

Extension Note

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Cariboo Forest Region: Part 2 of 3

Forest Health Stand Establishment Decision Aids

Kathie Swift¹, Jennifer Turner², and Leo Rankin³

Introduction

Over the last four years, the Early Stand Dynamics program of FORREX–Forest Research Extension Partnership has assessed the information needs of the operational silvicultural community. This process has identified a number of issues relating to management of competing vegetation, forest health, silvicultural systems, and best practices. Besides information needs, members of the silvicultural community also expressed concern about the loss of their experiential knowledge.

These operational concerns prompted the initiation of an extension project to fill in the identified information gaps and document local knowledge. Competing vegetation and forest health were selected as the first subject areas on which to focus effort. Information relating to these two subject areas was collected, synthesized, and presented in an easy-to-use format. The resulting product was then presented to both the operational and scientific communities for their review and input.

The extension product generated by this process was called a “Stand Establishment Decision Aid” (SEDA). SEDAs are designed to provide information on the biological features that new and inexperienced practitioners need to consider when making silvicultural decisions about site limiting factors, such as competing vegetation or forest health. These decision aids are not intended to make the decisions for the practitioners. We currently base these decision aids on the Biogeoclimatic Ecosystem Classification (BEC) system. A description of this system is available on-line at: www.for.gov.bc.ca/hfd/pubs/Docs/Srs/SRseries.htm

The SEDAs for the Cariboo Forest Region will be published as a three-part series. The first section of the forest health SEDA provides a hazard rating system that identifies the specific biogeoclimatic zone and subzone where the forest health problem can potentially occur. The second section outlines some possible silvicultural considerations that affect the host species. These considerations could be used to develop a management strategy, if one is required. The SEDA concludes with a resource section outlining where more information can be located. Reference material that is not available on-line can be ordered through the Queen’s Printer at: www.qp.gov.bc.ca

Although these decision aids currently identify the problem first, rather than the particular ecosystem in which the problem occurs, we intend to develop a product that focuses on the ecosystem (subzone and site series) and ecosystem-specific problems. This extension product will be presented as part of a compendium of limiting factors in the Cariboo Forest Region, and is currently under development.

Contact Information

- 1 Early Stand Establishment Specialist, FORREX–Forest Research Extension Partnership, 360–1855 Kirschner Road, Kelowna, BC V1Y 4N7. E-mail: kathie.swift@forrex.org
- 2 Extension Projects Assistant, FORREX–Forest Research Extension Partnership, c/o Malcolm Knapp Research Forest, 14500 Silver Valley Road, Maple Ridge, BC V4R 2R3. E-mail: jennifer.turner@forrex.org
- 3 Regional Entomologist, Cariboo Forest Region, B.C. Ministry of Forests, 200–640 Borland Street, Williams Lake, BC V2G 4T1. E-mail: Leo.Rankin@gems8.gov.bc.ca



Atropellis Canker – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region



Atropellis canker damage on lodgepole pine

Hazard Rating

BEC Zone*	Drier subzones	Wetter subzones
SBPS	xc dc	mk
SBS	dw1	mw mc2

Hazard Rating Key

Low hazard	Low-mod hazard	Moderate hazard	Mod-high hazard	High hazard

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Hosts: Lodgepole Pine

- More prevalent in forest stands over 20 years old.
- Dense stands most heavily affected.
- Standing dead trees in shaded areas can continue spore production for one or two years.
- Trees less than 15 years old are resistant to the disease. Small or infected residuals should be destroyed after harvest.
- Areas with higher summer rainfall tend to have an increased incidence of Atropellis.

Establishment/Regeneration

- Remove susceptible trees growing near young regeneration.
- Plant a mixture of species or non-susceptible species in high-hazard subzones.

Plantation Maintenance

- Thin to decrease disease incidence; this treatment is most effective in areas with low summer rainfall.
- Thin forest stands before they are 15 years old.

