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March 23, 2006

**BY EMAIL**

To: Regional Executive Directors

From: Bill Howard  
Director  
Revenue Branch

**Re: Amendment No. 4 to the *Cruising Manual***

I hereby approve Amendment No. 4 to the *Cruising Manual*, and attach a copy for your use.

This amendment is necessary to reflect the changes to the risk groups for dead potential and grey attack lodgepole pine in the Interior of British Columbia.

This amendment will come into force on April 1, 2006. Further amendments or revisions to this manual require by approval.

**Original Signed by:**



**for:**

Bill Howard  
Director  
Revenue Branch

Attachments





# **Amendments**

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**Amendment No. 4 - Effective April 1, 2006**

For your convenience the current amendment updates appear in red text. All changed graphics are indicated with a red arrow . Two arrows  represents text removed.

<b>Section</b>	<b>Description</b>
Section 3.5.6	Tree Classes 3 and 7 Lodgepole pine (PL) will use Risk Group 2 Loss Factors.
A.6.1.3	Grey attack PL will use Risk Group 2 Loss Factors.

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### 3.5.5 Pathology

Pathological indicators are recorded when observed on the bole or a merchantable secondary leader (see Section A.4.2) of the tree. The exceptions are *Phaeolus Schweinitzii*, which will occur on the ground near the base of the tree and scars on the root collars. There are qualifications to many of the suspect characters such as age of scars, position of fork or crook, size of rotten branches, etc (please refer to Appendix 4, for a detailed description of pathology).

### 3.5.6 Tree Classes

All living and dead trees must be given the appropriate tree class code numbered from 1 to 9. It is essential that every tree be viewed from all sides before classification as Residual or Suspect.

Refer to Appendix 4 for diagrams and further information about residual and suspect trees.

Use the following age in 10s and tree class combinations:

<b>Interior</b>	<p>Enter 11 for the Age in 10's on the cruise tally card type 9. The tree classes will be coded as follows:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 70%;">Older immature</td> <td>– tree class 1</td> </tr> <tr> <td>Older immature - Suspect</td> <td>– tree class 2</td> </tr> <tr> <td>Older Imm. Dead Potential</td> <td>– tree class 3</td> </tr> <tr> <td>Dead useless</td> <td>– tree class 4</td> </tr> <tr> <td>*Mature</td> <td>– tree class 5</td> </tr> <tr> <td>Live Useless</td> <td>– tree class 6</td> </tr> <tr> <td>*Mature-Dead Potential</td> <td>– tree class 7</td> </tr> <tr> <td>Younger Immature</td> <td>– tree class 8</td> </tr> <tr> <td>Younger Imm. Dead Potential</td> <td>– tree class 9</td> </tr> </table> <p>* = except FIZ K and L Aspen and Cottonwood - see Table 17</p>	Older immature	– tree class 1	Older immature - Suspect	– tree class 2	Older Imm. Dead Potential	– tree class 3	Dead useless	– tree class 4	*Mature	– tree class 5	Live Useless	– tree class 6	*Mature-Dead Potential	– tree class 7	Younger Immature	– tree class 8	Younger Imm. Dead Potential	– tree class 9
Older immature	– tree class 1																		
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Live Useless	– tree class 6																		
*Mature-Dead Potential	– tree class 7																		
Younger Immature	– tree class 8																		
Younger Imm. Dead Potential	– tree class 9																		
<b>Coast</b>	<p>Use the same coding as above for younger and older immature stands if there are not any trees older than 120 years old in a plot.</p> <p>If there are trees older than 121 years old in the plot then refer to section 9.1.5.7 for details regarding the age in 10s and tree class reporting.</p>																		

Refer to the tree class modification of Loss Factor Tables at the end of Table 17 for the age in 10s and tree class combinations when combining plots cruised before April 1, 2003 with newer cruise plot data.

#### 3.5.6.1 Tree Class 1 (Older Immature)

These are living trees with none of the eight external pathological indicators.

#### 3.5.6.2 Tree Class 2 (Older Immature)

These are living trees containing one or more of the following eight external pathological indicators of decay:

Conks, Blind Conks, scars, fork and/or pronounced crook, frost crack, mistletoe (trunk infection), rotten branches, dead or broken top.

