Potential Impacts of Climate Change on the Park

Glaciers, Snowpack and the Hydrological Cycle

Retreating glaciers are one of the most immediately evident impacts of warmer temperatures in the Northern Hemisphere, and studies demonstrate that many glaciers in B.C. are shrinking. Ongoing warming will very likely result in continued and possibly more rapid retreat of glaciers. The total area of snowpack will likely shrink, as warmer temperatures in winter and spring mean a greater proportion of total precipitation will fall as rain rather than snow, especially at low and mid elevations. In addition earlier spring thaws will likely reduce snowpack duration. Ice and permanent snowfields currently represent 7% (16,000 ha) of the Mount Robson Provincial Park landscape.

Changes in climate, glaciers, and snowpack will likely affect many streams and rivers within the Park. More rain and less snow in winter means that precipitation runs directly into streams and rivers, increasing winter flows and the potential for flooding. Warmer spring temperatures mean that snow and ice melt earlier in the year and that peak flows therefore occur earlier. In contrast, there is typically less water available from late spring to early fall. In summer, decreased precipitation in combination with reduced stream flows may contribute to drought, reduced groundwater supply, and reduced water quality. In the short term, glacier melting may temporarily augment summer flows; over the long term glacier disappearance may reduce flows.

Such changes may affect Park users. Increased annual precipitation may increase the frequency of debris flows, and avalanches and erosion on alluvial floodplains, thereby increasing risks for backcountry users of the Park. Some lower elevation recreational areas may become less accessible in winter as a result of reductions in the size and duration of snowpack.

Shifts in the Extent and Distribution of Forest and Alpine Ecosystems

Numerous studies have concluded that changes in climate affect vegetation both directly and indirectly (for example by changing soil moisture and other factors important to plants). Climate change is therefore expected to affect ecosystems within Mount Robson Provincial Park, which is expected to experience a long-term increase in mean annual temperature in the range of anywhere from +2°C to +8°C, and an increase in mean annual precipitation in the range of +2% to +17%. Such “warmer-wetter” climate trends are generally expected to result in an upslope expansion of forested ecosystems. The long-term result (shown conceptually in the figure at left), is that we should expect to see a general expansion of all forested ecosystem subzones to higher elevations. The Interior Cedar-Hemlock (ICH), Sub-Boreal Spruce (SBS), and Engelmann Spruce–Subalpine Fir (ESSF) subzones will all likely expand their elevation range. As a result, there is likely to be a long-term decline in the area of the higher elevation Interior Mountain Alpine (IMA) subzone.

As ecosystems shift, so too will individual tree species. In particular, recent modelling results forecast that we can expect western redcedar and lodgepole pine to expand their range in this region of BC.

Since habitats for wildlife populations are completely dependent on the distribution and composition of ecosystems, any changes in the distribution of ecosystems can be expected to have a direct impact on wildlife. The Park is home to a variety of ungulate species including woodland caribou, moose, mountain goats, Rocky Mountain elk, mule deer and white-tailed deer, as well as large carnivores such as wolf, black and grizzly bears. The habitat requirements for these and other species will have to be considered in response to the potential for ecosystem and habitat shifts.

Natural Disturbance Patterns: Mountain Pine Beetle and Wildfire

The inter-relationship between mountain pine beetle (MPB) and wildfires has played an integral role in the development and maintenance of coniferous lodgepole pine forests throughout British Columbia. At endemic levels, the mountain pine beetle preferentially attacks and kills older, weaker trees often leading to important effects such as the provision of wildlife habitat. However during epidemic MPB outbreaks such as the current infestation in the province, the insect can cause significant tree mortality spread over vast areas, which in turn can provide the fuel accumulations required for large-scale fires that regenerate entire landscapes. Changes in climate will undoubtedly affect such natural disturbance patterns in Mount Robson Provincial Park.

In addition, historic fire suppression is linked in some forests to fuel buildup and a greater fire risk. Longer, drier, and warmer summers associated with climate change will likely contribute to more frequent and more intense fires, as well as a longer fire season. In the Park, this may decrease visitor safety, increase risks to infrastructure, impair access to some recreational areas, and add management or emergency costs.

Fire management plays a central role in directing and controlling the long-term processes that underlie the Park’s ecosystem management challenges. Within prescribed areas, burning has been identified as the primary management tool to address the legacy of past management practices and the current and expanding MPB issues. It also supports the management of long-term climate change risks as described above.

In addition to regulating forest disease and insects (such as the MPB), fires create younger habitats (required by some species of fauna for forage) and releases nutrients into the soil. Managing forests to mimic the natural disturbance pattern of fire is now widely accepted, particularly within parks and other protected areas. However, the key challenge remains in balancing the beneficial aspects of wildfires with impacts that include smoke and an impact on viewscapes.