

The Mountain Pine Beetle: Scope of the Problem and Key Issues in Alberta

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Abstract

Alberta is facing the threat of another mountain pine beetle (*Dendroctonus ponderosae* Hopkins) outbreak. Current infestations in the Bow Valley have spread outside Banff National Park to adjacent provincial land. Almost all lodgepole pine (*Pinus contorta* Douglas var. *latifolia* Engelmann) forests in Alberta are found outside the normal mountain pine beetle distribution range; however, its range has been expanding in Alberta. Pine forests in Alberta are becoming older due to an effective wildfire suppression program. Approximately 60% of eastern slopes pine forests is over 80 years old and is very susceptible to the mountain pine beetle. The current mountain pine beetle infestation spans a variety of jurisdictions. The values and tools used to manage the beetle vary according to their individual land management mandates. Various resource and land management agencies in Alberta and British Columbia are working cooperatively to manage the mountain pine beetle in the Rocky Mountain region along the border between the provinces. Historical climate records in Alberta indicate a warming trend in the last century. If the current warming trend continues, this pest will expand its range in Alberta. Jack pine (*Pinus banksiana* Lamb.) is a potential beetle host in Alberta. In northern Alberta, lodgepole and jack pine overlap in distribution and hybridize. If the mountain pine beetle successfully colonizes hybrid lodgepole-jack pine and pure jack pine forests, Canada will face a major ecological, social and economical disaster.

Introduction

The mountain pine beetle (*Dendroctonus ponderosae* Hopkins) is the most destructive pest of mature lodgepole pine (*Pinus contorta* Douglas var. *latifolia* Engelmann) forests in Canada. British Columbia (BC) is currently experiencing the largest pest outbreak in Canadian history. Alberta has been fortunate to have experienced only two known outbreaks in recent history: 1940 to 1943 in Banff (Powell 1966) and 1977 to 1985 in the Waterton-Blairmore area (Alberta Forestry, Lands and Wildlife 1986). In both cases, human intervention played a major role in containing the outbreaks, with below normal fall and winter temperatures eventually being responsible for ending the outbreaks. However, Alberta is facing the threat of another mountain

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pine beetle outbreak. The current threat is much greater than that of the previous outbreaks, due to the overwhelming abundance of susceptible pine forests on the eastern slopes of the Rockies.

Alberta has to face three challenges in dealing with mountain pine beetle management: aging forests, multi-jurisdictional mandates, and the potential expansion of the beetle into jack pine (*Pinus banksiana* Lamb.) forests.

Mountain Pine Beetle in Alberta

The current mountain pine beetle infestation in Bow Valley started along Healy Creek in Banff National Park where an infestation was detected in 1997; however, at the time of detection there was evidence of trees killed by the beetle 2-3 years previously. Healy Creek is located approximately 20 km east of the outbreak in Kootenay National Park in British Columbia. At Healy Creek, the first infestation was observed at an approximate elevation of 1700 m in a marginal habitat for the mountain pine beetle; however, this population appeared to have been influenced largely by the Kootenay population and expanded downstream of the creek. Since then, the beetle infestations in Banff National Park have spread eastward through the park and to adjacent provincial land. The number of infested trees has increased exponentially over the last six years.

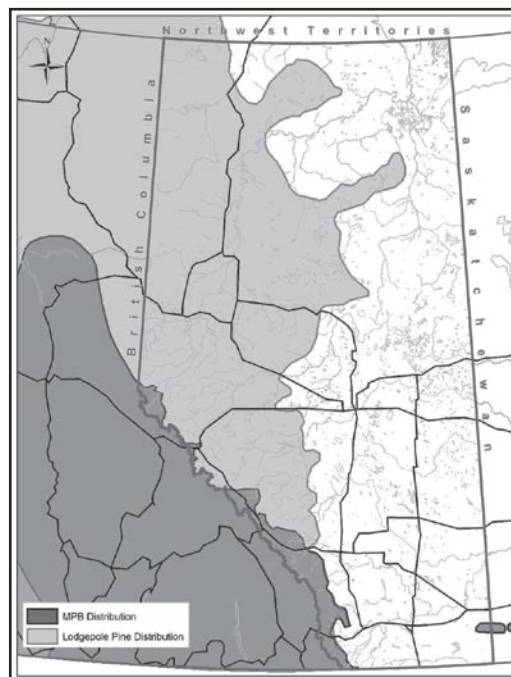


Figure 1. Distribution of lodgepole pine and the current mountain pine beetle distribution range in Alberta based on the historical surveys and pheromone bait monitoring records.