All pathological indicators must be recorded for each tree where they occur in order for the computer to properly assign the appropriate loss factor. Tree classification will be made on the basis of the above signs of decay only. See "Metric Diameter Class Decay, Waste and Breakage Factors" for the specifications of Risk Groups and Table 18 for risk group assignments by pathological indicators.

#### 3.5.6.3 Tree Class 3 (Older Immature Dead Potential)

Dead standing or down timber which is estimated to contain at least 50 percent of its original gross volume in sound-wood content. All dead potential standing and down trees must be tallied.

Trees with green and/or red needles are considered live trees and will be classified based on pathological indicators. Standing or windfall trees with grey or no needles will be considered dead trees.

Down stems in this class will be determined as "in" or "out" by measuring from DBH on the tree where it lies to the plot centre (see Section 3.4.1.4, *Leaning or "Down" Trees*). For net merchantable volume compilation, dead potential stems will have the highest Risk Group factor for that particular species except Lodgepole Pine which will use Risk Group 2 Loss Factors.

The 50 percent or more firmwood rule is the key consideration. Consider the resistance to decay of the species and the local climate (refer to Table 19 for the Sound Wood Factors for saprot and formulas to assist in the determination of 50 percent soundwood content).

Decay should be determined at various intervals on the tree. Tables are available to estimate cross-sectional area of decay. For example, the outer one-third of a tree represents one half the volume. Also, the bottom third of a tree contains approximately one half of its volume. Other tables are available which show the percentage of volume

of the tree in each 10 m log. By estimating percent firmwood in each 10 m log, the firmwood percent of the tree can be determined.

1. Dead Standing

Decay percent is difficult to assess on standing trees, "Sounding" with an axe or equivalent implement can be helpful. Before sounding, look for overhead hazards that may be dislodged.

2. Dead Down

Good judgement must be exercised in applying tree classes to down material. Since some species are more resistant to decay than others, decisions will therefore be influenced by the tree species involved as well as by local climatic conditions. C, Cy, F, S, P and L are the most decay resistant species and are less likely to exhibit extensively sloughing bark and conks. Other species exhibiting these characteristics are more likely to be "Dead Useless". However, it should be remembered that in drier areas, dead and down Pl and Py may be entirely bark-free yet still be relatively sound.

Pathology is required on all dead potential trees on the coast, dead potential hemlock in the interior for use in the log grade algorithms.

The only exception to the green and/or red needle rule is for *abies lasiocarpa* in the Interior, where the following guidelines will apply:

**Indications – One or More Must be Present**

1. Sap-rot and/or,
2. Deep checking and/or,
3. Loose or shedding bark.

**Contraindications – None can be Present for Tree Classes 3, 7 and 9 Trees**

1. Live Cambium.
2. Green needles.
3. Pitching that is on the end of a log or on exposed wood and not under the bark.
4. Live bark beetles are present.

If there is any doubt after applying the indicators and contraindicators, then the tree will be classified as green.

#### 3.5.6.4 Tree Class 4 (Dead Useless)

Dead standing trees that have less than 50 percent of their original gross volume in firmwood content or otherwise fails to meet the criteria of a dead potential tree as described in Section 3.5.6.3 will be classified as "dead useless" trees. Only dead useless standing trees will be tallied (dead useless down trees are *not* tallied). Dead useless trees are considered standing if they are leaning into another tree. Dead useless standing trees will not be compiled for volume, but along with Live Useless trees, provide a record of snag density in the stand for appraisal purposes. Only trees equal or greater than 3 m high and equal or greater than the minimum timber merchantability specifications must be tallied. Estimate their actual observed height and the original DBH, not an estimate of the stems original height.

#### 3.5.6.5 Tree Class 5 (Mature)

A mature conifer tree is defined as any tree over 120 years old. A mature deciduous tree is defined as any tree over 40 years old. The exceptions are:

- a. Aspen and Cottonwood in FIZ K and L where tree classes 5 or 7 will be used for trees 141 years and older,
- b. Coastal cruises where there are trees between 121 and 140 years old, then tree classes 5 and 7 will be used for trees 141 years and older.

A reasonable number of mature ages should be sampled along with the age drilling of the main stand component.

