Northern Silviculture Committee Summer Field Tour 2011: Silviculture in uncertain times – (*and the trees kept growing*)

Alan Wiensczyk

"Management of stem rusts in lodgepole pine plantations is one of the major challenges faced by forest managers in the Mackenzie Forest District," said **Richard Reich** of the Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO) to the 60 participants attending the Northern Silviculture Committee's 2011 Summer Field Tour which was held June 15 to 16, 2011 in the Mackenzie Forest District. **Reich** has been working with licensees and district staff on the development of a rust management strategy which includes district level hazard maps for each of the 3 types of rusts (comandra blister rust, stalactiform blister rust, and western gall rust) found in the district (Figure 1).

One of the key elements in the development of these maps using RESULTS data, is proper identification of the pathogen during free growing assessment surveys. On the tour, participants were given instruction on stem rust identification by **Reich** and **Bill Laing** of BC Timber Sales (BCTS) and were then given the opportunity to put that new knowledge to the test by conducting a timed plot survey in a lodgepole pine plantation to look for infections of comandra, stalactiform blister rusts, and western gall rust on live and dead pine. Each group's results were compared to data collected by **Reich** and **Laing**, with the closest group winning a prize. Fortunately for tour participants all three species of rust were in their sporulation phase which greatly aided in identification.

Results were close; the key difference was participant differentiation between comandra and stalactiform blister rusts. These rusts are very similar in appearance. Comandra blister rust cankers tend to be short and squat on stems and blunt-ended with a cigar shaped appearance on branches. Comandra spores are orange in colour, whereas stalactiform spores are a lighter orange, and the blisters are taller and narrower. Stalactiform cankers are long, narrow, and pointed on both stems and branches. The canker's appearance is similar to a stalactite, which according to **Reich** is an easy way to remember the difference. Noting the presence/absence of the species' alternate host (comandra blister rust – bastard toad flax; stalactiform blister rust – common paintbrush and other figworts including yellow rattlebox; western gall rust – no alternate host) aids in risk assessment given that blister rust spread from alternate hosts only occurs over short distances. It turns out that a considerable component of site risk is determined by the presence and amount of alternate hosts on site, noted **Reich**. Topographically, high risk areas for infection include lower elevation toe slopes, depressions, and level meso slope positions which generally have higher relative humidity, a key requirement for disease spread.

For further information on pine stem rusts see:

- Swift, K., J. Turner, and L. Rankin. 2002. Cariboo Forest Region: Part 1 of 3. Forest Health Stand Establishment Decision Aids. BC Journal of Ecosystems and Management 2(1):13–18.
- Stock, A., M. Duthie-Holt, S. Walsh, J. Turner, and K. Swift. 2006. Southern Interior Forest Region: Forest Health Stand Establishment Decision Aids. BC Journal of Ecosystems and Management 6(1):55–73.
- BC Ministry of Forests. Unknown. Hard pine stem rusts: A primer. Available at: *http://www.for.gov.bc.ca/hfp/health/rusts/silvicon/primer.html* (Accessed July 19, 2011).

Current management solutions for dealing with areas of high pine stem rust hazard are to plant alternate species where suitable and (or) to manage to higher stand densities through planting or natural regeneration. According to **Reich** some work is being done on screening for comandra blister rust resistant lodgepole pine, but success has been limited so far. Western gall rust resistant families are much more common which has allowed the recent creation of a gall resistant seed orchard.

In the Mackenzie Forest District, drag scarification for natural regeneration is one of the tools being used to address pine management in high rust hazard areas and this was highlighted in the next stop on the tour. **Erik Olson** and **Carmen Augustine** of Canadian Forest Products (Canfor) and **Bernie Hulstein** and **Miodrag Tkalec** of BCTS described their drag scarification programs as an active operation. In addition to facilitating higher initial stand densities to address rust issues, drag scarification also results in a significant cost savings if successful regeneration is achieved (35% of the cost of planting). Currently the cost of drag scarification ranges between $150-$180/ha (2011 rates), and according to **Olson** only 30% of the treated ground needs to be successfully regenerated to "break even." In the Mackenzie district, successful regeneration following drag scarification has been achieved on 01, 02, and 03 site series within the Sub-Boreal Spruce (SBS) mk1 and mk2 subzones, with the most success on the 03 sites. It has also been moderately successful on 02 and 03 sites within the Engelmann spruce–Subalpine fir (ESSF) mv3 subzone.

