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July 28, 2025

**BY EMAIL**

To: Regional Executive Directors

From: Allan Bennett, Director, Timber Pricing Branch

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

I hereby approve Amendment No. 4 to the *Cruising Manual*.

The manual can be found here:

[Timber Cruising Manual](#)

The purpose of this amendment is to update the *Cruising Manual*, which provides:

- BCTS cruise based standards for the Interior Area.
- Cruise standards and procedures for area based cutting authorities in the Interior Area.
- Updates and improved clarity of various roles, standards, and procedures.

Amendment No. 4 of the *Cruising Manual* comes into effect on August 1, 2025.

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Allan W. Bennett, RPF  
Director  
Timber Pricing Branch

pc: Melissa Sanderson, Assistant Deputy Minister, Forest Policy and Indigenous Relations Division  
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Bruce Sullivan, Revenue Officer, Regional Operations Division, South Area

# TIMBER PRICING BRANCH

## Cruising Manual

Effective: July 1, 2020

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### Includes Amendments

Amendment No. 4

Amendment No. 3

Amendment No. 2

Amendment No. 1

### Effective Date

August 1, 2025

February 1, 2025

August 1, 2024

July 1, 2021



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## Highlights

Section	Description
1.1	Added 'Volume in Thirds' and 'Linear Tenure' definitions.
2.3.2	Added section 'Area Based Cutting Authorities – Interior'
2.3.3	Added Interior cruise based requirements for BC Timber Sales. Added percent reduction requirements for Interior cruise based tenures.
2.4.2.1	Updated procedures for adding extra plots to linear tenures.
Table 3-1	Removed requirement of forest cover information for Lodgepole Pine aging. Addition of Point of Intersection required for cruise plan and final cruise submissions.
3.4	Updated damage code quality assurance targets to 1 for every 20 trees checked.
4.3.2.6	Updated live useless tree descriptions to include all species. Updated dead potential calculation process for volume in thirds. Removed reference to tree classes related to VRI age class codes.
7.5.1	Updated to allow Area Director discretion when FIZ/PSYU discrepancies occur.
7.6.3	Fixed typo in Figure 7-4.
7.15.2.5	Added natural crooks in deciduous must not be called as pathological indicators.
7.15.2.9	Added clarity on when to call a fork or a broken top.
Appendix 7	Updated Appendix 7 Table 7.7.1 Sound Wood Factors for Saprot. Added Table 7.7.2 Sound Wood Factors for Heart Rot. Added Appendix 7.7.3 Example Net Tree Volume Calculations Using Volume in Thirds.
Appendix 10	Removed Appendix 10 FS 694 Provincial Cruise Plan and Map Check List and added new FS 695 Provincial Office Check Cruise Form

Appendix 11	Removed Appendix 11 FS 695 Provincial Office Check Cruise Summary and added new FS 696 Provincial Field Check Cruise Form.
Appendix 12	Removed previous version of FS 696 Provincial Field Check Cruise Summary.
Appendix 13	Removed Appendix 13 FS 697 Provincial Compilation Form.

“**Linear Tenure**” means an area based cutting authority, as described in the *Interior Appraisal Manual* in Sections 6.7.1 and 6.7.2, that require clearing of long, narrow corridors for mining, Oil and Gas and related activities as defined in the *Energy Resource Activities Act*, or authorizations for investigative purposes issued under the *Land Act*;

“**Log Grade**” means those log grades that are identified in the Scaling Regulations, Cruise Compilation Grade Algorithms or CGNF Standards and Procedures for the Coast Forest Region, as appropriate;

“**Loss Factor**” means the method used to determine the net volume of a tree. The loss factors were determined as part of the provincial inventory system. Loss factors use a combination of tree maturity, pathological indicators and tree location (FIZ and PSYU or local factors) to determine the percentage of decay, waste and breakage that will be deducted from the gross merchantable volume equally from each log in a tree;

“**Marked to Leave Percent Reduction**” means trees within a cutting authority that are individually marked and measured in the field and adequately mapped prior to harvesting so that they are not felled or damaged during logging. Every leave tree is removed from the compilation by converting the known quantity of leave trees to an equivalent percent reduction;

“**Marked to Leave Selective Cutting**” means trees within a cutting authority that are individually marked in the field prior to harvesting so that they are not felled or damaged during logging. Leave trees that occur within cruise plots are compiled as leave trees in the compilation using the selective cut indicator with an “L” for leave trees in Position 59 of the cruise card;

“**Major Species**” means a species that comprises 20 percent or more of total net merchantable volume in a timber type, cutblock or cutting authority;

“**Mean**” means the sum of all measurement values divided by the number of measurements;

“**Mean Difference of Hits**” means the average of the absolute variations of each GPS hit or coordinate from the plot reference point (PRP), measured in metres;

“**Merchantable**” means a segment of a tree between 30cm stump height and a top diameter inside bark that is at least 3 metres in length and within the timber merchantability specifications as defined in the *Coast* and *Interior Appraisal Manuals*;

“**Ministry**” means the Ministry of Forests;

“**Minor species**” means a species that comprises less than 20 percent of the total net merchantable volume in a timber type, cutblock or cutting permit;

“**Net merchantable area**” means net merchantable area as defined in the *Interior Appraisal Manual* and/or harvest area as defined in the *Coast Appraisal Manual*.

“**Orphan Tree**” means a tree of a certain species that occurs in a count plot but has not been tallied in a measure plot within the same timber type;

“**Partial Cutting**” means silviculture systems in which only some of the trees are felled during the

“**Tree Class**” means a series of classes (nine) signifying age/maturity, presence of pathological indicators, and live/dead classification. This classification system, in combination with pathological indicators and age in 10’s, determines the appropriate risk group for volume deduction;

“**UTC**” means Coordinated Universal Time, the primary global time standard. It is defined more precisely than GMT as it is defined to the sub-second level;

“**UTM**” means Universal Transverse Mercator coordinate system, a two dimensional coordinate system that divides the earth into 60 zones;

“**Uprooted**” means a tree that has fallen over and is not self supporting and the stem is either intact or has a break below stump height;

“**Variable Plot Sampling**” means a method of plot sampling where the trees to be tallied are based on their size and not the frequency or density of trees in the stand. Each tree has its own plot radius and can be assessed with an angle gauge (e.g. prism or relaskop);

“**Variance**” is the mean of squared deviations of observations about a sample mean. (These deviations or differences from the mean are called residuals);

“**Variation**” is the difference, plus or minus, between two measurements or a standard and a measurement (e.g., standard of 7 and measurement of 5 gives variation of -2);

“**Volume in Thirds**” is a method of estimating the volume in each third of a tree based on the total original height. Starting at the base of the tree, the bottom third represents 65% of the tree’s gross volume, the middle third represents 30% and the top third represents 5%; and

“**Waste**” is waste as defined in the Provincial Logging Residue and Waste Measurement Procedures Manual.

