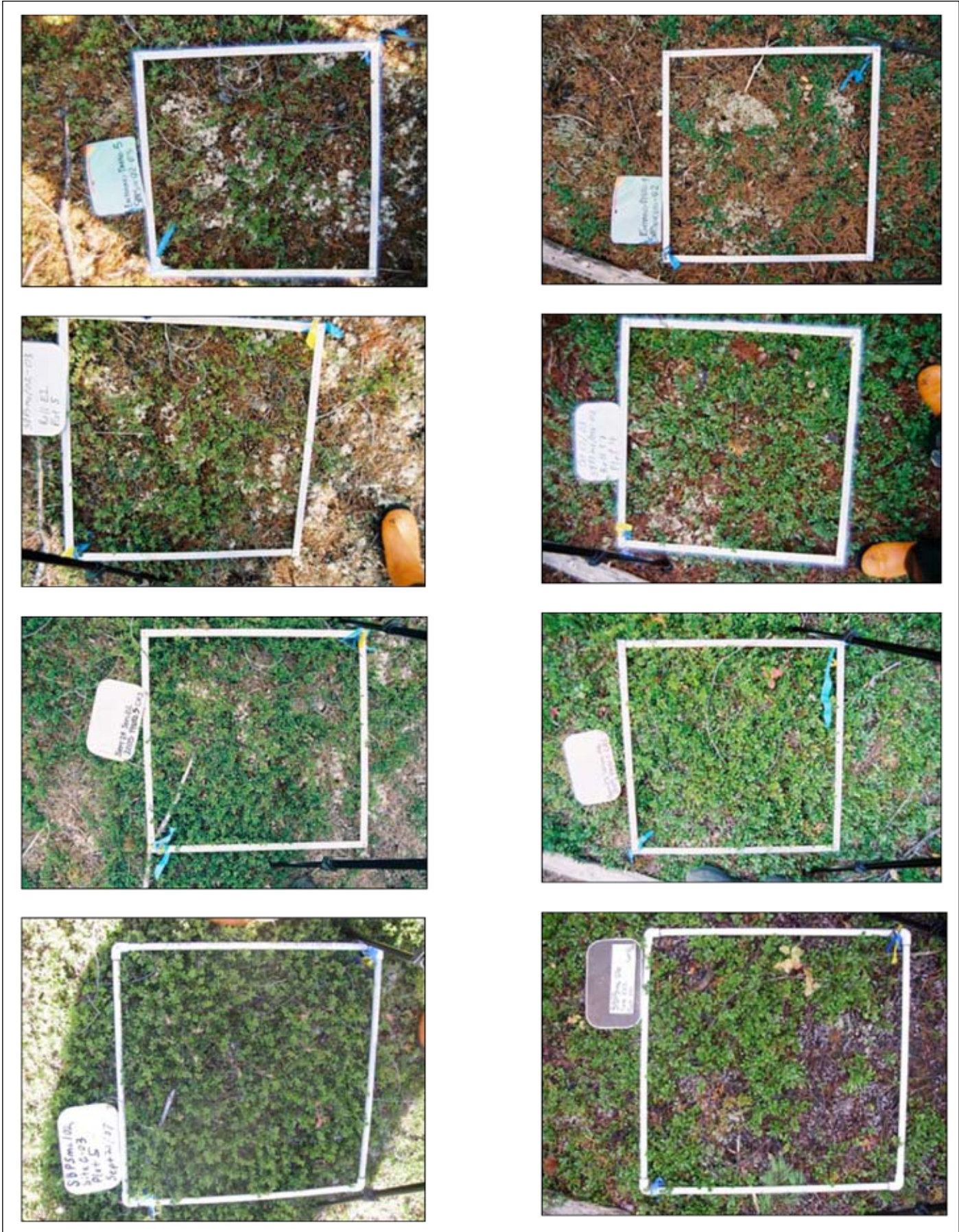


Figure 2. Examples of an increase in kinnikinnick from 2001 to 2007 (left) and an increase in kinnikinnick from 2001 to 2005 and then dieback from 2005 to 2007 (right) Photos are from 2001 to 2007 from top to bottom

Growth rates for kinnikinnick were an order of magnitude greater than growth rates of *Cladina* or moss, and moss grew about twice as rapidly as *Cladina*. *Cladina* growth rate was generally constant from 2002 to 2007 and was highest in canopy gaps, followed by underneath a tree canopy and lastly, in clearcuts. Moss growth rate increased both in clearcuts and under a canopy tree after an initial year of slow growth. Change in moss growth rate under a canopy tree was likely due to the shift in growing conditions under a dead canopy tree, which changed to approximate conditions found in a canopy gap, where moss growth rate was higher.

By following transplants over six growing seasons, we observed mosses expanding when transplanted into lichen colonies, while lichens diminished when transplanted into moss colonies.

Coarse woody debris transects showed that a limited amount of blowdown was occurring each year but that large-scale blowdown of mountain pine beetle attacked trees had not yet occurred. Currently, the amount of coarse woody debris is generally low on all sites and is not enough to impede animal movements.

References

Cichowski, D.B. 1993. Seasonal movements, habitat use and winter feeding ecology of woodland caribou in west-central British Columbia. *B.C. Ministry of Forests Land Management Report No. 79*, Victoria. 54p.

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A full text of this study is contained in the Ministry of Forests and Range library website:

Cichowski, D., P. Williston and S. Haeussler. 2008. *The Response of Caribou Terrestrial Forage Lichens to Mountain Pine Beetles and Forest Harvesting in the East Ootsa and Entiako Areas: Annual Report – 2007/08 – Year 7.* A report to the Morice & Lakes Innovative Forest Practices Agreement, Prince George, B.C., the Bulkley Valley Centre for Natural Resources Research and Management, Smithers, B.C., and Ministry of Environment, Prince George, B.C. 46p.

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For More
Information...



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