Resource and Reference List

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Laminated Root Rot – Cariboo Forest Region

Tim Ebata and John Henigman, Canadian Forest Service



Laminated root rot damage

Hazard Rating

BEC Zone*	Drier subzones	Wetter subzones
ICH		mk3 wk2 wk4
IDF	xm xw dk3+4	

Hazard Rating Key

Low hazard	Low-mod hazard	Moderate hazard	Mod-high hazard	High hazard

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

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Silvicultural Considerations

Hosts: Douglas-fir and occasionally Spruce species

- In most cases, disease is diagnosed by the laminated pitted decay in root balls of windthrown trees (combined with the stand-level symptom of a root disease centre).
- Apply treatments only after completing an assessment of disease intensity and distribution (e.g., diffuse vs. aggregated distribution). Limit fertilization or pruning treatments to disease tolerant, potential crop trees.
- Where operationally feasible, remove infected stumps. If disease centres are scattered, consider creating “disease barriers” by felling healthy trees in a strip around the centre. However, even healthy stumps of susceptible hosts can be colonized by the fungus up to five years after felling. Consult your regional pathologist to determine whether this treatment should be used.
- Learn about the association between root diseases and bark beetles before conducting root rot surveys.

Regeneration/Establishment

- Plant resistant or tolerant species (pine, cedar, or hardwoods) where laminated root rot is detected.
- If inoculum reduction through post-harvest stumping, chemical inactivation, or push-falling treatments is not an option, plant less susceptible species in an area extending at least 30 m beyond the outermost infected stumps.

Plantation Maintenance

- Avoid thinning if root disease centres are extensive and widely distributed in sapling stands. Consider destroying the plantation and either replant with resistant species, or reduce inoculum and replant with any suitable species.
- Unless an inoculum removal treatment was previously applied, do not thin below maximum density if more than 60% of the trees are moderately or highly susceptible.
- Avoid commercial thinning when laminated root rot is present in 20% or more of the stand.
- In stands of poles or small saw timber, remove only dead or infected trees within 15 m of an infection centre to avoid excessive windthrow.

Spruce/White Pine Terminal Weevil – Cariboo Forest Region

www.forestryimages.org



Spruce weevil

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Hazard Rating

BEC Zone*	Drier subzones	Wetter subzones
ESSF	dc2	wk1 wc3
ICH	dk	mk3 wk2+4
SBS	dw1 dw2	mc1+2 mh mw wk1

Hazard Rating Key

Low hazard	Low-mod hazard	Moderate hazard	Mod-high hazard	High hazard

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

- Spittlehouse, D.L., B.G. Sieben, and S.P. Taylor. 1994. Spruce weevil hazard mapping based on climate and ground surveys. In *The white pine weevil: biology, damage and management*. R.I. Alfaro, G. Kiss, and G.R. Fraser (editors). Can. For. Serv. and B.C. Min. For., Victoria, B.C. FRDA II Rep. No. 226, pp. 23–32.
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Silvicultural Considerations

Host: Spruce species

- Feeding and larval mining by this weevil kills terminal growth and, therefore, causes unacceptable growth loss and stem deformation.
- This pest causes extreme depletion of stand productivity. However, as spruce weevil is native to the province, management should aim to minimize damage rather than eradicate the pest.

Establishment/Regeneration

- When planting spruce, use the appropriate provenance; for example, do not plant high-elevation spruce in low-elevation zones.
 - Refer to hazard rating maps for your area.
- If potential hazard rating is high:*
- Consider planting resistant strains of spruce.
 - Consider planting a mixture of species (e.g., other conifers or hardwoods).
 - Thin only after weevil attack rates decline.
 - Consider increasing densities to reduce the growth of lush leaders; greater inter-tree distances result in increased stand temperature, which promotes greater brood survival.
 - Brush on sites with medium and high site indexes containing vegetation complexes that form overstorey canopies (aspen, cottonwood). Avoid brushing sites with low-lying vegetation canopies (willow/alder), unless brush greatly inhibits seedling growth.
 - No direct controls are available for this insect.

