

Ref: 280883

January 24, 2025

BY EMAIL

To: Regional Executive Directors

From: Allan Bennett, Director, Timber Pricing Branch

Re: Amendment No. 3 to the *Cruising Manual* and Amendment No. 1 to the *CGNF Standards and Procedures Manual*

I hereby approve Amendment No. 3 to the *Cruising Manual* and Amendment No. 1 to the *Call Grade Net Factor Standards and Procedures Manual*.

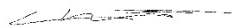
The manuals can be found here:

[Timber Cruising Manual](#)
[CGNF Standards and Procedures Manual](#)

The purpose of this amendment is to update the *Cruising Manual* and *CGNF Standards and Procedures Manual*, which provide:

- Addition of comparative cruise information for use in the Coast Area.
- Update the Check Cruise Submission Form Requirements.
- Separation of H grade and I grade sorts for CGNF.
- Updates and improved clarity of various roles, standards, and procedures.

Amendment No. 3 of the *Cruising Manual* and Amendment No. 1 of the *Call Grade Net Factor Standards and Procedures Manual* come into effect on February 1, 2025.



Allan W. Bennett, RPF
Director
Timber Pricing Branch

pc: Melissa Sanderson, Assistant Deputy Minister, Forest Policy and Indigenous Relations
Division
Patrick Asante, Manager, Timber Pricing
Randy Husband, Director, Regional Operations Division, Coast Area
Anthony Giannotti, Director, Regional Operations Division, North Area

Larry Henry, Director, Regional Operations Division, South Area

Fred von Westharp, Pricing Section Head, Regional Operations Division, Coast Area

Gretchen Prystawik, Revenue Team Lead, Regional Operations Division, North Area

Bruce Sullivan, Revenue Officer, Regional Operations Division, South Area

TIMBER PRICING BRANCH

Cruising Manual

Effective: July 1, 2020

Includes Amendments

Amendment No. 3

Amendment No. 2

Amendment No. 1

Effective Date

February 1, 2025

August 1, 2024

July 1, 2021



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Highlights

Section	Description
1.1	Added definitions for Check Cruising, Harvest, Timber Cruising and Uprooted.
2.2	BCTS maintains all cruising related documents on file.
2.3.5	Added BC Timber Sales Managers to approve specific external right of way volume scenario.
2.5.2	Clarify the Area Director approves and does not determine volumes of unsafe to cruise areas.
2.5.3	Updated cruise plan guidelines for patch cut systems.
2.9	Remove references to 'Interior Only' for comparative cruising.
3.1	Clarify BCTS completes check cruising where approved.
3.3.1, 3.8	Check Cruise Submission Form is to be submitted to the District prior to submission of cruise data to ECAS.
3.4	Allow licensees to re-sweep for fire damage code updates.
5.10.1	Added Partial Cut Percent Report, and CP, Block and Type Damage Summary Reports to the list of required if requested by Ministry.
7.6.3	Clarify blowdown code guidelines and updated Figure 7-4.

1.1. Definitions

In this manual:

“**100% Cruise**” means a cruise in which every tree is measured.

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

“**Accuracy**” means the nearness of a measurement to the actual value of the variable being measured;

“**Area Director**” means the Area Director of Pricing and Tenures for the North or South Areas, the Area Director of Pricing, Tenures and Administration for the Coast Area, and/or their delegates;

“**BAF (Basal Area Factor)**” means the basal area (m²) per hectare that each "in" tree represents when using a prism or relaskop. Prisms are sometimes classified as "dipter" size or inscribed with the BAF number. The size denotes the basal area factor (i.e., an 8 BAF prism which tallies 7 trees in a plot would give a basal area (in timber) of 56 m²/hectare);

“**BC Albers**” means a map projection that is one of the standard map projections used in British Columbia.

“**BCTS**” means BC Timber Sales;

“**Bias**” means a difference between the sampling result and the actual value due to errors in measurement, sampling procedure or calculations;

“**Bole**” means the trunk or main stem of the tree and excludes branches and candelabras. The bole of the tree includes merchantable and non-merchantable portions of the trunk of the tree.