Sites should be relatively flat to avoid erosion issues and should have minimal amounts of aspen cover. In order to ensure an adequate supply and even distribution of cones, the harvest system used should be cut to length at the stump, and sites should be scarified as soon after harvest as possible as cones will open and release their seed very quickly. **Olson** informed participants that most regeneration will occur during the first three years after treatment and that Canfor usually waits five years before assessing to determine if fill planting is required (less on sites with limited access). He also stated that he would prescribe drag scarification for naturals even if stem rusts were not an issue, as the higher initial densities of lodgepole pine can result in better stem form; the practice helps conserve seed supply and it is economical. He also noted that to date they have not had any issues with overstocking.

Hulstein added that BCTS's role of advertising, awarding, and administering Timber Sale Licenses (TSL) adds a special challenge to responding to high risk rust areas with the use of drag scarification. Dictating the method and (or) timing of harvest on a TSL may potentially limit the number of bidders and (or) the bid price on advertised TSLs. Generally, BCTS limits imposing these restrictions to blocks within TSLs that are considered at a high risk for pine stem rusts. For BCTS, drag scarification is the preferred option on sites where:

1. the risk of Pli stem rusts is high;
2. the planting of alternative species (e.g., Sx, Fdi, or Bl) is limited to <40%;
3. processing has occurred at the stump (rather than roadside); and
4. mineral soil exposure (MSE) can be improved considerably by scarification (BCTS may forego drag scarification and move directly to raw planting at a normal density in cases where summer logging has already created sufficient MSE to allow natural regeneration).

Both **Olson** and **Hulstein** noted that one of the main challenges associated with using this treatment is the unpredictability of the outcome. In addition, a new challenge facing proponents of this technique is the impact of the mountain pine beetle infestation. When operating

FIGURE 1. Stem rusts of lodgepole pine during sporulation.

1a. Comandra blister rust

1b. Stalactiform blister rust

1c. Western gall rust

(photos by Alan Wiensczyk)

in pine stands killed by the mountain pine beetle, time since death has a large impact on seed viability and thus treatment success.

Olson also described (and participants were able to view) the drag configuration that Canfor uses in its operations. Canfor has its own specially designed drags, which have lengths of chain between the tow bar and the first drag, and swivels so that the chains can rotate to allow for even chain wear, and are weighted at the back end so that the chains do not flop around (Figure 2). This aggressive configuration has been developed over a number of years through trial and error and has been found to be quite effective across a range of slash load levels.

For more information on drag scarification considerations refer to:

Bancroft, B. 1996. Fundamentals of natural lodgepole pine regeneration and drag scarification. B.C. Ministry of Forests, Silvicultural Practices Branch Report. Available at: ***http://www.for.gov.bc.ca/hfp/publications/00096/NatPlregen.pdf*** (Accessed July 20, 2011)

In addition, FORREX is currently in the process of producing a Stand Establishment Decision Aid (SEDA) for the natural regeneration of lodgepole pine in British Columbia that will include information on drag scarification.

FIGURE 2. Configuration of the drags used by Canadian Forest Products in their Mackenzie Forest District operations (Photo by Alan Wiensczyk).

Continuing with the site preparation theme, this year's tour included a stop at a 25-year-old site preparation trial in which several different site preparation treatments were applied in 1986. **Allan Powelson** and **John McClarnon** of BC Ministry of Forests, Lands, and Natural Resource Operations described the Mackenzie installation of the trial and noted that the results from the trial demonstrated that:

1. The greatest limiting factor on the site was frost;
2. Mounding was the best treatment at this site as it created microsites that allowed planted seedlings to survive frost events and achieve a greater realization of the growth potential of the site;
3. Herbicide treatments resulted in significant mortality and delayed growth due to exposure to frost damage;
4. Linear treatments such as trenching created wildlife corridors that resulted in increased browsing of seedlings; and
5. High seedling mortality occurred on areas with fine textured soils that were sheared and planted due to frost heaving.