Plantation Maintenance

- Avoid mechanical thinning; this treatment can damage trees, making host trees easier for weevils to find.
- Maintain high stand densities. Avoid brushing until trees are over 12 m tall.
- Remove seriously damaged trees after the stand has reached a sufficient size.



Tomentosus Root Disease – Cariboo Forest Region

Kathy Lewis, University of Northern British Columbia



Red stain caused by tomentosus root disease

Hazard Rating

BEC Zone*	Drier subzones	Wetter subzones
ESSF		wk1 wc3
ICH		mk3 wk2
SBS	dw1+2	mc1+2 mw wk1

Hazard Rating Key

Low hazard	Low-mod hazard	Moderate hazard	Mod-high hazard	High hazard

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Hosts: Spruce species and Lodgepole Pine

- Because of its patchy distribution, recognizing the disease is critical. Surveys may be required to determine how much root disease is present. Stratifying the block will make these surveys more efficient.
- Recent research suggests that partial harvesting does not cause a large flush of infection; however, the added stress may result in faster death of infected residual trees. Therefore, consider partial harvesting on sites with low to moderate levels of infection.
- Effects of fertilization on disease development are unknown.
- Consider push-falling or stumping after harvesting in areas where soil disturbance is not a concern (e.g., gently sloping, highly productive sites with light soils).
- Consider inoculum removal on sites with slopes of less than 35% and with soils rated at a low to moderate hazard for mass wasting, erosion, compaction, and soil displacement.

Establishment/Regeneration

- Plant less susceptible or resistant species (e.g., Douglas-fir, true firs, or hardwoods) in subzones affected by the disease.

Plantation Maintenance

- Avoid thinning.

Resource and Reference List

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Warren's Root Collar Weevil – Cariboo Forest Region



www.forestryimages.org

Warren's root collar weevil

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Hazard Rating

BEC Zone*	Drier subzones	Wetter subzones
ESSF	xc xv1+2	wc3 wk1
ICH		mc2 mk3 wk2+4
IDF	xm1 xw dk3+4 dw	
MS	xv	
SBPS	xc dc	mk
SBS	dk dw1+2	mc mw wk1

Hazard Rating Key

Low hazard	Low-mod hazard	Moderate hazard	Mod-high hazard	High hazard

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Steen, O. and R. Coupé. 1997. A field guide to forest site identification and interpretation for the Cariboo Forest Region. B.C. Min. For., Victoria, B.C. Land Manage. Handb. No. 39. URL: www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh39.htm
Tree Doctor Version 6.1 (Nov. 25, 2001). URL: www.for.gov.bc.ca/hfp/training.htm

Silvicultural Considerations

Hosts: Lodgepole Pine, Engelmann Spruce, and White Spruce

- Lodgepole pine are susceptible at a young age (6–8 years old and 1–2 m tall).
- Dominant and co-dominant trees on moister sites with coarse-textured soils and a deep organic duff layer are generally most susceptible.
- Mortality usually occurs in trees less than 20 years old.

Establishment/Regeneration

- Weevils prefer moist sites with a substantial duff layer.
- Consider planting a mixture of species.
- If possible, delay planting by 2–3 years in harvested areas that previously had a moderate to high hazard rating.
- Keep stand densities high.
- If planting, make sure seedlings have well-formed root systems.
- Remove duff around the root collar or prune lower branches of young infected trees to reduce the spread of disease.
- Disc-trench and plant seedlings on mounds to decrease mortality levels.

Plantation Maintenance

- These weevils may cause mortality even in pruned and spaced stands.
- In moderate to high hazard subzones, delay spacing until stand is at least 20 years old, particularly on sites where root disease is also present.
- If the stand is marginally stocked, fill-plant with an alternate species and delay declaring free-to-grow until the re-survey is complete in 5 years.