Alberta's present lodgepole pine forest ecosystem has evolved without the presence of the mountain pine beetle.

The mountain pine beetle is a temperate pine forest pest. The eastern edge of the beetle distribution lies along the southern Rockies near the Alberta-BC border where the effect of maritime climate ends. Thus, a large component of lodgepole pine forests in BC and almost all the lodgepole pine forests in Alberta are found outside the normal mountain pine beetle range of distribution (Fig. 1).

The mountain pine beetle range is expanding in Alberta. The mountain pine beetle occasionally invades pine forests in a narrow area along the eastern slopes of the Rockies in southern Alberta when consecutive mild winters and hot, dry summers occur. However, Alberta has recently been experiencing

more frequent mild winters. In 1979, the beetle was discovered for the first time in the Cypress Hills in southern Alberta (Chambers 1981). In 1997, the mountain pine beetle was recorded in the Wilmore Wilderness Park (north of Jasper National Park). In 2003, the mountain pine beetle was recorded for the first time at a pheromone-baited monitoring site in the Kakwa Wildland Provincial Park located still further north (54° latitude).

Pine forests in Alberta are generally getting older due to an effective wildfire suppression program. The mountain pine beetle attacks and kills healthy mature lodgepole, limber (*P. flexilis* James) and whitebark (*P. albicaulis* Engelman) pines in Alberta. The eastern slopes of the Rockies consist of over 3 million ha of naturally occurring, homogeneous lodgepole pine forests that contain approximately 387 million m³ of timber. For tens of thousands of years, forest fires, mainly due to lightning and burning by aboriginal people, have been the main disturbance of these forests. In fact, most of the eastern slopes pine forests have originated from massive forest fires in the 1880s and early 1900s. However, decades of wildfire suppression have resulted in extensive, 80 to 120+ year-old pine forests. Currently about 60% of eastern slopes pine forests is over 80 years old. Therefore, mountain pine beetle hazard in eastern slopes pine forests is extreme.

Jurisdictions and Land Management Mandates

A healthy forest is able to sustain itself ecologically while providing for society's economic, social, recreational and spiritual needs and values. While all jurisdictions share the same objective of managing for a healthy forest, the values and tools used to manage the beetle vary according to land management mandates. Public support for mountain pine beetle management programs also vary. Forest industry wants an aggressive approach. Environmental non-governmental organizations want natural processes to continue, including the restoration of fire to the ecosystem. However, smoke is an issue for tourism, transportation and local residents.

Mountain pine beetle infestations span a variety of jurisdictions with different land management mandates. The mountain pine beetle is considered to be a naturally occurring species in the mountain national parks. Therefore, the parks have no mandate for controlling the beetle. However, the mountain pine beetle is invasive on adjacent forests in the eastern slopes where the expansion of the beetle populations has serious economic, social and environmental consequences.

Various resource and land management agencies in Alberta and BC are working cooperatively to manage the mountain pine beetle in the Rocky Mountain region along the border between the provinces. The collaboration between Parks Canada and Alberta Provincial Agencies has achieved significant results in reducing the beetle infestations in the Bow Valley corridor. Banff National Park has: rescheduled the prescribed burning to remove large tracts of lodgepole pine stands susceptible to mountain pine beetle attack; implemented single-tree treatment of attacked trees in the area from the Banff town site to the eastern boundary; and harvested trees to create fire guards for prescribed burns.