#### 3.5.6.6 Tree Class 6 (Live Useless)

Live Useless trees are trees that have only one or two live limbs. They are combined with TC 4 for the compilation of percent snags. This tree class must not be confused with a Tree Class 2 tree, which has a high proportion of rot due to conk.

**Cedar and Cypress** The tree must be almost completely rotten or hollow with just a thin shell of sound wood remaining. The low proportion of sound wood must be obvious (i.e., rotten or hollow knots, and large open scar).

**Hemlock, Balsam, Fir, Pine & Spruce** The tree must be broken off in the lower or middle thirds (i.e., at least the top third must be missing) with only a few live branches and almost completely rotten or hollow.

#### 3.5.6.7 Tree Class 7 (Mature Dead Potential)

This class is a combination of Veteran and Dead Potential so that the correct loss factor tables are applied in the compilation. The guidelines for TC 3 and TC 5 apply. Dead potential Lodgepole Pine will use Risk Group 2 loss Factors.

## Appendix 6 Damaged Stands

Trees are assigned damage codes so as to apply volume and value adjustments. Each tree is assessed and coded as it appears at the time of the cruise with no attempt to predict the future condition of the trees. Where damage is tallied it will be compiled and reported.

Damaged tree volumes and LRF's are adjusted using the loss factors. In addition, the cruise compilation reports identify tree volume within the damaged code categories so as to enable cost and value adjustments in appraisal.

Each code has a different effect in compilation. Damage codes result in the modification of risk group and corresponding adjustments to net volume.

Depending on the patchiness of the beetle attack, or fire and wind damage, consideration should be given when drawing up the sampling plan as to whether these patches should be treated as "types" and be a part of the stratification.

### A.6.1 Pest Damage

The following section applies for all cruises. Standard cruising methods as outlined in the *Cruising Manual* are to be followed with all beetle attack trees on the sale area coded in accordance with the *Bark Beetle Code*.

#### A.6.1.1 Bark Beetle Codes<sup>1</sup>

When Bark Beetle codes are recorded, the compilation program modifies the risk group. The compilation reports state the volume affected by this damage.

Trees are coded as they appear at the time of the cruise with no attempt to guess what the future condition of the trees will be.

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<sup>1</sup> L. Safranyik, D.M. Shrimpton, H.S. Whitney, Management of Lodgepole Pine to Reduce Losses from Mountain Pine Beetle, 1974, Forestry Technical Report 1, Environment Canada.

### A.6.1.2 Bark Beetle Descriptions

The most common and destructive infestation the cruiser will encounter are caused by the following bark beetles.

**Mountain pine beetle attacks lodgepole, ponderosa and white pine (however, whitebark, limber and exotic pines could also be infested).<sup>2</sup>**

**Douglas fir beetle attacks Douglas fir and sometimes western larch.<sup>3</sup>**

**Spruce beetle attacks mainly white and Englemann spruce in the Interior.<sup>4</sup>**

**Western pine beetle attacks ponderosa pine.**

**Western balsam bark beetle attacks mainly subalpine fir (*Abies lasiocarpa*).**

### A.6.1.3 Attack Codes for Balsam, White Pine, Yellow Pine and Lodgepole Pine

Code	Description
1	Green Attack
2	Red Attack
3	Grey Attack

These attack codes (based on crown and bole symptoms) are applicable to:

- The mountain pine beetle (*Dendroctonus ponderosae*) and the lodgepole pine beetle (*Dendroctonus murrayanae*) in lodgepole pine (*Pinus contorta*-PL), yellow pine (*Pinus ponderosa*-PY) and white pine (*Pinus monticola*-PW).
- The western pine beetle (*Dendroctonus brevicomis*) in yellow pine (*Pinus ponderosa*-PY).
- The western balsam bark beetle (*Dryocoetes cofusus*) in alpine fir (*Abies lasiocarpa*-BL).

<sup>2</sup> R.O. Wood, Foliage Changes of Three Pine Species, Pacific For. Res. Centre, Internal Report BC-17.

<sup>3</sup> L.H. McMullen, 1977, Douglas Fir Beetle, Pacific For. Res. Centre, Pest Leaflet A.