### 2.3.1. Scale Based Cutting Authorities

1. Unless otherwise stated, the scale-based cutting authority sampling error objective is  $\leq 15.0\%$  at 2 SE based on the total stand net merchantable volume prior to any percent reductions.
2. Single Stem – the options are:
  - a. 100% cruise of the cut trees,
  - b. Achieve  $\leq 15.0\%$  sampling error on the cut trees at 2 SE using variable radius plots, or
  - c. Sample using at least 2 variable radius measure plots/ha and at least 2.0 cut trees/plot.

**The sampling error requirement will be waived if the following three conditions have been met:**

1. A systematic square grid of equal intervals and spacing of 100 metre by 100 metre, or less, has been established in each timber type.
2. For cutting authorities:
  - a. of 20.0 ha net merchantable area or larger in size, a maximum ratio of 1.0 count plot to 1.0 full measure plot has not been exceeded, or
  - b. of less than 20.0 ha net merchantable area in size, only full measure plots are used. (Count plots are acceptable in addition to the required intensity of full measure plots. E.g. A 70 metre by 70 metre grid with alternating full measure and count plots is acceptable.) And
3. An average of at least 4.0 trees per plot per cutblock has been met. If the minimum tree count cannot be achieved with a BAF 2 prism, then the minimum tree count requirement will be waived.

### 2.3.2. Area Based Cutting Authorities – Interior

For area based cutting authorities that meet the requirements under Section 6.7.1 or 6.7.2 of the *Interior Appraisal Manual*, the cruise volume is determined as directed in the IAM.

For area based cutting authorities that require a timber cruise as per the IAM, the following requirements must be met:

1. Achieve a sampling error of  $\leq 15.0\%$  at 2 SE. This requirement is waived if the cutting authority is cruised with a 100m square grid and a maximum count plot to measure plot ratio of 1:1, and
2. An average of at least 4.0 trees per plot must be met. This requirement is waived if the timber types with less than 4.0 trees per plot are cruised with BAF 6 prism.

Plot establishment for area based cutting authorities must follow these procedures:

1. Linear tenures must allocate the plots with equal plot spacing along the centerline of the proposed harvest area.

- a. The first plot must be located half the inter plot distance from the start of the linear tenure harvest area.
2. Non linear tenures must use a cruise design as per Section 2.4.1 of this manual.
3. All timber types must have a minimum of 2 measure plots.

### 2.3.3. Cruise Based Cutting Authorities – Interior

The following minimum sampling error objectives apply to all BC Timber Sales cruise based cutting authorities within the Interior as described in the *Interior Appraisal Manual*:

BC Timber Sales cutting authorities must:

1. Achieve a  $\leq 10.0\%$  sampling error objective at 2 SE using measure and count plots, and an average of at least 4.0 trees per plot per cutblock, or
2. The sampling error will be waived if the following conditions have been met:
  - a. A systematic grid of equal intervals and spacing of not greater than 70 metres by 70 metres has been established,
  - b. A maximum ratio of 1.0 count plot to 1.0 measure plot has not been exceeded, and
  - c. An average of at least 4.0 trees per plot per cutblock has been achieved.

The following minimum sampling error objectives apply to all **other** cruise based cutting authorities within the Interior as described in the *Interior Appraisal Manual*:

1.  $\leq 8.0\%$  at 2 SE on all plots, and
2. If count plots are used, a 2 SE of  $\leq 12.0\%$  on full measure plots must be achieved.

All other scale based standards apply, except that the sampling error cannot be waived.

**Interior cutting authorities cannot be cruise based if a partial cutting prescription with greater than 10% percent overall volume or basal area retention is in place.**

### 2.3.4. Cruise Based Cutting Authorities – Coast

The following minimum sampling error objectives apply to all cruise based cutting authorities within the Coast area (except road right of way timber to be transported under road timbermark) as described in the Coast Appraisal Manual:

Cutting authorities must:

1. achieve a  $\leq 10.0\%$  sampling error objective at 2 SE using measure and count plots, and an average of at least 4.0 trees per plot per cutblock, or
2. The sampling error will be waived if the following conditions have been met:
  - a. For cutting authorities of 40.0 ha net merchantable area or larger in size:

### 2.4.2. Standards for the Location of Additional Plots to Meet Section 2.2 Requirements

The following sections describe the situations and procedures to establish additional plots where the grid design does not meet the minimum one or two full measure plot per timber type polygon standard specified in Section 2.2.

#### 2.4.2.1. Office Cruise Plan Procedure

When creating the cruise plan map, reduce the grid interval (using the same grid system) within the desired timber type by increments of 10 metres until the largest grid spacing meets the minimum plot establishment standards is achieved. The grid, **or interplot distance for linear tenures**, must be reduced from the point where the grid originates (See Section 2.4.1), but only for the type in which additional plots are needed, not for the entire cutblock or cruise.

#### 2.4.2.2. Field Procedure

In the event that in the field, measure plots fall outside the timber type polygon, then use the procedure in the following table to establish the measure plot(s) inside the timber type polygon:

Sequence	Location	Sequence	Location	Sequence	Location	Sequence	Location
1	1/2 Grid North	2	1/2 Grid East	3	1/2 Grid South	4	1/2 Grid West
5	1/4 Grid North	6	1/4 Grid East	7	1/4 Grid South	8	1/4 Grid West
9	1/8 Grid North	10	1/8 Grid East	11	1/8 Grid South	12	1/8 Grid West
13	1/16 Grid North	14	1/16 Grid East	15	1/16 Grid South	16	1/16 Grid West

The procedure must be applied from the planned measure plot locations that fell outside the timber type polygon in the field. This procedure is used to obtain the required number of measure plots in the timber type polygon. If the plot cannot be established inside the timber type polygon using this procedure, attempt to establish the plot using this procedure with NE, NW, SE or SW bearings.