For the latest published results from this trial see:

Boateng, J.O., J.L. Heineman, and L. Bedford. 2011. Mechanical site preparation and windrow burning: 20 year effects on soil properties and lodgepole pine nutrition. BC Ministry of Forests, Lands and Natural Resource Operations, Resource Practices Branch, Victoria, BC. Silviculture Note 31. Available at: *http://www.for.gov.bc.ca/hfp/publications/00127/silviculture%20note%2031_%20July%2013%202011%20(2).pdf* (Accessed July 20, 2011)

Boateng, J.O., J.L. Heineman, and L. Bedford. 2011. Twenty-year effects of windrow burning, chemical and mechanical site preparation, and repeat brushing on survival and growth of white spruce. BC Ministry of Forests, Lands and Natural Resource Operations, Resource Practices Branch, Victoria, BC. Silviculture Note 30. Available at: *http://www.for.gov.bc.ca/hfp/publications/00127/Silviculture%20note%2030_revised%20July%2013%202011.pdf* (Accessed July 20, 2011)

Cortini, F., P.G. Comeau, J.O. Boateng, L. Bedford, J. McClarnon, and R.A. Powelson. 2011. Effects of climate on growth of lodgepole pine and white spruce following site preparation and its implications in a changing climate. Canadian Journal of Forest Research 41(1):180–194.

This year's summer tour also included a presentation by **Barry Jaquish** of BC Ministry of Forests, Lands, and Natural Resource Operations on the six-year results of a spruce genecology/climate change study. The study was designed to enhance our understanding of the relationships between climate and tree survival, growth, and pest interactions, and to help in the development of climate-based seed transfer guidelines. Researchers planted seedlings from 128 populations (36 class A/elite and 92 wild stand) of spruce from British Columbia, Alberta, the Northwest and Yukon territories, Washington, Idaho, Montana, New Mexico, and Arizona on 18 climatically unique sites in British Columbia, Alberta, and the Yukon. As expected, seedling survival, growth, and damage varied considerably among sites. The highest growth and survival occurred on warm, moist sites, while the lowest occurred on cold, dry sites, based on the 2010 assessment. Seed source also had an impact on results. Class A seedlots from British Columbia and Alberta were, on average, 20% and 7% taller than the average of wild-stand seedlots, respectively. **Jaquish** also noted that the elite populations from Nelson and Prince George were the tallest.

Richard Kabzems (BC Ministry of Forests, Lands and Natural Resource Operations) led a discussion on aspen-spruce mixedwood management. "The decision at a strategic level on whether to manage for aspen-spruce mixedwoods depends on your management objectives and on the purpose of the tree species that you are growing," **Kabzems** said. He explained that aspen has many positive benefits for wildlife and can also contribute harvestable volume. He also described a number of methods that can be used to manage boreal mixedwoods, including relay cropping techniques, underplanting aspen stands with hybrid spruce, and the strip shelterwood silvicultural system. He directed participants to the paper by Lieffers et al. (1996), which describes other silvicultural options for managing boreal mixedwood forests. **Kabzems** noted that there are a number of policy issues that need to be addressed before a number of these options can be fully implemented.

Lieffers, V.J., R.B. Macmillan, D. MacPherson, K. Branter, and J.D. Stewart. 1996. Semi-natural and intensive silvicultural systems for the boreal mixedwood forest. Forestry Chronicle 72(3):286–292.

The tour also stopped at a 28-year-old subalpine fir/hybrid spruce stand that had been assessed this year under the Stand Development Monitoring (SDM) program by **Alex Woods** of BC Ministry of Forests, Lands, and Natural Resource Operations. Based on the assessment data collected the stand is performing well and contains more free growing stems and a greater number of larger trees than anticipated based on growth and yield model projections (Table Interpolation Program for Stand Yields, or TIPSY). In addition to this stand, **Woods** and his team have completed assessments on nine other stands throughout the province this year from Nakusp in the south to Skeena-Stikine in the north.

Mike Trepanier of Industrial Forestry Service described the planning process for determining where to invest Forests for Tomorrow (FFT) funds from a FFT recipient perspective. Two levels of planning are used. The first, a tactical plan, is a Geographic Information System (GIS) exercise in which a number of criteria are used to select sites to progress to the operational/site level planning phase. This second level of planning involves a low intensity reconnaissance (or recce) survey, usually by helicopter, to pre-screen the areas selected. **Trepanier** noted that approximately 75% of the areas visited are either left as is or are put in the "monitor" file, 5% move to a full survey, while the remaining 20% move directly to the treatment prescription phase. During the prescription phase, FFT recipients conduct a Return on Investment (ROI) analysis to determine if site treatment is economically viable. If the ROI for the site is greater than 2%, treatment proceeds, and if it is below 2%, further assessment is done using a multiple accounts decision process that factors in other values to make a final decision.