<sup>4</sup> C.B. Cottrel, 1978, Spruce Beetle, Pacific For. Res. Centre, Pest Leaflet B.

**Green Attack Code 1 (Risk Group 2, Balsam and the Pines)**

Since the mountain pine beetle and the western pine beetle normally complete their life cycles in one year, the Green Attack code will represent trees that have been infested ten to twelve months or less. The crown is green but pitch tubes are evident on the lower bole and the inner bark will contain characteristic gallery patterns and immature stages of the beetles. Successfully attacked trees usually die within a few weeks following initial attack even though their crowns may stay green up to twelve months. How long the crown of an infested tree stays green depends on climate, soil, topography and tree species. For lodgepole pine, green attacked trees are common from late July to late May in most areas. White pine and yellow pine infested by mountain pine beetle often start discolouring by fall or mid-spring.

**Red Attack Code 2 (Risk Group 2, Balsam and the Pines)**

This code represents trees that, on average, had been attacked during the previous two seasons. The crowns first fade to straw colour, then to red and finally to rust colour before the needles fall off the tree. By the time the foliage is rust coloured, the beetles have usually left these trees to infest green trees. The boles of many trees in this category may be heavily worked by woodpeckers, making them susceptible to checking.

**Grey Attack Code 3 (Has to be dead = Highest Risk Group, Balsam and the Pines Except PL = RG2)**

This code will represent trees that are dead and have grey needles except *Abies lasiocarpa*, which can have grey or red needles. The bole of the older kills will have much checking and loose bark. However, pitch tubes on the bark of the lower bole and/or bark beetle galleries under the bark will be readily discernible.

The western pine beetle has a different gallery pattern than the mountain pine beetle, but infested trees go through the same sequence of foliage changes after attacks by either beetle. Therefore, the same attack code is applicable.

The western balsam bark beetle usually completes its life cycle in two years. Therefore, both green and red attacked trees will contain brood. Also quite often there is no evidence of pitch tubes on the trunk of infected trees. Therefore, the boles of balsam fir need to be examined at close range for signs of boring dust in the crevices of the bark and/or small round holes in the bark that signify entry or emergence by this beetle. Thus, in the green infected stage, attacked trees are quite difficult to find.

**A.6.1.4 Blister Rust Code 4 (Risk Group 2, White Pine)**

Normally used in stands where white pine is a major species (more than 20 percent of the volume) which is seriously infected with blister rust. This code can be used in a normal old growth H-C type containing a few scattered PW veterans.

All other insect attack codes take precedence over Blister Rust, Code 4.

## A.6.1.5 Attack Codes for Spruce, Douglas Fir

Code	Description
5	Green Strip Attack – S and F
6	Green Full Attack – S and F
7	Grey Attack – S and F
8	Red Attack – Fir only

The first three codes are applicable to the spruce and fir beetle. Spruce foliage turns yellowish for a brief period in the winter season following an attack before the needles drop off the tree. Therefore, the species was not included in the red attack. Infested trees with faded crowns should be included in the green (dead) full attack.

**Green Strip Attack Code 5 (Path/Tree Class = Risk Group, Fir and Spruce)**

The trees in this code will be infested in a strip on the lower bole where broods either failed or succeeded in completing their development. In either case, the attacks did not kill the trees. These trees will live on, at least until subsequent attacks (which can happen quite often) completely girdle the bole. In the case of Douglas fir, strip attacked (green in well established infestations are usually much less common than Green fully attacked trees. The loss factors are unaffected by this code.

**Green Fully Attacked Code 6 (Risk Group 2, Fir and Spruce)**

The trees in this code still have green foliage but the attack by the bark beetles has completely girdled the tree. Some of these trees will have a considerable amount of their bark removed by woodpeckers lowering the value because of checks and splits.

In the case of Douglas fir, the beetle usually has a one year life cycle. The attack is usually in May and June. The crowns of infested trees stay green from a few months to a year after attack. Do not code as Tree Class 3. The compilation program will downgrade these trees to Risk Group 2.

**Grey Attack Code 7 (Highest Risk Group and has to be dead, Fir and Spruce)**

This code represents trees which are dead and have gray needles. Little or no foliage is left, the boles of the older kills may have much checking and loose bark. The compilation program downgrades these trees to the highest risk group.