Extension Note

B.C. Journal of Ecosystems and Management

Cariboo Forest Region: Part 1 of 3

Forest Health Stand Establishment Decision Aids

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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

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Comandra and Stalactiform Blister Rust – Cariboo Forest Region

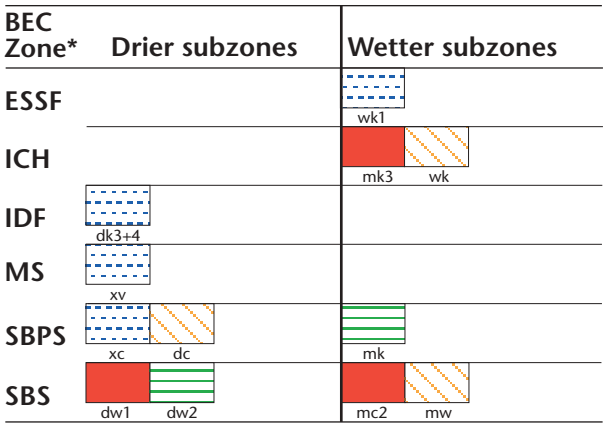
www.na.fs.fed.us/spfo/pubs/fids/comandra/comandrafdl.htm

Comandra blister rust damage to lodgepole pine

B.C. Ministry of Forests, Cariboo Forest Region

Stalactiform blister rust damage to lodgepole pine

Hazard Rating



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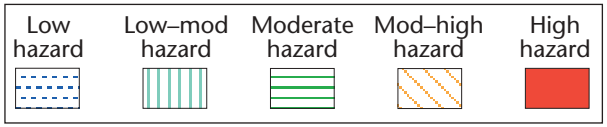

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Hosts: Lodgepole Pine

Lodgepole pine are very susceptible to these rusts at an early age. The diseases are most damaging on young trees, and most of the mortality occurs before the age of 20. Mature trees take much longer to kill; thus, infections that have accumulated at a low rate over many years are present, making it appear that older trees have a higher incidence.

Establishment/Regeneration

In high-hazard subzones consider:

- Planting above minimum stocking standard to compensate for disease-induced mortality.
- Planting with non-susceptible tree species.
- Inter-tree planting with non-susceptible host to compensate for rust mortality.

Plantation Maintenance

- Consider spacing cankered trees in areas with a low to moderate hazard rating.
- Calculate expected rust mortality and incorporate into post-spacing tree density.
- If possible, space in late spring during aeciospore dispersal (most visible) to maximize disease removal. However, the existence of infection by basidiospores through wounds in the autumn is very weak, and may not happen at all. The cost of limiting spacing to certain times will likely outweigh any possible benefits.

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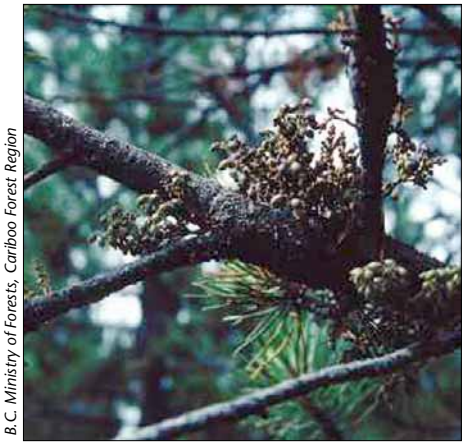
Lodgepole Pine Dwarf Mistletoe – Cariboo Forest Region



B.C. Ministry of Forests, Cariboo Forest Region

Lodgepole pine dwarf mistletoe

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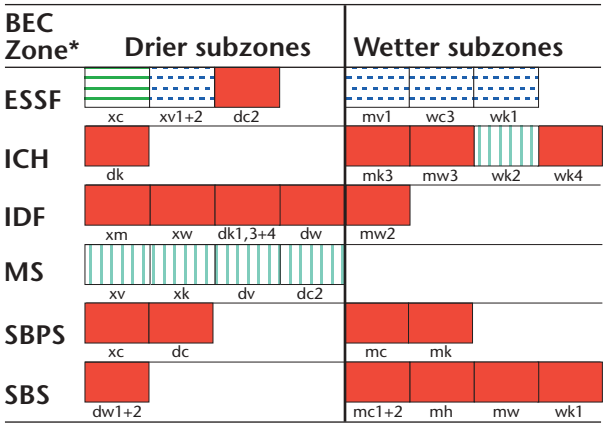
Hazard Rating



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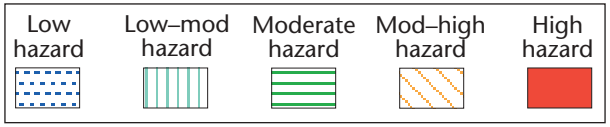