### 2.4.3. Standards for the Location of Additional Plots to Meet Sampling Error

Where plots must be added to an existing cruise plan to meet the sampling error requirement, they must be added in a systematic random manner. It is recommended to target the timber type (s) with the greatest variability. Determine the number of plots required using the coefficient of variation statistic for the timber types from the compilation (See Coefficient of Variation in the Appendices).

Where the added plots result in an overall sampling intensity equivalent to a 100m by 100m grid, or a 70m by 70m grid, it will be considered equivalent to that grid spacing. Smaller grids may be used in a sample design at the discretion of the person preparing the cruise plan.

## 3.2. Cruise Plan Standards

The cruise plan is a key document that supports the integrity of the sample design.

A cruise plan must include the requirements identified in sections [2.2](#) and [3.2.1](#), as well as the cruise plan form (FS 693). If all the required information is included on the cruise plan map, a cruise plan form (FS693) is not required.

The cruise fieldwork and compilation may not be accepted by the Ministry for use in the appraisal if the above conditions are not met.

### 3.2.1. Cruise Plan Map Standards

1. The cruise plan map must be legible and of good quality 1:5 000 or 1:10 000 scale.
2. The cruise plan map must provide clear and legible lines, lettering and numbers.
3. The cruise plan and/or cruise plan map shall include the items indicated in Table [3-1](#).

A sample cruise plan map can be seen at the following link:

[Sample Cruise Plan Map.pdf](#)

**Table 3-1 Requirements for Cruise Plan and Final Cruise Submissions**

	Requirements	Cruise Plan Submission	Final Cruise Submission
a	Tenure and Cutting authority	Yes (if known)	Yes
b	Forest Region and District	Yes	Yes
c	Scale	Yes	Yes
d	Timber Supply Area	Not required	Yes
e	North Arrow, Declination, Map base	Yes	Yes
f	Cruise or Scale Base Indicator	Yes	Yes
g	Maturity of forest inventory polygons/cutblocks identified	Yes	Yes
h	Timber type lines and identifier	Yes	Yes
i	Point of Intersection (local cruise grid only)	Yes	Yes
j	Plots identified as measure or count plots and numbered	Yes	Yes
k	Cutblock numbers (including any old numbers if changed)	Yes	Yes
l	Cutblock and type net areas	Yes	Yes
m	Harvest methods and areas	Only required for heli logging areas	Yes
n	Existing and proposed roads	Yes	Yes

	Requirements	Cruise Plan Submission	Final Cruise Submission
o	Forest Inventory Zone	Not Required	Yes
p	PSYU	Not Required	Yes
q	Biogeoclimatic zone(s) and sub zone(s)	Not Required	Interior only
r	Plots used in the compilation are clearly indicated	Not required	Yes
s	Locations of baselines (when used), boundary tie lines, points of commencement and actual strip line location with direction of travel (direction of travel and strip line location not required for GPS located plots)	Not Required	Yes
t	Actual location of plots in field (after fieldwork is completed)	Not Applicable	Yes
u	Physiographic features	Only if they affect sampling	Only if they affect sampling
v	Legal survey features	Only if they affect sampling	Yes
w	Forest and non-forest type boundaries	Yes	Yes
x	Cutting boundaries	Yes	Yes
y	Location of Marked to Leave Percent Reduction Trees	Yes (if known)	Yes
z	Name of person or company who produced map and date map was produced	Yes	Yes
Aa	Name of person(s) who completed the cruise field work	Yes - proposed	Yes
Ab	Signature of submitting professional	Yes	Yes
Ac	Registration type (ATE, RFT, RPF) and registration number	Yes	Yes
Ad	Indicate if the submission is original or a revision	Yes	Yes

Longworth, Monkman, Purden and Robson PSYUs and TFL 30. Tree heights are used to determine mature red cedar loss factors in these PSYUs and TFL (Loss Factor Table 0296). The height in metres in Card Type 9 is not a check cruise item in any other PSYU or TFL. (See [4.3.1.9](#))

## 5. Pathological Indicators (Section [4.3.2.7](#))

No more than 10.0 % of all trees checked can have a risk group change resulting from incorrect pathological indicator records.

## 6. Damage Codes (Section [4.3.2.18](#))

The following standards apply to the measurement of damage codes:

- a. No more than **1 for every 20** trees checked can have an incorrect code.
  - i. **1 error for 1 to 20 trees checked**
  - ii. **2 errors for 21 to 40 trees checked**
  - iii. **3 errors for 41 to 60 trees checked**
  - iv. **With one additional allowable error for every 20 trees assessed thereafter.**
- b. Incorrect codes that result in a risk group change will contribute to the number of pathological indicators and risk group changes (not applicable to CGNF cruises).
- c. In the case of a reappraisal due to damage as specified in the *Interior Appraisal Manual*, the following standards will apply:
  - i. All reclassification of insect damage, fire codes and down tree codes must be based on field data collection.
  - ii. In order to provide the Ministry with adequate time to perform check cruises, re-sweep data must be provided to the Ministry at least 10 business days prior to the commencement of any harvest activity, or some other mutually agreed upon time frame. In turn, the Ministry must respond to the licensee within that time frame if there are any concerns with the cruise, otherwise the cruise will be considered acceptable. If re-sweep data is not submitted as required in this section the data may not be included in the appraisal.
  - iii. In order to check and verify the re-sweep insect, fire and down tree code data and confirm who performed the cruise, the following information must be made available to the Ministry:

The date(s) the re-sweep was completed.

The cruiser must take responsibility for the cruise data in accordance with Section [3.8\(5\)](#) of this manual.

## Tree Class 2

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 swelling), rotten branches, dead or broken top.

All pathological indicators must be recorded for each tree in the tree third where they occur 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 Risk Group Ratings by Pathological Indicators (Appendix 20: Table 7.20.1) for risk group assignments by pathological indicators.

## Tree Class 3 (Dead Potential; Older Immature Dead Potential in Interior)

Tree Class 3 are dead standing or down timber which is estimated to contain at least 50 percent of its original gross volume in soundwood (firmwood) 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; except for insect attacked trees where a tree with less than 5.0% red needles will be considered dead.

