

# QuickNotes

Science summaries from fRI Research

## Introducing: Impacts of the Mountain Pine Beetle on the snow hydrology of the McLeod River watershed

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The ongoing Mountain Pine Beetle (MPB) outbreak has affected over 24,000 km<sup>2</sup> of boreal pine forests in Alberta and is considered one of the largest ecological disturbances ever recorded in the province. The evidence indicates that the MPB population is on the rise and is expanding its range eastward and northward of Alberta. There is mounting concern on how the MPB outbreak affects regional ecosystems and socioeconomic resources in Alberta, including the impact of MPB infestation on various watershed processes at a stand and watershed scale.

### Objectives

This project will investigate the magnitude and direction of MPB-induced changes in regional hydrology under inter-annual climate variability using a state-of-the-art hydrological model to evaluate changes that are critical to account for hydrological risks in managing and planning both the watershed infrastructure and water availability. We will:

- Identify the role of interannual climate variability in streamflow generation in the MPB-affected watersheds and evaluate the range of hydrological impacts due to the increased or decreased MPB attack.
- Provide specific thresholds of forest cover in MPB-affected watersheds that will cause changes in water quantity, and estimate hydrological recovery time under variable climate conditions and MPB attacks.
- Improve the scientific basis for managing MPB-affected ecosystems and enhance understanding of the water supply and quantity challenges for MPB-affected areas across western Alberta.

## Federal-Provincial MPB Research Partnership

Mountain Pine Beetle remains a severe threat to Alberta's pine forests despite the province making positive progress in controlling its spread within the province and reducing the risk to the rest of Canada.

Natural Resources Canada and Alberta Agriculture and Forestry have provided funding to a suite of projects with the goals of limiting the spread of Mountain Pine Beetle and mitigating damages where it has already invaded.



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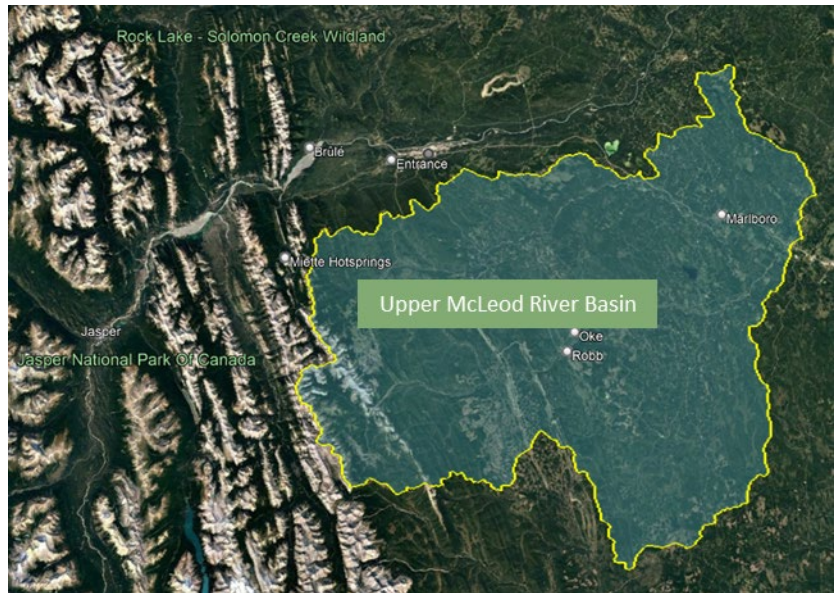


Alberta  
Agriculture and Forestry



## Methodology

The study area will focus on the upper McLeod River watershed in west-central Alberta. In recent years, this watershed has experienced a significant increase in MPB infestation. We will quantify the hydrological response in MPB-affected areas by implementing a hydrological model over selected sub-basins. The impact of MPB on forests will be estimated by varying the forest area in the model. Through a series of experiments, specific thresholds of forest cover will be estimated by analysing the changes in water quantity and timing at different outlets of the watershed. The model experiments will use idealized scenarios to evaluate the hydrological recovery time when forests start growing back. The effect of climate variability in the presence of MPB impact will also be evaluated using long-term simulations.



## Expected Outcomes

The outcomes of this research will identify areas that will experience the greatest impacts due to the MPB outbreak at the watershed level and will estimate potential cutoff thresholds for forest cover. The results from this case-study work will be transferable to other watersheds within Alberta. This will help resource managers to better understand the effects of MPB on the environment and will provide direction for the use of forests for industrial and recreational purposes and to manage and plan excessive water availability and changes in the timing of the flows (i.e., potential increased flooding risks). Furthermore, through this case study at the McLeod River watershed, the investigators will develop valuable skills and methodologies to estimate specific thresholds of forest cover and related changes in water availability in western Alberta. Such thresholds will ensure its operational applicability and will improve current water resources management practices and hydrological forecasting under the MPB attack.

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*MPB attack on mature pine near Maligne Lake, Jasper National Park, August 29, 2022. Photo: Siraj ul Islam.*