In the past 12 months the park has burned 4,420 ha of susceptible pine forests (total area burned: 4,968 ha) containing some infested trees, and cut and burned or logged 2725 trees. The park also deployed 524 pheromone baits in Fairholm Range to contain the beetle population for the 2003-04 winter treatment. Banff National Park has implemented an exceptional program to manage the mountain pine beetle, despite limited available tools, and has destroyed approximately 68% of green-attack trees in the beetle treatment zone between the Banff town site and the east park gate along the Bow Valley (Personal Communication, J. Park, Banff National Park, Parks Canada, Banff). In the 2002-03 winter, Alberta Sustainable Resource Development detected and treated a total of 1,009 infested trees (98% treatment) in Alberta Provincial Parks, and the Town of Canmore and private developers treated an additional 303 infested trees. Overall, Banff National Park, Alberta Sustainable Resource Development, the Town of Canmore and private developers controlled approximately 74% of infested trees in the area east from the Town of Banff in the Bow Valley corridor.

A Ministerial Order was issued in 2002 and 2003 prohibiting the movement of pine logs and pine products with bark-on into Alberta from BC, western US and southern Saskatchewan between June 1 and September 30. The BC Ministry of Forests, Saskatchewan Environment and Resource Management, and the Forest Industry in Alberta and BC were notified. A truckload of infested logs is equivalent to a large patch of infestation containing sufficient beetles to potentially infest a few hundred trees. This awareness campaign appears to have been effective in reducing unauthorized log movement from 18 incidents in 2002 to zero incidents in the summer of 2003.

Future Risk of Mountain Pine Beetle in Alberta

Historical climate records in Alberta indicate a warming trend in the last century. It is reasonable to assume this trend will continue for the foreseeable future. The northern and northeastern limits of the beetle's distribution are approximately bounded by the isotherm for -40°C mean minimum winter temperature (Safranyik 1978). Therefore, the current warming trend will allow this pest to expand its range.

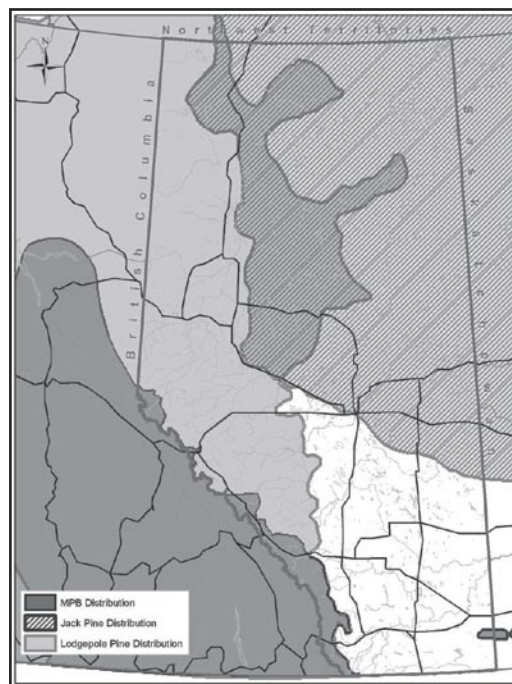


Figure 2. Lodgepole pine and jack pine hybrid zone with the current mountain pine beetle distribution range in Alberta.

Furthermore, jack pine is a potential beetle host in Alberta and Saskatchewan (Cerezke 1995). Lodgepole pine and jack pine overlap their distribution ranges in northern Alberta. This is the only place in North America where western and eastern pine species meet and hybridize (Fig. 2). The mountain pine beetle is an invasive species. If the mountain pine beetle successfully colonizes hybrid lodgepole-jack pine and pure jack pine forests, Canada will face a major ecological, social and economic disaster.

In the past the Alberta shelterbelt program introduced a large number of Scots pine (*Pinus sylvestris* L.) into the prairie farms. The mountain pine beetle successfully attacked some of these Scots pines during the last outbreak in the 1980s. The surviving Scots pines are now 20 years older and more susceptible. These patches of shelterbelt may serve as stepping-stones for the mountain pine beetle to susceptible jack pine forests.

Conclusions

Overall, the mountain pine beetle program in Alberta has been effective in maintaining the beetle population at a steady level. The program in Alberta has been implemented at a landscape level by collaboration among stakeholders including Alberta Departments of Sustainable Resource Development and Community Development, Parks Canada, Canadian Forest Service, Forest Industry and Municipalities and private developers. The successful mountain pine beetle management program in Alberta will also prevent the introduction of the beetle to Canada's boreal jack pine forests.

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