For net merchantable volume compilation, dead potential stems will have the highest Risk Group deduction for the species, except Lodgepole Pine which will use Risk Group 2 Loss Factors.

Refer to Sound Wood Factors for Saprot (Appendix 7: Table 7.7.1), Sound Wood Factors for Heart Rot (Appendix 7: Table 7.7.2) and the Ten Metre Log Table (Appendix 7: Table 7.7.4) to assist in the determination of 50.0 percent soundwood content.

Decay should be determined at various intervals on the tree, preferably at the mid-point of each third of down trees **or the midpoint of each 10 metre log. If using the volume in thirds to assess the soundwood content cruisers must use a ratio of 65% of the original gross volume is in the bottom tree third, 30% in the middle third and 5% in the top third of the total original tree height.**

### 1. Dead Standing

Decay percent is difficult to assess on standing trees. "Sounding" can be helpful, but must only be done in safe conditions.

### 2. Dead Down

On the Coast, only Tree Class 4 trees that contain a CGNF minimum 8 m standard U grade log are tallied. On the Coast, the original tree height and DBH are required for CGNF measurements and must be recorded.

Tree Class 4 trees that are not self-supporting are not to be tallied as they are considered down trees.

### **Tree Class 5 (Mature)**

Tree Class 5 trees are living mature trees which are considered:

- a. A coniferous tree greater than 120 years old in a stand with age in 10's of 12 or less.
- b. A deciduous tree greater than 40 years old in a stand with age in 10's of 4 or less.

Two exceptions exist:

- 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.

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

Live useless trees are **living** trees that exhibit extreme decay, **as detailed below**. They are combined with Tree Class 4 for the compilation of percent snags. This tree class must not be confused with a Tree Class 2 tree with a high proportion of rot due to conk. **Tree class 6 determination is not dependant on low percentage of sound wood remaining and must meet the following definitions.**

#### **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).

#### **All Other Tree Species**

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.

### **Tree Class 7 (Dead Potential; Mature Dead Potential in Interior)**

Tree class 7 dead potential trees are mature and contain at least 50.0% of the tree's original

Age of living trees is determined by a ring count from an increment borer core, taken at diameter breast height (DBH). The pith must be included in the core to properly count the age of the tree. In cases where the pith is not contained in the core, and is missed by an estimated three years or more, the tree must be re-bored.

Sufficient trees must be bored for age to ensure the correct maturity classes. The number of trees that need to be drilled will be dependent upon the maturity profile in each plot.

Refer to the **VRI** age class codes from the table below to **support in** determining the corresponding age range **for the dominant trees in a timber type**.

<b>VRI Age Class Code</b>	<b>Age Class Limits</b>
1	1 to 20 years
2	21 to 40 years
3	41 to 60 years
4	61 to 80 years
5	81 to 100 years
6	101 to 120 years
7	121 to 140 years
8	141 to 160 years
9	250 + years

#### **4.3.2.7. Positions 37 to 44 Pathological Remarks**

Pathological indicators are recorded when observed on the bole or a merchantable secondary leader (see Section 7.4.2) of the tree. The exceptions are:

- *Phaeolus Schweinitzii*, which will occur on the ground near the base of the tree.
- Scars on root collars.

There are qualifications to many of the pathological indicators, such as age of scars, position of fork or crook, size of rotten branches, etc. (please refer to Pathological Classification of Trees - Appendix 17, for a detailed description of pathology).

Pathological Indicators located above 10 cm top diameter (inside bark) are not to be recorded.

Refer to the box entitled "Path Code by Tree Third". This indicates the numerical coding to be used in this section. The tree is schematically divided into thirds, with the bottom (BOT) cells representing the bottom third, the middle (MID) cells the middle third, and the top (TOP) cells the

row.

- i. To check the FIZ, re-select ‘Map Layers’ under the ‘Navigation’ tab.
- j. Expand the ‘Land Cover’ category.
- k. Select the box beside ‘Vegetated Land Cover’.
- l. Select the ‘Identify’ symbol at the top up the page (under navigation tab).
- m. Click on the map location you want to define.
- n. The results are displayed on the left side of the map.
- o. Among the results highlighted in blue at the left hand side of the map, there should be one or more 7 digit numbers for PSYU (e.g.3391115). Select one of these numbers.
- p. Scroll down the list under the attributes tab until you find FIZ Code.

3. If a discrepancy between the FIZ and PSYU prevents compilation of the cruise data, the Area Director must determine which FIZ and PSYU combination will be used.