“**Boring Height**” means the distance from the ground (high side) up the tree to where an age is taken with an increment borer. It is usually taken at breast height (1.3 m);

“**Breast Height**” means the location on a tree where its diameter (DBH) is measured. It is located exactly 1.3m above "high side". If high side is lower than the point of germination (POG), breast height is 1.3 m above the POG;

“**Cardinal directions**” means North, South, East and West. All references to azimuths or bearings mean the “true” value. For a description of True North, please see True North, Magnetic North and Grid North in the Appendices;

“**CGNF**” or “**Call Grade Net Factor**” means the survey methodology used by timber cruisers to estimate decay, waste and grade for individual logs in a tree;

“**Check Cruiser**” means a person authorized by the Ministry to assess the veracity of timber cruising data;

“**Check Cruising**” means an audit of the quality of the design, fieldwork and compilation of a

cruise to determine whether it meets Ministry standards;

“**CEP**” means Circular Error Probability, a measure of precision, defined as the radius of a circle, centered around the mean, which is expected to include 50% of the results.

“**Closure Error**” means the distance between the start and end of the traverse in a closed traverse, divided by the length of the traverse, and is usually expressed in percent;

“**Coast**” or “**Coast Area**” means the area subject to the *Coast Appraisal Manual*;

“**Coefficient of Variation (CV)**” is a relative measure of variation, equal to the sample standard deviation expressed as a percentage of the sample mean $\frac{SD}{\bar{x}}$;

“**Confidence**” means an expression of precision of sample estimates, usually assessed by confidence intervals such as 95 percent, a specified proportion of which contain the true population parameters;

“**Correct**” is used in this manual in the context of an audit (or check cruise). In this context, correct means the value determined by a check cruiser. This definition recognizes that cruisers and check cruisers are fallible. This underscores the importance respectful communication, extending the benefit of the doubt where there is valid doubt, and dispute mechanisms as a last resort.

“**Count Plot**” means a prism plot where only the number of "in" trees by species and plot slope is noted. No individual tree measurements are recorded;

“**Crown Class**” means one of the four crown classes, which are dominant, co-dominant, intermediate and overtopped (see *Figure 6.3 Crown Classes*);

“**Cruise-Based**” means a cutting authority where under section 106 of the *Forest Act*, the stumpage payable is calculated using information provided by a cruise of the timber conducted before the timber is cut;

“**Cutblock**” for Interior cruises is as defined as a ‘logical unit’ in the *Interior Appraisal Manual*. A coast definition may be provided in a future Coast Appraisal Manual amendment.

“**Cutting Authority Area**” means the area authorized to harvest Crown timber, as provided by the *Forest Act*;

“**Cutting Specifications**” mean the timber merchantability specifications as defined in the *Coast* and *Interior Appraisal Manuals*;

“**DBH (Diameter Breast Height)**” means the outside bark diameter of a tree measured at breast height;

“**Decay, Waste and Breakage (DWB)**” means factors to reduce the gross merchantable volume to a net merchantable volume and to approximate the volume depletion due to decay, firmwood waste and breakage due to harvesting;

“**DIB (Diameter Inside Bark)**” means the diameter of a tree, excluding bark;

“**Diopter**” means a method of denoting prism "size". A value of one diopter represents a right

angled deflection of one unit per one hundred units in distance.

The formula for converting diopter size to BAF size (metric) is:

$$\text{BAF} = 10,000 / \left[1 + \left(\frac{200}{\text{diopters}} \right)^2 \right]$$

“**Double Sampling**” means a method which incorporates a second sampling procedure where only some of the characteristics of the main sampling method are recorded. An example is measure and count plots established on a cutblock;

“**Faller Selection**” means a timber falling technique that applies to selection logging in cutting authorities where the cut and leave trees are not marked and the faller decides which trees to cut or leave. The decision is based on the partial cutting prescription and/or safety considerations;

“**Firmwood**” means the volume remaining after the application of firmwood deductions as defined in the *Scaling Manual*.

“**Fixed Area Plot Sampling**” means a sampling method where a fixed amount of area is sampled in each plot within a stratum. All trees larger than the timber merchantability specifications are tallied if they are within the plot. All plots within a stratum must be the same size and shape;

“**Forest Inventory Zone**” or “**FIZ**” means one of the 12 zones delineated by Forest Analysis and Inventory Branch of the Ministry of Forests.