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Hosts: Lodgepole Pine

- Do not partially harvest infested stands that are managed primarily for timber, as residual trees will substantially increase disease occurrence in regenerating stands.
- Remove residuals over 50 cm tall.
- Large, rounded clearcuts decrease the likelihood of infection from adjacent stands. Avoid creating cutblocks with convoluted boundaries, as this increases ingress of mistletoe.
- Single tree or group selection systems result in the intensified spread and damage by dwarf mistletoe.
- If possible, avoid leaving islands of infected trees for wildlife patches. However, if wildlife reserves are required, layout islands to minimize spread of dwarf mistletoe into the young stand.
- In stands that have not reached crown closure, *approximately half the infections are invisible* (i.e., no swelling or dwarf mistletoe shoots).
- Leave non-host species as border trees and incorporate natural barriers wherever possible.

Establishment/Regeneration

For moderate–high hazard stands:

- Favour non-host tree species for regeneration or as leave trees.
- Consider mixed species planting.
- Consider planting 20-m strips of resistant species along the border of infested stands, but only if the host species will not invade such strips and take over. Unfortunately, resistant species, such as Douglas-fir and spruce, are commonly overtopped by naturally regenerating pine along stand edges.

Plantation Maintenance

- Avoid thinning if possible. In dwarf mistletoe infected stands, the gains associated with thinning are small compared to the silvicultural costs. However, ensure that yield projections for such stands are properly handled in cut calculations.
- If thinning is required, use wide spacing in moderate–high hazard stands (i.e., crop tree crowns should be 6 m apart).
- Use sanitation thinning for stands younger than half the rotation age. Stands with a dwarf mistletoe ratio (DMR) equal to or greater than 3 should not be thinned.

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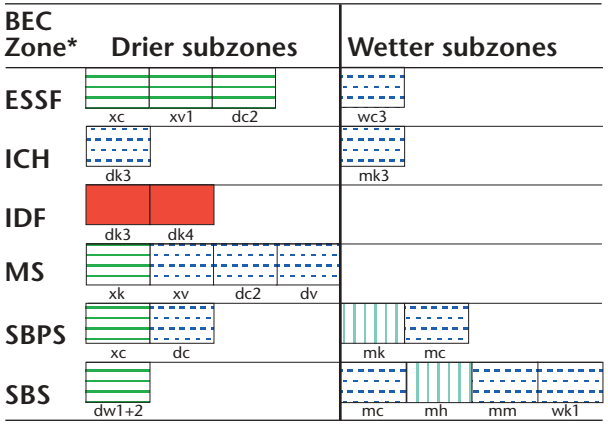
Lodgepole Pine Terminal Weevil – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region

Lodgepole pine terminal weevil larvae

Hazard Rating



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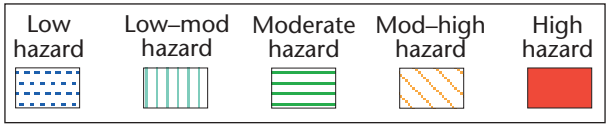

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

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Silvicultural Considerations

Host: Lodgepole Pine

- Weevil attacks are most common in 10- to 25-year-old stands; therefore, weevil surveys to detect peak attack intensity should be delayed until the stand is at least 15 years old.

Establishment/Regeneration

- Plant a mixture of species (if possible).
- Keep densities high, preferably greater than 2400 stems per hectare in high-hazard stands.
- Note that greater inter-tree distances result in increased stand temperature, which promotes greater brood survival.

Plantation Maintenance

- Avoid spacing to low densities at an early age (8–15 years), as this increases stand susceptibility to weevils and damage severity.
- If early stand densities are very high, use non-mechanical spacing methods.
- Maintain high stand densities and do not brush until trees are more than 5 m high.
- Remove seriously weevil-damaged trees when the stand has reached a sufficient size.
- Note that levels of attack increase after spacing in moderate to high hazard zones (when spacing occurs at 8–15 years).
- Space only when attack rates are less than 10% annual attack.
- If attack rates exceed 10%, modify spacing (leave 2500 stems per hectare) or delay spacing until trees are more than 5 m high or stand is 25 years old.

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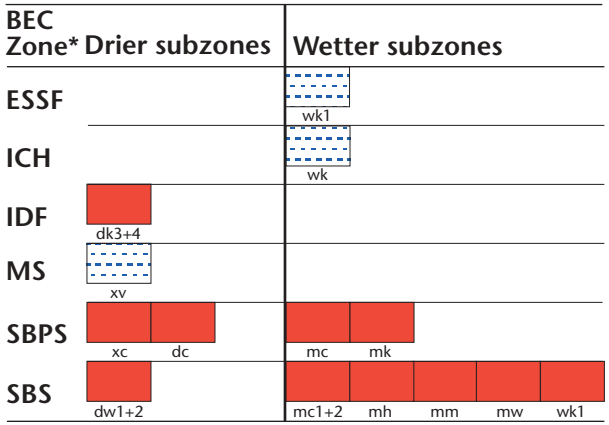
Pine Needlecast – Cariboo Forest Region

www.pfc.forestry.ca/diseases/CTD/Group/Needle/needle4_e.html

Damage to a young lodgepole due to pine

Hazard Rating



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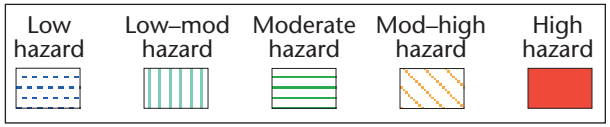