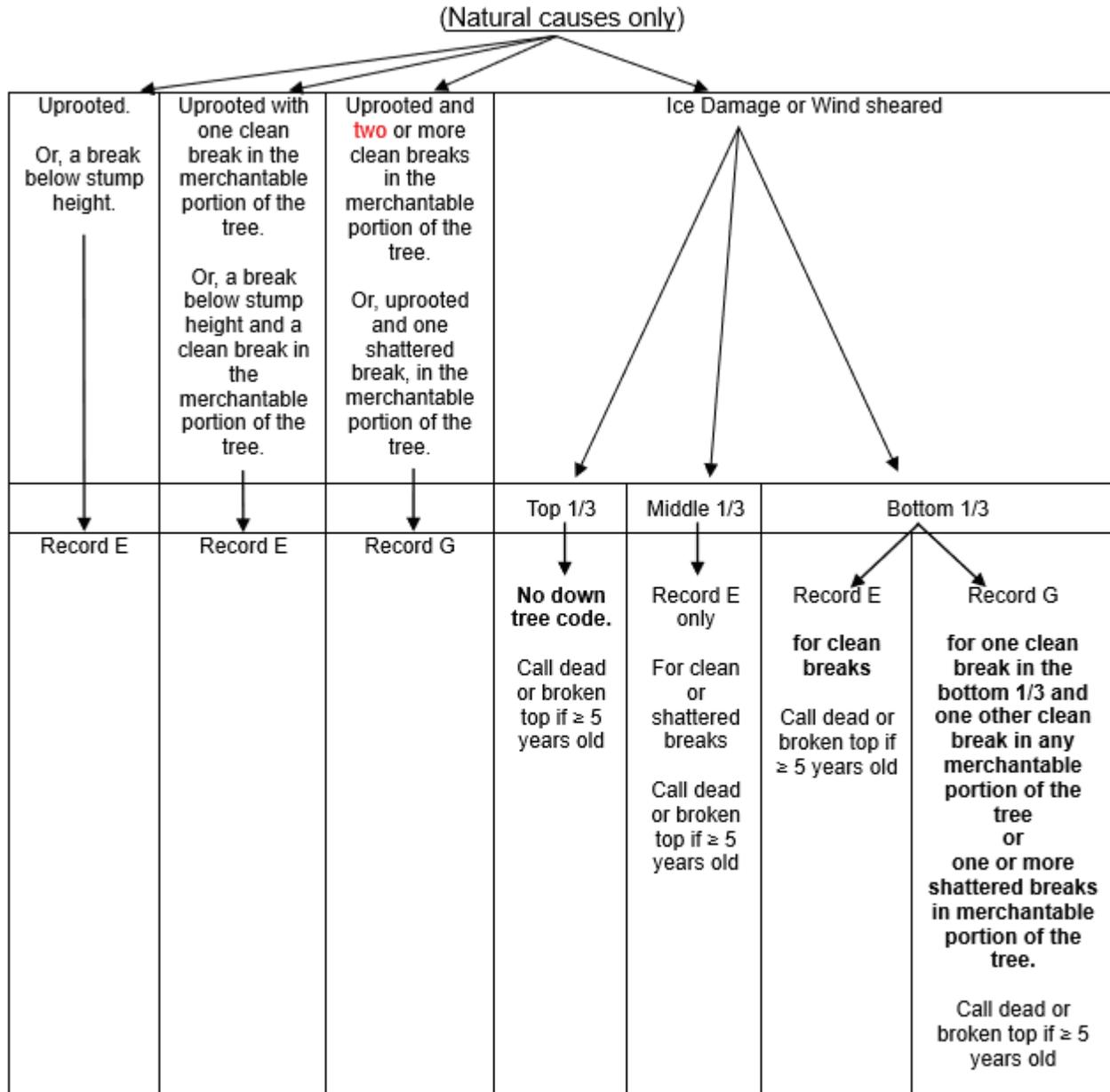
**7.5.2. Tree Farm Licences**

The TFL loss factors are the same as those approved by the Chief Forester in the Management Plans (MP). This manual will be updated as new Management Plan's result in loss factors changes. All "local" factors noted below apply only to mature volumes (i.e., 121 years or greater). Timber Licences in the TFL’s use the TFL loss factors and Timber Licences outside of the TFL will use the *Metric Diameter Class Decay, Waste And Breakage Factors 1976*.

All loss factors referenced in the following lists refer to the Ministry of Sustainable Resources Management publication entitled: *Metric Diameter Class Decay, Waste And Breakage Factors 1976*.

**7.5.2.1. TFL Loss Factors for Coast Forest Region (Table 7.5.1)**

TFL 6	Kingcome locals for Cedar and Hemlock. All others FIZ "B"
TFL 10	All FIZ "B"
TFL 19	Nootka local for mature Hemlock. All others FIZ "B"
TFL 25	Area #1 (Dean PSYU) - Kingcome locals for Cedar and Hemlock. All others FIZ "A" Area #2 (Quadra PSYU) - Kingcome locals for Cedar and Hemlock. All others FIZ "B" Area #3 (South Island) - All FIZ "B" Area #4 (Old TFL 24 – Queen Charlotte Is.) – use FIZ A for all species and maturity classes.



Note: Record all trees in plot if DBH is in the plot (natural or man induced).  
 Damage codes can only be recorded for natural occurrences. No codes for hand felled, beaver felled or mechanical influences.  
 Do not record uprooted TC4 or TC6.

Figure 7-4 Damage Call Matrix for Uprooted, Ice Damaged and Wind Sheared Trees

**7.7.2. Sound Wood Factors for Heart Rot (Table 7.7.2)**

$$\% \text{ Sound Fibre} = 100 * \left( 1 - \left( \frac{\text{Diameter of Heart Rot}}{DIB} \right)^2 \right)$$

A spreadsheet to calculate sound wood using the above equation can be found at the following website:

