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Ministry of Forests and Range

## **Mountain Pine Beetle and Hydrology**

In British Columbia, salvage harvesting of all trees – including stands killed by the mountain pine beetle – must meet economic, social and environmental considerations.

When salvage harvesting beetle-attacked areas, forest resource professionals are required to consider how their activities will affect all forest values, including water. For example, forest resource professionals are required to manage their forestry operations for protection of fish, fish habitat, and water for human consumption.

Natural disturbances such as the beetle infestation that kill trees can increase the total amount of water flowing out of a watershed in a year as well as the lowest and highest annual stream flows. That's because healthy forests, harvested areas, regenerating forests, and damaged stands all influence water movement in different ways.

For example, healthy trees intercept rain and snow, some of which evaporates, and they provide shade that slows the rate of melting snow. While harvested areas accumulate and melt snow at different rates. This can have effects on peak flows, low flows and other hydrological characteristics.

After an extensive beetle attack in pine stands, water and nutrients ordinarily taken in by pine trees go unabsorbed and can raise the water table and increase the net flow of water into rivers and streams. This may damage river channels, destabilize slopes, and alter the soil conditions needed for reforestation.

The B.C. government is committed to actions that will mitigate the impacts of the mountain pine beetle infestation on the environment, communities and the provincial economy in the short term, and will ensure sustainability in the long term.

### **Watershed Planning**

When planning their harvesting activities, licensees are expected to consult with qualified professionals to consider hydrology research and watershed management tools such as best practices guidance, guidebooks, and expert opinion. This means assessing potential risks using available management tools, employing due diligence on the site, and developing strategies to produce field results that can be measured and verified.

For example, in 2005 B.C.'s chief forester provided guidance to forest companies on best practices for large-scale mountain pine beetle salvage operations. A key recommendation was to leave behind more trees and larger reserves in beetle-affected areas to lower changes in hydrology.

Watershed planning can also involve the use of different harvesting and retention strategies across the landscape to reduce runoff. Companies may plan harvesting that protects young trees and other vegetation growing under the dead pine trees and leave stands with high proportions of non-pine species, which helps to speed up reforestation of that stand.

Further, they may leave behind more fine or coarse woody debris to delay surface runoff where appropriate, change the layout or timing of the harvest, set aside reserves to protect sensitive areas, adopt specific forest practices in the watershed, or decide not to harvest if the risk to water quality is too high.

Other activities to ensure the protection of water resources can involve the upgrading of drainage networks on permanent roads before salvage harvesting takes place, and ensuring forest roads are built, inspected and maintained to withstand increases in peak flow. Culverts and bridges may also be examined to ensure they have adequate capacity and do not impede fish passage.

In addition, the Ministry of Forests and Range has prepared maps for the Provincial Emergency Program that identifies watersheds affected by the mountain pine beetle infestation, and plans to provide further information showing where road building and harvesting have been focused for the last three years.

### **Improving Knowledge**

The B.C. government is supporting research projects to improve understanding about how the beetle infestation can affect hydrological processes, and to fill knowledge gaps as quickly as possible. Research projects, both field and modeling, are addressing questions about the impacts of stand mortality, salvage logging, partial retention and regeneration effects on snow accumulation and melt, water table levels, and stream flow.

The Ministry of Forests and Range has research hydrologists located in the area affected by the mountain pine beetle who can provide local knowledge and expertise to government and industry about impacts of the infestation and harvesting on hydrology.

The ministry is also planning and implementing ecosystem restoration projects to address impacts to environmental values through its Forests for Tomorrow program and Future Forest Ecosystems initiative.

The Ministry of Forests and Range and Natural Resources Canada's Federal Mountain Pine Beetle Program are investigating the impact of the beetle attack on reforestation and aquatic ecosystems to assess best salvage harvesting and rehabilitation practices.

For more information about the mountain pine beetle and British Columbia's comprehensive action plan for mitigating impacts of the infestation, visit [www.gov.bc.ca/pinebeetle](http://www.gov.bc.ca/pinebeetle).