Other stops on the tour included two at Kennedy Siding. At the first, **Dale Seip** of the BC Ministry of Environment gave an update on the work being done on monitoring the effects of the mountain pine beetle on woodland caribou habitat. The caribou in this area migrate from the Rocky Mountains to the low elevation pine-lichen forests in October and remain until January-March, depending on snow conditions. Caribou feed on a combination of terrestrial and arboreal lichens during the winter months. Caribou continue to use the ungulate winter range (UWR) despite the mountain pine beetle attack in 2006 that killed greater than 90% of the lodgepole pine canopy. However, **Seip** explained that the resulting increase in understorey light levels has led to a decline in the abundance of terrestrial lichens in favour of vascular plants, which have flourished. He also noted that an increase in the abundance of moss can also result in a decrease in terrestrial lichens and that some disturbance is often needed to "reset" the successional clock in these pine-lichen forest types. The abundance of arboreal lichens has been unaffected by the mountain pine beetle attack, although this is expected to change in the future as the trees decay and fall over. Data indicates that trees have been falling at a rate of 2% over the first four years since attack. Terrestrial lichens are recovering quickly in the salvage harvested blocks, although caribou only use these areas when snow depths are low. **Seip** concluded that the hope is that the retained stands of mountain pine beetle killed forest will continue to maintain the caribou until the cut-blocks are old enough to provide adequate replacement habitat.

At the second stop, **Vanessa Foord** of BC Ministry of Forests, Lands, and Natural Resource Operations described the work being done to monitor the impact of the mountain pine beetle infestation on forest carbon dynamics. Researchers have been collecting data on carbon flux, water vapour flux, soil moisture, photosynthesis, canopy closure and light levels, snow levels, as well as standard climate measurements at the weather tower installation since 2006. Two other towers in the Prince George area, one at Crooked River in a mountain pine beetle stand attacked in 2003 and the other at Summit Lake where they are looking at the effects of salvage harvesting on carbon flux, are collecting similar data. Lodgepole pine mortality at the Kennedy Siding site was approximately 80% while at the Crooked River site it was greater than 95%. Noted **Foord**, one of the unexpected results from the Kennedy Siding and Crooked River sites was that they both have remained net carbon sinks even after the mountain pine beetle infestation. She explained that this was due, in part, to the development and growth of the residual live pine stems and secondary structure in these stands. In contrast, nearby planted clearcuts continue to be carbon sources ten years after harvesting.

For more information and other results from this study see:

Brown, M., T.A. Black, Z. Nesic, V.N. Foord, D.L. Spittlehouse, A.L. Fredeen, N.J. Grant, P.J. Burton and J.A. Trofymow. 2010. Impact of mountain pine beetle on the net ecosystem productivity of lodgepole pine stands in British Columbia. Agriculture and Forest Meteorology 150(2): 254–264.

The field tour also included a quick stop with **Ryan Bichon** of the Macleod Lake Indian Band who discussed the Band's use of goats for vegetation control in conifer plantations. He said that they have found this treatment to be quite effective and that the key to its success was having a good herder who knew when to move the animals to a new area to avoid damage to conifer seedlings. **Peter Hellenius** of Silva Enterprises and **Don Piggott** of Yellow Point Propagation provided updated data on available seed for several northern districts. They also described and provided some helpful tips on cone collection methods, handling procedures, and supplies and equipment.

The next Northern Silviculture Committee event is the Winter Conference, which is scheduled for February 21 to 22, 2012 at the University of Northern British Columbia.

For more information on vegetation management alternatives see:

March/April 2011 issue of the Forestry Chronicle 87(2): full issue. ***http://pubs.cif-ifc.org/toc/tfc/87/02***

For more information on cone collection see:

Portlock, F.T. (compiler). 1996. A field guide to collecting cones of British Columbia conifers. BC Ministry of Forests and Canadian Forest Service, Victoria, BC. FRDA Handbook. Available at: ***http://www.for.gov.bc.ca/hfd/pubs/Docs/Frh/Frhcone.htm*** (Accessed July 20, 2011)

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