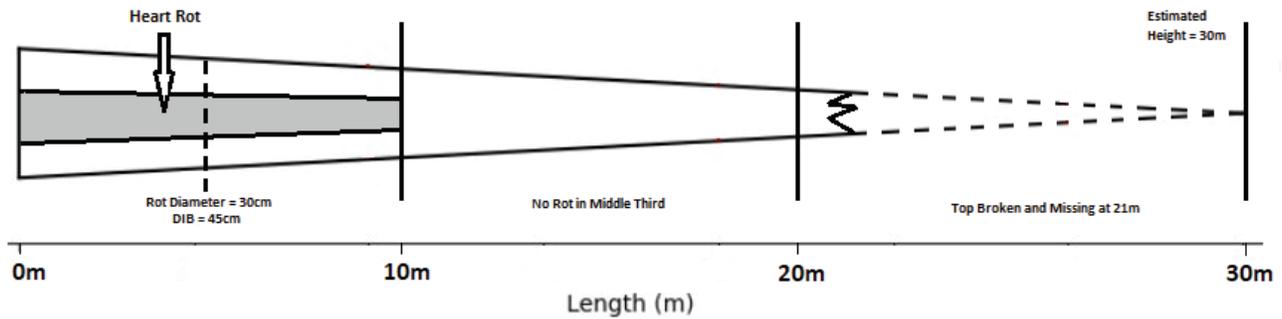
Cruising Calculations

*DIB	HEART ROT DIAMETER (cm) - **Table Reports Percent Sound Fibre																			
	5	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60	65	70
20	94%	75%	64%	51%	36%	19%	0%													
25	100%	84%	77%	69%	59%	49%	36%	23%	8%	0%										
30	100%	89%	84%	78%	72%	64%	56%	46%	36%	25%	13%	0%								
35	100%	92%	88%	84%	79%	74%	67%	60%	53%	45%	36%	27%	0%							
40	100%	94%	91%	88%	84%	80%	75%	70%	64%	58%	51%	44%	23%	0%						
45	100%	95%	93%	90%	87%	84%	80%	76%	72%	67%	61%	56%	40%	21%	0%					
50	100%	96%	94%	92%	90%	87%	84%	81%	77%	73%	69%	64%	51%	36%	19%	0%				
55	100%	97%	95%	94%	92%	89%	87%	84%	81%	78%	74%	70%	60%	47%	33%	17%	0%			
60	100%	97%	96%	95%	93%	91%	89%	87%	84%	81%	78%	75%	66%	56%	44%	31%	16%	0%		
65	100%	98%	97%	95%	94%	92%	91%	89%	86%	84%	81%	79%	71%	62%	52%	41%	28%	15%	0%	
70	100%	98%	97%	96%	95%	93%	92%	90%	88%	86%	84%	82%	75%	67%	59%	49%	38%	27%	14%	0%
75	100%	98%	97%	97%	95%	94%	93%	91%	90%	88%	86%	84%	78%	72%	64%	56%	46%	36%	25%	13%
80	100%	98%	98%	97%	96%	95%	94%	92%	91%	89%	88%	86%	81%	75%	68%	61%	53%	44%	34%	23%
85	100%	99%	98%	97%	96%	96%	94%	93%	92%	91%	89%	88%	83%	78%	72%	65%	58%	50%	42%	32%
90	100%	99%	98%	98%	97%	96%	95%	94%	93%	92%	90%	89%	85%	80%	75%	69%	63%	56%	48%	40%
95	100%	99%	98%	98%	97%	96%	96%	95%	94%	93%	91%	90%	86%	82%	78%	72%	66%	60%	53%	46%
100	100%	99%	99%	98%	97%	97%	96%	95%	94%	93%	92%	91%	88%	84%	80%	75%	70%	64%	58%	51%
105	100%	99%	99%	98%	98%	97%	96%	96%	95%	94%	93%	92%	89%	85%	82%	77%	73%	67%	62%	56%
110	100%	99%	99%	98%	98%	97%	97%	96%	95%	94%	94%	93%	90%	87%	83%	79%	75%	70%	65%	60%

\* DIB must be measured at the same location as the heart rot diameter.  
 \*\* Percentage of sound wood fibre assumes the rot runs the full length of the log or tree.

### 7.7.3. Example Net Tree Volume Calculations Using Volume in Thirds

Volume in Thirds is a method of estimating the volume in each third of a tree based on the total original height. Starting at the based of the tree, the bottom third represents 65% of the tree’s gross volume, the middle third represents 30% and the top third represents 5%.



- Bottom Third (10m) = 65% of Gross Tree Volume

Net Volume = Sound Wood – Full Length Heart Rot

$$= \% \text{ Sound Fibre of bottom third} = 100 * \left( \frac{\text{Diameter of Heart Rot}}{DIB} \right)^2$$

$$= \% \text{ Sound Fibre of bottom third} = 100 * \left( 1 - \left( \frac{30}{45} \right)^2 \right)$$

$$= \% \text{ Sound Fibre of bottom third} = 55.6\%$$

- Middle Third (10m) = 30% of Gross Tree Volume

Net Volume = 100% sound wood as there is no rot or missing wood.

- Top Third (10m) = 5% of Gross Tree Volume

Net Volume = Sound Wood – Missing Wood

$$= 100 * \left( \frac{\text{Gross Log Length} - \text{Missing Log Length}}{\text{Gross Log Length}} \right)$$

$$= 100 * \left( \frac{10m - 9m}{10m} \right)$$

$$= 10\% \text{ sound wood}$$

- Total Net Tree Volume = Bottom Third Net Volume + Middle Third Net Volume + Top Third Net Volume

$$= (65\% * 55.6\%) + (30\% * 100\%) + (5\% * 10\%)$$

$$= (36.1\%) + (30\%) + (0.5\%)$$

$$= 66.6\% \text{ sound, therefore the tree is dead potential.}$$

## 7.10. Appendix 10: FS 695 Provincial Office Check Cruise Form

PROVINCIAL OFFICE CHECK CRUISE FORM					
Licensee:		Tenure/CP:		Cutblock IDs in Submission:	
Cruiser(s)/ Designation/ Agency:		Audit Date (YYYY-MM-DD):		Submitter/ Designation/ Agency:	
Check Cruiser(s)/ Designation/ Agency:		If applicable, professional supervisor of Check Cruiser(s):		ECAS Submission Date (YYYY-MM-DD):	
<b>A. CRUISE PLAN AND FINAL MAP: Maps and Plan Review</b>					<b>Yes / No / NOT CHECKED</b>
1. All cruise plans have all required information as per Table 3-1 in the Provincial Cruising Manual:					
2. All cruise plans submitted prior to commencement of field work:					
3. Are there cruise plan amendments and do they meet standards:					
4. Minimum number of plots per timber type polygon met (both cruise plan and final cruise maps):					
5. Are there changes in cutblock areas, timber type boundaries, reserves, plots, etc. between the cruise plan and final cruise maps? If so, is the professional rationale acceptable (i.e., rare, minor, unforeseen, or good practice)?					
6. Final cruise maps have all required information as per Table 3-1 in the Provincial Cruising Manual:					
<b>B. OFFICE CHECK OF FIELD DATA: Plot Cards</b>					<b>Yes / No / NOT CHECKED</b>
7. Are all plot cards submitted? While a compilation DAT file is mandatory, cruise information may be requested in other formats (paper cards, pdf, ccp, etc.):					
8. If field checked, ensure that any necessary changes were made if required after field audit:					
9. Each plot card filled properly (i.e., signed, dated, and mandatory date elements completed):					
10. All BAF changes limited to one change per type, within 50% of the BAF:					
11. Plot locations and numbers by type, strip and cutblock match the final cruise map:					
12. Harvest methods correctly identified:					
13. If the harvest method is helicopter, have heli lengths been used (Coast CGNF only):					
14. Dual tally. i.e., both Loss Factor and CGNF (Coast only) data present:					
15. Total age of age samples correct (if paper cards are used):					
16. Age in 10s and tree classes correct:					
<b>C. COMPILATION: Cruise/Tenure Information</b>					<b>Yes / No / NOT CHECKED</b>
17. Licenses correct:					
18. Forest District correct:					
19. Forest Inventory Zone (FIZ) correct:					
20. PSYU or TFL correct:					

