MOUNTAIN PINE BEETLE ECOLOGY PROGRAM

RESEARCH THEME NO. 1

MPB BIOLOGY AND MANAGEMENT

Importance of Research Theme

Understanding the various aspects of MPB biology, population growth and spread are necessary for managing beetle infestations effectively. Most of what we know about MPB biology stems from studies conducted in BC, but since 2007 out understanding of the beetle system has increased considerably. Although there are several well documented endemic populations of beetle in Alberta, the current infestation arises from in flights from BC in 2006 and 2009. Several anecdotal observations suggest that these new populations exhibit differences in behaviour, infestation dynamics, and survival and growth patterns than in their native BC range. Alberta's forests are different from those in BC in many respects, most importantly, stand structure, moreover, they do not share a co-evolutionary history as observed in BC. Besides, Alberta's climate differs from the interior of BC or the USA where outbreaks have been studied. Management tools employed in Alberta are mainly predicated on an understanding of beetle biology, as observed in its historic range. It is yet unclear how these tools can be adapted to improve their relevance, accuracy, and predictive power in Alberta's landscapes.

The efficacy of current management aimed at slowing the rate of spread of the Mountain Pine Beetle infestation needs to be continually evaluated to manage prescriptions to suit changing conditions. Early detection and aggressive action are crucial for the timely control of MPB populations. When populations are small, the chances of eradicating spot infestation are highest. Accurate detection methods are necessary for any management action.

Implications if information needs are not addressed

MPB biology, population dynamics, and spread potential can have significant implications for forest managers and the communities that depend on the forest industry. Harvest plans need to be adjusted to prevent beetles from spreading; new containment measures need to be taken to transport and store infested wood, adding to processing costs. Where, when, and how much harvesting is necessary for slowing the spread can be improved with more accurate spread models.

If the effect of current control actions cannot be measured, it is difficult to be accountable to taxpayers, to request more funding and to evaluate the merits of different strategies. When low-density populations are missed, it is more difficult to control them once they transition into large epidemics. The forest industry may lose its immediate to mid-term timber supply and communities could lose their main source of income and natural heritage. Drinking water supply may be jeopardized, and wildlife may lose critical habitat.

Economic, social and ecological benefits derived from addressing information needs

Government and industry will be able to make well-informed decisions about managing the infestation. Detection of low MPB populations would enable early management action before populations grow, reducing the overall cost of control. Knowing when, where, and how much to harvest will allow forest companies to remain economically viable and secure the future of the communities that depend on them. Understanding the growth and spread potential of MPB populations enables identifying risk to key forest values. Vulnerable watersheds can be prioritized for protection, so drinking water quality is sustained. The people of Alberta will be able to enjoy the beauty of the forest. Wildlife will persist if its habitat is maintained and created for the future. Spread through the Boreal forest to other provinces of Canada might be prevented. Other regions in Canada will be in a better position to manage MPB infestations as more knowledge becomes available.

Urgency of addressing information needs

Finding answers to priority questions is urgent as the window of opportunity for managing the infestations is narrowing with populations growing across Alberta. Since large-scale management is conducted every year, it is critical to be able to evaluate its effectiveness at slowing MPB spread.

Early, rapid and accurate detection of beetle infestations is essential if containment and control of the beetle are to occur. Accurate detection of low-level populations is most critical on the eastern and northern edge where MPBs are crossing the borders to SK and NWT. Knowledge of MPB survival and population growth in northern latitudes is increasingly critical.

PRIORITY RESEARCH QUESTIONS
OCTOBER 31, 2019

Research Theme 1: MPB Biology and Management	
1	What is the efficacy of current control measures applied to MPB in Alberta?
2	Can a spread model that incorporates key variables and is broadly applicable be developed and used to predict beetle range expansion against a backdrop of climate change?
3	What drives local and long distance beetle dispersal, promotes beetle establishment and affects population dynamics of MPB in novel host environments? Do indicators of stand susceptibility to beetle attack vary eastward and can they be exploited to curb expansion?
4	Can indicators of tree physiology be effectively incorporated into spread models?
5	Can critical thresholds in terms of population dynamics of beetles be defined and used to guide operational management of beetle infestations in novel habitats?
6	Detecting populations of MPB at low densities is a critical step in managing the beetle. Can baits and protocols for its placement within the leading edge zone be developed and successfully deployed?
7	What is the potential impact of secondary injurious insect populations following MPB attack? Should we be concerned about the loss of residual pine?
8	Demonstrate / evaluate the efficacy of genomic science to support management's response to mountain pine beetle (CF Research Theme No 3)

Updated: October 31, 2019