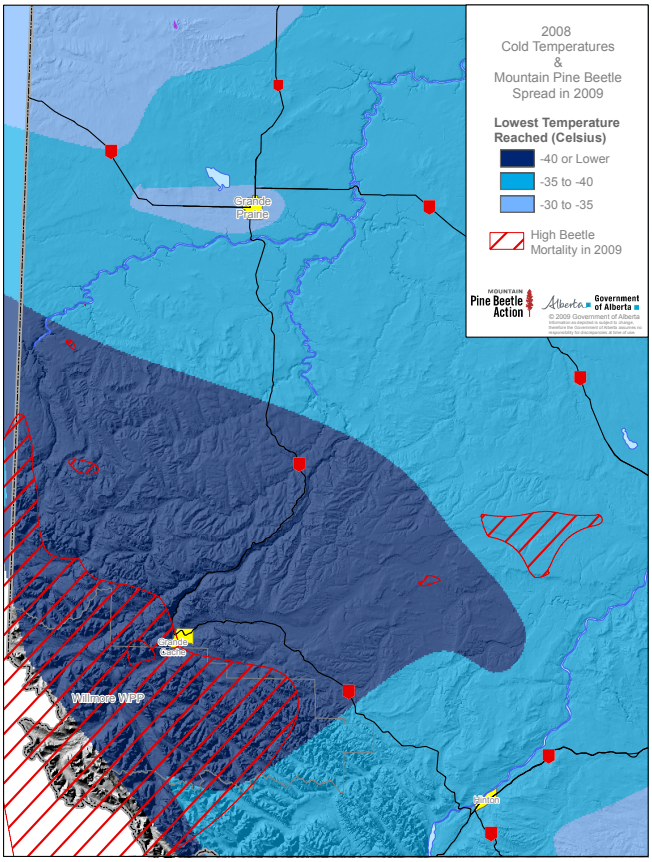
MOUNTAIN PINE BEETLE & COLD TEMPERATURES

THE FACTS

FOREST MANAGERS AND RESEARCHERS KNOW THAT COLD WINTER TEMPERATURES CAN REDUCE MOUNTAIN PINE BEETLE POPULATIONS.

Winter temperatures often fall below -40°C in many parts of Alberta's pine forest between mid-December and March. The success of mountain pine beetle overwintering survival is a complex function of daily temperature fluctuations, under-bark temperatures and the 'winter-readiness' of beetle larvae. When there is a large drop in temperature from an incoming cold air mass, mountain pine beetle larvae die in proportion to the severity of the temperature change. The temperature at which beetles start to die is not fixed, but varies given the larvae's response to daily temperature fluctuations. For example, an under-bark temperature of –37°C will kill 50 per cent of a mountain pine beetle population, even in mid-winter; however, a low temperature of –20°C in the fall, before the beetles are prepared for winter, or in the spring, when beetles are starting to become more active, will also kill beetles if it is preceded by temperatures above 0°C. The relatively warmer temperature causes the larvae to start to lose its natural antifreeze.

The problem for forest managers is measuring how cold it is under the bark where the larvae live. Under-bark temperature can be significantly different from ambient air temperature and is controlled by several factors, most notably the insulating effects of snow, bark thickness and the water content of the tree. Also, remote weather stations recording air temperatures are not always located within areas infested with mountain pine beetles. This makes predicting overwintering mortality difficult, particularly when a temperature inversion occurs. For example, in 2009 -40°C temperatures were recorded at weather stations in several valley bottoms of west-central Alberta but the temperature at higher elevations on the hillside, where the beetle-attacked trees were, was significantly warmer.



The map above, from January 2009, shows cold temperature ranges and subsequent mountain pine beetle overwintering mortality near Grande Prairie.

ITS SPREAD AND DAMAGING EFFECTS CAN BE MANAGED

Extremely cold temperatures occurred throughout the area (dark blue represents –40°C). The red-stripes outline the only area that experienced significant beetle mortality. All other areas on this map have beetle populations this year (2009) that are larger than in 2008. In fact, some beetle populations are 15 times larger this year compared to last year. As illustrated, the cold weather in January 2009 did not significantly reduce the beetle population in many areas even though the temperatures were extremely cold.

Mountain pine beetle over-winter mortality cannot be accurately determined until on-the-ground surveys completed in spring. Without factual survey information, forest managers are only able to speculate on the effect cold weather may have on Alberta's beetle populations.

In addition to the survival and spread of local beetles, Alberta continues to receive beetle in-flights from areas where winter temperatures are typically not cold enough to reduce populations. These in-flights are predicted to continue over the next several years, until 80 per cent of the pine trees are killed in British Columbia and the beetle populations begin to decline.

Beetle populations are expanding in parts of Alberta despite extremely cold temperatures in the recent past. Without sustained cold temperatures across the full range of infested pine forests in Alberta and British Columbia, cold weather will not significantly reduce mountain pine beetle infestations. Forest managers understand the mountain pine beetle cannot be eradicated from Alberta's pine forests, but its spread and damaging effects can be managed through the continued implementation of the Provincial Mountain Pine Beetle Action Plan.