Figure 7-8 FS 695 - Provincial Office Check Cruise Form (Page 1 of 2)

<b>D. COMPILATION: Map Area Statement</b>		<b>Yes / No / NOT CHECKED</b>
21. Do the final cruise map net merchantable areas match with the compilation and appraisal:		
22. Do the number and areas of the timber types & cutblocks on the final cruise maps agree with compilation:		
23. Type of compilation correct (Interior Only: Wet or dry belt fir = BEC Subzone with most fir):		
24. Is the compilation version correct (see TPB website):		
25. Is re-cruising required as per Provincial Cruising Manual & % immature in compilation (immature "shelf-life" = 5 yrs., mature "shelf-life" = 10 yrs.):		
26. Sampling error % (SE%) achieved (Pre-reduction compilation):		
27. If SE% not achieved, are the SE waived conditions in the Cruising Manual met for: a) Grid spacing? b) Avg. Trees/plot/type? c) Count/Measure ratio?		
<b>E. COMPILATION: Plot Summaries</b>		<b>Yes / No / NOT CHECKED</b>
28. Are the plots in the compilation and appraisal accounted for and only from the harvest area:		
29. Are all the harvest methods correctly identified:		
30. Are all the plots in the correct cutblocks and timber types:		
31. Were count plot orphan trees moved to the appropriate measure plot?		
<b>F. COMPILATION: Reduction Compilations</b>		<b>Yes / No / NOT CHECKED</b>
32. Pre-reduction (full volume) compilation submitted:		
33. Percent reduction input consistent with the selection harvest source documentation and surveys:		
<b>G. COMPILATION: Appraisal Information</b>		<b>Yes / No / NOT CHECKED</b>
34. ASCII cruise data file (DAT) and CSV file attached in ECAS:		
35. All pages of the compilation reporting 'For Appraisal Purposes':		
36. All ECAS Submitted data recompiled without errors and outputs identical to the submitted .pdf (compilation programs available in Citrix):		
37. Key appraisal drivers in ECAS checked: slope, volume, maturity, damage codes, harvest method attributes, partial cut %, etc.:		
<b>H. REMARKS:</b>		
<b>Accepted:</b>		<b>Rejected:</b>
<b>Action:</b>		
<b>Signature:</b>		<b>Professional Designation:</b>
<b>Rejection letter sent by (if required):</b>		<b>Date:</b>

FS 695 HVA 2025/08 Please be advised that this information may be released under the Freedom of Information and Protection of Privacy Act.

Figure 7-9 FS 695 - Provincial Office Check Cruise Form (Page 2 of 2)

Link: <https://www.for.gov.bc.ca/isb/forms/lib/FS695.pdf>

**7.11. Appendix 11: FS 696 Provincial Field Check Cruise Form**

**PROVINCIAL FIELD CHECK CRUISE FORM**

Licensee:		Tenure/CP:		Cutblock IDs in Submission:	
Cruiser(s)/ Designation/ Agency:		Audit Date (YYYY-MM-DD):		Submitter/ Designation/ Agency:	
Check Cruiser(s)/ Designation/ Agency:		If applicable, professional supervisor of Check Cruiser(s):		Cruise Data Submission Date (YYYY-MM-DD):	
# Cruise Plots in Submission:		# of Check Plots:		Cutblock ID(s) Field Checked:	

A. OFFICE CHECK: Field Cruise Data	Yes	No	Comments
1. Cruise Plans acceptable? Plans submitted prior to fieldwork:	<input type="checkbox"/>	<input type="checkbox"/>	
2. Are there any rare, minor, or unforeseen changes to the cruise plans (including boundary changes)? Changes acceptable:	<input type="checkbox"/>	<input type="checkbox"/>	
3. Final Cruise Maps acceptable:	<input type="checkbox"/>	<input type="checkbox"/>	
4. All plot cards submitted:	<input type="checkbox"/>	<input type="checkbox"/>	
5. Each plot card filled properly: i.e., signed, dated, and mandatory date elements completed:	<input type="checkbox"/>	<input type="checkbox"/>	
6. All BAF changes limited to one change per type, within 50% of the original BAF:	<input type="checkbox"/>	<input type="checkbox"/>	
7. Plot locations by type, strip and out block match the final cruise map:	<input type="checkbox"/>	<input type="checkbox"/>	
8. Harvest methods identified:	<input type="checkbox"/>	<input type="checkbox"/>	
9. If the harvest method is helicopter, have heli lengths been used (Coast CGNF):	<input type="checkbox"/>	<input type="checkbox"/>	
10. Count/measure plot ratios met:	<input type="checkbox"/>	<input type="checkbox"/>	
11. Were orphan trees recorded correctly:	<input type="checkbox"/>	<input type="checkbox"/>	
12. Age correction to DBH done correctly (if paper cards used):	<input type="checkbox"/>	<input type="checkbox"/>	
13. Age in 10s & tree classes correct:	<input type="checkbox"/>	<input type="checkbox"/>	

B. FIELD CHECK: Plot Establishment and Boundaries	NUMBER (IF REQUIRED)	ACCEPTABLE (Y/N)	NOT CHECKED
14. Conventional traverse plot location: distances & bearings between plots (+/- 2% distance / 2 degrees), or GPS traverse plot location: PRPs to plot centres:		<input type="text"/>	<input type="checkbox"/>
15. GPS Check Plot Variance: ( $\leq 3m$ avg. & $1/10 > 5.0m$ ):		<input type="text"/>	<input type="checkbox"/>
16. Distance & bearings from reference trees to plot centre (+/- 1% distance / 2 degrees):		<input type="text"/>	<input type="checkbox"/>
17. Sample point integrity plots (<10% total & <20% species basal area change)		<input type="text"/>	<input type="checkbox"/>
18. Cutting boundaries & non-forest types - marking & traverse accuracy:		<input type="text"/>	<input type="checkbox"/>

C. FIELD CHECK RESULTS: Reporting Options	Field Check Results Below:	Field Check Results Attached:
19. Field Check Results recorded on this form or in attached Check Cruise Report (if report attached skip to Section G):	<input type="checkbox"/>	<input type="checkbox"/>

