2010 Winter SISCO Workshop – Climate Change Panel Discussion

Searching for sustainability in forest management: Is good silviculture the key?[1]

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I am pleased to summarize the first session from the 2010 Winter Southern Interior Silviculture Committee (SISCO) Workshop. As most are aware, the financial situation that a lot of us find ourselves in has affected our ability to attend many face-to-face events; however, although numbers were down, SISCO was able to deliver an informative one-and-a-half-day session that focussed on climate change, sustainable forest management, and issues and concerns of small firms and operators.

This article provides an update on the workshop's opening plenary session, titled "Climate Change—The Underlying Reality that Shapes Forest Planning and Management," and the latest science that can help inform decisions.

On the morning of April 13, 2010, at the Naramata Centre, over 70 participants had the opportunity to hear about and discuss the technical implications of the latest climate research on present and future silvicultural practices. The session on climate change showcased the work being undertaken by scientists from various agencies addressing forestry-related issues such as climate modelling, tree species vulnerability, seed transfer guidelines, and climate adaptation strategies.

The session was opened by **Dave Spittlehouse** (Research Climatologist, B.C. Ministry of Forests, Lands and Natural Resource Operations), who provided his thoughts on the modelling tools available to help practitioners think about and discuss what the future may hold. Part of the challenge when using existing models to help plan the future is that, as in most modelling exercises, your results will be inaccurate. This is because of the many sources of uncertainty within the modelling process including

- scale at which the original climate change data is collected (and is being collected);
- scenarios in which the data is to be applied;
- time period you would like to look at (the longer the time frame, the more uncertain the outcome);
- downscaling the data to look at a specific area; and
- biological and physical responses that may be taking place on the land base due to local geographic or geological features, which are not being captured.

Spittlehouse did point to several groups with available tools that can help practitioners "game" with potential future outcomes. These groups include the **Pacific Climate Impacts Consortium** (*http://pacificclimate.org*), which has plans to adapt its website to provide climate change planning tools, and the **University of Washington Climate Impacts Group**, which has some useful forecasting and planning tools on its website (*http://cses.washington.edu/cig/fpt/fpt.shtml*).

The next series of climate change discussions focussed on existing adaptation strategies that practitioners can potentially use today to help manage their future forests. **Mark Johnston** (Senior Research Scientist, Saskatchewan Research Council) presented his latest science on the vulnerability of tree species to climate change (published through the Canadian Council of Forest Ministers' Climate Change Task Force). According to Johnston, there is an expectation that climate in Canadian forests will shift northwards at a rate likely exceeding the ability of individual trees species to migrate.

[1] This *LINK News* article was unavoidably delayed. More recent climate change information from the 2011 SISCO Winter Workshop related to silvicultural activities is forthcoming in the next issue of the *BC Journal of Ecosystems and Management*.

What does this mean? Climate change will create changes in microclimates, local site conditions, disturbance, phenology, and the distribution, abundance, and ecosystem interactions of invasive species, all of which could lead to increased tree mortality and changes in competitive interrelationships (Johnston 2009). Tree species will attempt to adapt, but the rate of change may exceed the species' ability to naturally adjust to the local environment and so they may become increasingly maladapted.

Part of the challenge for forest managers is that approximately 20% of the forested landscape is in managed forests, which limits the options to help address climate change. Although these limitations may exist, it is still important that silviculturalists try to consider adaptation strategies that include using a species vulnerability index, climate-based seed transfer zones (to support assisted migration of values species), and species distribution climate envelope modelling. Johnson left participants with the following additional adaptation options.

- Consider mixed-species stands.
- Consider thinning drought-prone sites where economically viable (but be cautious of the potential for grass species to dominate these sites and compete for limited moisture).
- Use fire-smart planning.
- Concentrate management efforts on sites that are more likely to remain productive in the long term.

More information on this discussion can be found in *Vulnerability of Canada's Tree Species to Climate Change and Management Options for Adaptation* (***http://www.ccfm.org/pdf/TreeSpecies_web_e.pdf***).