* See Steen and Coupé (1997) for an explanation of Biogeoclimatic Ecosystem Classification (BEC) zone, subzone, and variant abbreviations.

Silvicultural Considerations

Hosts: Lodgepole Pine

- Most widespread and abundant pest of young lodgepole pine in recent years.
- New foliage is infected in early summer.
- Disease is the most damaging on young or suppressed trees.

Establishment/Regeneration

- Planting mixed species may increase stand vigour in areas where disease incidence is high.
- Do not plant lodgepole pine provenances from low-risk areas in high-risk areas, such as sites in the Sub-Boreal Pine–Spruce Very Dry Cold subzone (SBPSxc) or the Interior Douglas-fir Dry Cool subzone, Fraser variant (IDFdk3) and Chilcotin variant (IDFdk4).

Plantation Maintenance

- Thinning may be used to maintain a vigorous stand.
- Select species susceptible to needlecast for spacing.

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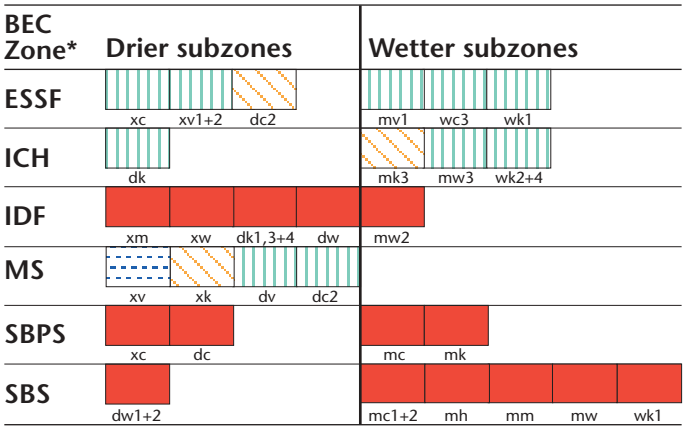
Western Gall Rust – Cariboo Forest Region

B.C. Ministry of Forests, Cariboo Forest Region

Stem gall on lodgepole pine infected by western gall rust

Hazard Rating



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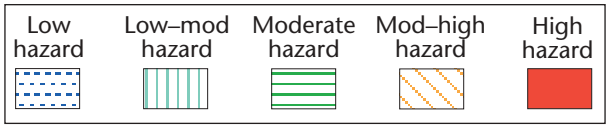

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Silvicultural Considerations

Hosts: Lodgepole Pine

- Risk of infection and proportion of stem galls is highest on young trees; the highest risk of infection occurs mainly before the age of 15 years.
- Older and taller trees are less likely to be infected since infection sites are found on elongating shoots.
- Certain geographic areas seem more susceptible than others, depending on elevation, prevailing winds, humidity, etc.
- This rust does not generally infect pruning wounds or branch stubs.

Establishment/Regeneration

- Plant at higher densities (or with non-susceptible tree species) in high-hazard subzones to compensate for rust-induced mortality.

Plantation Maintenance

- Refer to Table 3 in the *Pine Stem Rust Management Guidebook* (B.C. Ministry of Forests and B.C. Ministry of Environment 1996) for a description of disease incidence and treatment levels by activity.
- Perform a prescription survey in late spring or early summer to determine rust thresholds.
- Do not wait to space stands beyond 15 years, as the cost of waiting will likely be too high compared to the small possible gains.
- Consider removing all trees with stem galls to decrease post-spacing growth reduction due to western gall rust. However, since the largest trees tend to be the most susceptible, this management option may result in a loss of forest productivity.
- Consider leaving infected trees if stem galls are less than one-third the circumference of the tree, ***and*** the infected tree is twice the height of the uninfected tree to be spaced. Although leaving stem galls can result in a marked stem deformity called hip canker, (if the tree doesn't die) a larger tree with this deformity may be preferable to a suppressed, small pine that will not reach co-dominance. No systematic research has been conducted on the success of this technique; however, it has proven effective in the Quesnel Forest District.
- Space trees in spring or early summer during spore production (improved visibility) to maximize disease removal. However, even during spore production, it may be difficult for the untrained eye to determine which rust is producing spores.

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