D. FIELD CHECK: Plot Data	NUMBER (IF REQUIRED)	ACCEPTABLE (Y/N)	NOT CHECKED
20. Stem count difference for tree class 1,2,3,5,7,8,9 (max. - 1 stem in 50):		<input type="text"/>	<input type="checkbox"/>
21. Percentage of stems with species incorrectly identified (max. - 1 stem in 50 for tree classes 1,2,3,5,7,8,9):		<input type="text"/>	<input type="checkbox"/>
22. At least 90% plot slopes within +/- 5% slope:		<input type="text"/>	<input type="checkbox"/>
23. Average variation of plot slopes within +/-5% slope:		<input type="text"/>	<input type="checkbox"/>

Figure 7-10 FS 696 - Provincial Field Check Cruise Form (Page 1 of 2)

E. FIELD CHECK: Tree Data		NUMBER (IF REQUIRED)	ACCEPTABLE (Y/N)	NOT CHECKED
24.	% average absolute variation of all of heights checked (max. 5%):		<input type="text"/>	<input type="checkbox"/>
25.	% of diameters that vary >+/-2% (at least 90% within 2%):		<input type="text"/>	<input type="checkbox"/>
26.	Average absolute variation of all diameters checked (max. 2%):		<input type="text"/>	<input type="checkbox"/>
27.	Risk Group changes due to Path. and damage codes (max. 10% of trees with >1 risk group change)		<input type="text"/>	<input type="checkbox"/>
28.	Damage codes - # of trees with incorrect codes (max. 1 for every 20):		<input type="text"/>	<input type="checkbox"/>
29.	Tree Ages - 95% of all trees in correct maturity class for loss factor deductions:		<input type="text"/>	<input type="checkbox"/>

F. FIELD CHECK: 'Coast Only' Attributes		NUMBER (IF REQUIRED)	ACCEPTABLE (Y/N)	NOT CHECKED
30.	Pathology - % of trees with path incorrectly coded in 1 <sup>st</sup> or 2 <sup>nd</sup> third (max 10%):		<input type="text"/>	<input type="checkbox"/>
31.	Quality - % of quality indicators (+/- one 5m log change allowed; max 10% spiral change; knot codes 5 and 6 must be correct):		<input type="text"/>	<input type="checkbox"/>
32.	CGNF – Net volume variation (max 10%):		<input type="text"/>	<input type="checkbox"/>
33.	CGNF – Net value variation (max 15%):		<input type="text"/>	<input type="checkbox"/>

G. REMARKS:	

Accepted:	<input type="checkbox"/>	Rejected:	<input type="checkbox"/>	Date:	
Action:					
Signature:			Professional Designation:		
Approval/rejection letter sent by:			Date:		

FS 696 HVA 2025/06 Please be advised that this information may be released under the Freedom of Information and Protection of Privacy Act

Figure 7-11 FS 696 - Provincial Field Check Cruise Form (Page 2 of 2)

Link: <https://www.for.gov.bc.ca/isb/forms/lib/FS696.pdf>

### 7.15.2.5. Fork or Pronounced Crook

A fork or crook is the result of damage to the main leader of the tree where one or more lateral limbs take over as the main stem. Fork or crook is called if severe enough to indicate that the original injury exposed the wood and provided an entrance point for decay fungi. Fork or crook is to be recorded between the root collar and the minimum top diameter specified in the cutting authority document.

Forks are recorded for any of the following conditions:

1. The main stem is markedly forked to indicate that 2 or more leaders have resulted from serious damage to the original leader (see Figure 7.25 Types of Forks and Crooks Which are Recorded, Example A and B).
2. The diameter of the main stem changes excessively from its normal taper to indicate that a serious injury has occurred. For cruising purposes, the diameter change must be at least 10 percent (Figure 7.25 Types of Forks and Crooks Which are Recorded, Example C and D).
3. Where there is no evidence of a broken top in the stem at the fork/crook position and neither of the leaders are merchantable, record fork/crook.

Crooks are recorded if:

1. There is at least a 10 percent diameter change in the bole above and below the crook (see Figure 7.25 Types of Forks and Crooks Which are Recorded, Example F).
2. The offset is severe enough to indicate that damage occurred to the main stem. For cruising purposes, the offset must be at least 50 percent of the diameter of the tree at the crook (see Figure 7.25 Types of Forks and Crooks Which are Recorded, Example E).

Some forks and crooks are not recorded (see Figure 7.40 Illustrates Forks and Crooks Which are Not Suspect). Forks and Crooks may be a growth characteristic of the tree species (for example deciduous species) or may have developed from malformation of the terminal leader due to insect or mistletoe attack. In addition, a fork may be confused with a branch. Forks or crooks which are not recorded are as follows:

1. Crooks with a minor offset (for cruising purposes, an offset less than 50 percent of the diameter of the tree at the crook).
2. Small sharply angled branches or spikes (for cruising purposes, less than a 10 percent change in the diameter of the main stem).
3. Natural forks and crooks in deciduous tree species.
4. If the damage is less than 5 years old and/or occurs above the minimum timber merchantability specifications specified in the Timber Utilization Policy (Coast or

### Causes of dead tops

Dead tops may be caused by several factors such as:

- insect attack,
- drought conditions,
- sun scald, and
- physiological death.

The recording of dead tops:

- a dead top must be obviously weathered, indicating that death occurred at least five (5) years ago and below the 10 cm top before it will be recorded as a pathological indicator<sup>1</sup>.

### Causes of broken tops

- wind breakage,
- snow damage, and
- damage from falling trees, etc.

Standing trees that are broken in the bottom third will have a windthrow damage code assigned. In this instance, do not record a dead or broken top in the first third unless the broken top occurred at least 5 years previously.

**Do not call both fork and dead or broken top indicators unless there is evidence of two separate injuries.**

### Flat topped trees

When trees attain their potential height for a specific site, the tendency for the top of the crown to flatten out is prevalent especially in certain species such as Douglas fir. This flattening of the crown is not indicative of damage to the tree and will not be recorded as a pathological indicator.

### 7.15.3. Abnormalities which are not Recorded

The following abnormalities are not indicative of decay and are, therefore, not recorded.

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<sup>1</sup> Recent pathological damage and pathological factors above 10 cm top diameter were not included in the loss factor data.