Following Mark Johnson's discussion, SISCO participants were updated on provincial research in support of the climate change adaptation framework—a collaboration between the Centre for Forest Conservation Genetics and the Research Branch of the B.C. Ministry of Forests, Lands and Natural Resource Operations. One component of this framework is the development of future climate projections for provincial ecosystem and tree species ranges. Some of this projection work is currently led by **Tongli Wang** (Associate Director, Univeristy of British Columbia Centre for Forest Conservation Genetics), who presented the modelling work under way to revise the 2004 "flying BECs" maps (future British Columbia ecosystems; ***http://genetics.forestry.ubc.ca/cfcg***). These revised maps should be available in the near future, once the final publication has been approved for distribution in the *Journal of Ecological Applications*.

A second component of the climate change adaptation framework is the development of a climate-based seed transfer system. **Greg O'Neill** (Research Scientist, B.C. Ministry of Forests, Lands and Natural Resource Operations) is leading the research taking place in this area. According to O'Neill, his work focusses on the provision of a tool that balances species adaptation with seed deployment, with the objective of minimizing the seed transfer distance. His research team will examine two types of seed sources in the near future—one for deployment and one for procurement—to help with assisted migration of our native tree species.

This general discussion on a climate-based seed transfer system was further refined to look at how it could apply to an individual species such as western larch. Current results from experiments and operational plantings of western larch outside its natural range suggest that this species' fundamental niche may far exceed its restricted contemporary distribution.

This type of research supports a third component of the adaptation framework—population response functions to climate change. Work undertaken by **Barry Jaquish** (Research Scientist, B.C. Ministry of Forests, Lands and Natural Resource Operations) suggests that climate change will have a pronounced impact on the western larch species and its population. His group's analysis and modelling work pinpoints high-probability areas where the future climate would be suitable for western larch. Their projections have also helped locate seed sources that should be best genetically attuned to future climates, and work is proposed to further test the planting of this species outside its current zone to help increase future ecosystem resilience.

A quartet of presenters highlighted the challenges of adapting our management strategies to address population response functions to climate change. **Alan Vyse** (Adjunct Professor, Thompson Rivers University), **Dr. Suzanne Simard** (Forest Management Professor, University of British Columbia), and **Nathan Davis** and **Jeff McWilliams** (**B.A. Blackwell and Associates**) presented some recent survey information on how lodgepole pine stands, which have been declared free growing according to current forest legislation, are doing in the Southern Interior of British Columbia.

Lodgepole pine has been the species of choice in plantations throughout the Southern Interior over the past 40 years for various reasons. The recent mountain

pine beetle infestation was perhaps a good reminder that although lodgepole pine survives well and grows rapidly across a wide range of sites, it also comes with a host of insects and diseases, which affect this species throughout its life span and can take a heavy toll on it—even without the added stress of future climate change.

Dr. Simard provided data from several recent surveys looking at well-spaced and free-growing stands in all Interior biogeoclimatic zones. Results from this Forest Science Program-funded research reveal that pest damage in lodgepole pine plantations, particularly from pine stem rusts, is widespread and of greatest concern in the Sub-Boreal Pine Spruce and Interior Cedar–Hemlock zones. This research also found that most forest health damage to pine increased with latitude.

B.A. Blackwell and Associates, as **Forests For Tomorrow** funding recipients, have also surveyed more than 40 000 ha of age class 2 pine-leading, beetle-affected stands, and also identified the widespread incidence of potential serious non-beetle forest health agents and poor-quality attributes.

So what does this mean? If we think about the climate change adaption framework and the fact that our adaptation strategies will need to address population response functions to climate—including those of forest health agents—we will likely need to rethink how we apply our silviculture toolkit. For example, perhaps densities could be increased in areas where higher mortality is expected due to forest health concerns; perhaps our decisions on what we do on moisture-limited sites need to consider the effect of other species, such as grasses, as well as our stand densities. Obviously further discussions and debate are necessary as we plan for a future in which change is inevitable.

Readers interested in viewing the presentations discussed in this article can download them from the SISCO website (***http://www.siscobc.com***).

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