British Columbia Forests and Climate Change – What Can We Do?

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Abstract

Global climate change has already had significant impact on BC forest ecosystems, and is projected to have increasingly severe impacts, unless greenhouse gas emissions are rapidly reduced. The changes projected for BC forests, and the uncertainty these changes bring to forest managers and the rural communities associated with those forests, demand a new approach to forest management. The new approach needs to directly inform harvesting and retention levels, by shifting to a climate change adaptation framework that includes monitoring, risk assessment and adaptive management at both strategic and operational levels.

Recent reports by the Intergovernmental Panel on Climate Change (IPCC) have confirmed that global climate change is underway and likely to accelerate over the coming decades unless humans make drastic cuts to global greenhouse gas (GHG) emissions. Analysis of climate data collected over the last century has confirmed that parallel climatic changes are also occurring in British Columbia (BC). Global circulation models (GCMs) are projecting further changes for BC, including increases in annual temperatures and greater frequency and magnitude of extreme weather events.

Vulnerability Will Vary by Region

The exposure to climate change is predicted to be greatest in the Northern Interior of the province. In that region, large temperature increases are expected to be accompanied by localized and seasonal increases in precipitation. Increases in summer temperatures may result in increased frequency and size of fires, especially where fuel loadings have been affected by insect outbreaks. Lakes, rivers and soils will freeze later in the autumn and thaw earlier in the spring, affecting aquatic habitats and winter access. Permafrost melting will affect soil processes, thereby increasing localized instability and potentially reducing water quality.

The increase in winter minimum temperatures has already contributed to an outbreak of mountain pine beetle in the Central Interior. In the northwestern portion of the Central Interior, increased summer temperatures and precipitation have likely contributed to an outbreak of *Dothistroma* needle blight in young lodgepole pine. Decreased snowpacks and increased

evaporative demand may impact water levels, salinity and algal growth in wetlands, lakes and ponds.

In the Southern Interior increased summer temperatures and reduced summer precipitation are expected to increase fire frequency and severity, leading to the expansion of open forest and grassland communities in many valley bottoms. Some systems (e.g. the Interior Cedar Hemlock Zone) have a high diversity of tree species that may increase ecosystem resiliency, but other systems, such as subalpine forests, are expected to see major changes in species composition. Reduced snowpacks due to warmer winters, and the eventual loss of alpine glaciers will impact temperatures and low flows in many streams.

Some climate modeling suggests that the future climates of Coastal BC may be different than any presently existing in western North America. The drier parts of the southern coast may experience increased fire frequency and pest outbreaks. Wetter parts of the coastal region are already experiencing dieback in yellow cedar, (likely caused by changes in freeze-thaw cycles). An increased incidence of large storms in Coastal BC could increase windthrow disturbance, the occurrence of landslides, and potentially the frequency and magnitude of flooding events. Anadramous fish species, and ecosystem processes linked to them will be impacted.

In many parts of BC, the presence of invasive species, large reservoirs, agriculture and human settlements in valley bottoms will limit the ability of native species to shift their distributions in response to changing habitat conditions. Alpine ecosystems are projected to decrease in size, and eventually disappear in many areas.

Embracing Uncertainty

Traditionally forest management has striven to establish certainty in forest management – initially through applying the principles of sustained yield and the "normalized forest". These have been slowly replaced by concepts of sustainable forest management, natural variability and maintenance of ecological integrity. With the advent of rapid climate change, and a growing understanding of the potential consequences for forest and range ecosystems and their linked socio-economic systems, there is need for further evolution in the paradigm of forest management.

The first step in formulating policies and designing actions to respond to climate change is to understand the scope of the problem in terms of the ecological systems and related social systems. Vulnerability assessments are needed to examine the potential exposure of systems to climatic changes, the systems' sensitivity to those changes, and the systems' adaptive capacity to cope with the changes. The Kamloops Future Forest Strategy and the West Kootenay Vulnerability Assessment are early examples of such processes[1]. A key finding in Kamloops was that development of an ongoing multi-scale process for monitoring and planning adaptive management could contribute to reducing local vulnerabilities. Without such a process, cumulative impacts will compound, further reducing future options.

[1] http://www.for.gov.bc.ca/hcp/ffs/kamloopsFFS.htm#Final_Report and www.kootenayresilience.org

Due to the ongoing uncertainty around both the magnitude and rate of climate change, and the potential ecosystem responses to that change, forest management decision-making is rapidly becoming more complex. It is recommended that climate change adaptation be incorporated into all levels of decision-making through the application of a risk management framework. It is also important to recognize that adaptation strategies can only be successful within a limited window of future climate change – therefore it is also crucial to be communicating the potential impacts of climate change and the benefits and limitations of adaptation to those assessing the costs and benefits of mitigation strategies to reduce GHG emissions.

Lastly there is a need for adaptation action. This will require significant effort to provide knowledge and decision-support tools to policy-makers and managers, to identify and eliminate barriers to implementation (institutional, financial and psychological), to develop a flexible and responsive adaptive management framework to govern implementation, and continuous monitoring to ensure that actions are responding to the most up-to-date information available. In this way, sustainable forest management becomes more a journey than a destination, which is probably more appropriate, given both past experience and projected changes in BC forests.

A more extensive document on this subject, including relevant references can be downloaded from: http://www.for.gov.bc.ca/ftp/hts/external/!publish/Web/FFEI/CC-EI_report_3-5-09_draft.doc