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Book of abstracts for the conference in Stjørdal, Norway, September 6-8, 2011

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ADAPTING FORESTRY TO CLIMATE CHANGE IN BRITISH COLUMBIA'S CENTRAL INTERIOR

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The Bulkley Valley and Lakes districts of British Columbia's central interior have a sub-boreal climate and a glaciated, rolling landscape similar to southern Fennoscandia. The forests have a mix of boreal (white spruce, black spruce, trembling aspen, paper birch, balsam poplar) and Rocky Mountain (lodgepole pine, subalpine fir, Engelmann spruce, Douglas-fir, whitebark pine, black cottonwood) tree species with temperate rainforest species (western and mountain hemlock, western red-cedar, amabilis fir) at the western margins. Silviculture in the region has focused on clearcutting and planting of lodgepole pine and white x Engelmann spruce, with some management of subalpine fir at the highest elevations and Douglas-fir on the warmest, dry sites. The climate and economy are, however, changing rapidly and a series of region-wide shocks (mountain pine beetle epidemic, increases in fires and floods, US housing market collapse) have exposed vulnerabilities in the forest-based economy, motivating local communities to address uncertainties associated with climate change.

The Bulkley Valley Research Centre, a not-for-profit sustainability institute, has undertaken a program of applied research to assist local communities in adapting to climate change, funded mainly through British Columbia's Forest Science and Future Forests initiatives. These projects have included assessing historic climatic variability; producing downscaled climate projections [1,2,]; monitoring the impacts and responses of forest ecosystems and wildlife to large scale disturbances; adapting forest simulation models such as TACA [3]; SORTIE-ND [4] and SELES [5] to project tree regeneration, forest growth and landscape configuration under a range of climate change scenarios; and engaging forest stakeholders in a multi-scale vulnerability and livelihood assessment.

Since 1895, mean annual temperature in British Columbia's central interior has risen over 2°C, while total precipitation has increased 30-40 %. Minimum temperatures have climbed sharply while maximum temperatures are mostly unchanged, resulting in a more temperate climate that is becoming favorable to a variety of non-boreal organisms including pests and pathogens. The region is also strongly influenced by ocean-atmosphere patterns such as El Nino/La Nina Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) and many environmental shifts reported anecdotally and in scientific studies can be linked to these cyclic phenomena.

Monitoring of forest vegetation change and indicators such as woodland caribou and reindeer lichens over a 7-30 yr. period has provided some support for the hypothesis that boreal forest species are declining while temperate species are increasing across the region. Longer-term climatically driven trends are, however, greatly confounded by short- and medium-term responses to ENSO/PDO fluctuations and forest disturbances including wildfire, bark beetles, logging, and tree diseases. Our tentative conclusion from this empirical research is that local-scale variability in how ecosystems respond to climate and disturbance will prove to be an important source of resilience for boreal species in a warmer climate. Active management could allow boreal organisms to persist outside of their historical climate envelope. Whether our society will pursue such management is another matter.

Climate change projections for the region using various IPCC emissions scenarios project a mean annual temperature increase of +1.3 to 2.7^{o}C by 2055, relative to 1961-1990 normals. Total precipitation is projected to increase between 2 and 16 % with most of the increase occurring in winter. The PDO and ENSO are not captured in GCM and could dramatically influence how the transition to a substantially warmer world unfolds. Adaptation strategies will need to be sufficiently flexible to accommodate anything from a semi-arid savanna climate to a mesic temperate forest climate, as well as more extreme weather. The first round of modeling suggests that silvicultural investments that target north aspects, moist topographic positions and higher elevations have the lowest risk of regeneration failure. The next round of modeling (in progress) will address interactions among tree performance, disturbances and forest practices.

Although the challenges and uncertainties caused by climate change may be broadly similar in boreal and northern temperate regions of the world, cultural, institutional and economic differences are likely to influence how governments and local communities respond to these challenges. We hope that the opportunity to share experiences with foresters from other nations will improve our ability to help local communities in British Columbia's central interior adapt wisely.

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