“**GIS (Geographic Information System)**” means a system designed to capture, manage, analyze, store and present digital geographic data;

“**GMT**” means Greenwich Mean Time, a global time standard. For the most part it is synonymous with UTC, but does not have a precise definition at the sub-second level.

“**GPS (Global Positioning System)**” means a method of determining or relocating a geographic position using a device to transmit and receive signals through a network of satellites;

“**Grid system**” means a method used to locate cruise plots systematically along a grid, usually a predetermined management unit specific GIS grid or a local cutblock level grid;

“**Harvest**” means to cut and remove timber from a cutting authority area;

“**HDOP**” means horizontal dilution of precision, which is a measure of the precision of GPS results related to the satellite positions. As HDOP decreases, the level of precision increases.

“**High Side**” means the position where the ground meets the tree adjacent to highest ground, ignoring any root flare, obstacles, vegetation, and loose matter that has accumulated at the base of the tree;

“**Interior**” means the area subject to the *Interior Appraisal Manual*;

“**Licensee**” means the holder of the cutting authority;

“**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 harvesting phase. The selection method may specify "removal" or "leave" trees. Some examples of selection criteria are diameter, species, volume, age, height, disease or other damage. For the “partial cutting” criteria in the interior, please refer to chapter 4 of the Interior Appraisal Manual;

“**Pathological Indicators**” means conk, blind conk, scar, fork or crook, frost crack, mistletoe, rotten

branch, and dead or broken top;

“**PDOP**” means positional (3D) dilution of precision, which is a measure of the precision of GPS results related to the satellite positions. As PDOP decreases, the level of precision increases.

“**Percent Reduction**” means a specified percentage reduction of the cruise volume which is targeted to be reserved from harvesting;

“**PRF (Plot Radius Factor)**” means a factor which multiplied by the DBH (cm) of a tree represents the appropriate plot radius (m) for the tree. In variable plot cruising, each tree has its own plot radius. This is a function of tree diameter (DBH) and prism BAF (m²/ha) size. The PRF formula is: $PRF = 0.5/\sqrt{BAF}$;

“**Plot Sampling**” means the estimation of volumes and grades by species within a cutblock from sample plot measurements, and the determination of the sampling error associated with the plot estimates;

“**Precision**” means the closeness, to each other, of repeated measures of the same quantity, expressed as Sampling Error or Standard Error of the sample estimate;

“**PRP**” means plot reference point; a GPS waypoint located a short distance (e.g. 15 to 20 m) from the cruise plot. The bearing and distance to the cruise plot are calculated and measured from this point;

“**PSYU (Public Sustained Yield Unit)**” means a management area of Crown land, with similar forest attributes based on local samples. PSYU always overrides the tables determined by FIZ;

“**Residual tree**” means a tree which does not bear any of the following external indications of decay on or immediately adjacent to the bole of the tree: conk, blind conk, scar, fork or pronounced crook, frost crack, mistletoe trunk infection, rotten branches, dead or broken top;

“**Risk Group**” means a grouping by expected "risk" or probability of average decay, waste and breakage. A combination of tree class, pathological indicators, Forest Inventory Zone and PSYU determines the Risk Group of an individual tree for volume deduction;

“**RMS**” means root mean square and is calculated by taking the square root of the average of the squared errors. It is a measure of precision, meaning that there is a 63 to 68% probability that the results will be within the RMS distance;

“**Sampling Error %**” means an expression of the accuracy of the sampling of the cruise, calculated as a percent of an estimated mean to a desired probability;

“**Scale-Based**” means the stumpage payable is based on a scale of the timber harvested from the cutting authority in accordance with Part 6 of the *Forest Act*;

“**Single Stem**” means the removal of individual trees based on specific tree level criteria, regardless of harvest method. Single stem removal, for the purposes of this manual, does not include the removal of trees based on spatial distribution or for silvicultural purposes, such as commercial thinning.

“**Site Class**” means a set of 4 site quality classes (good, medium, poor, low) which characterize the potential growth capacity of the minerals and moisture in the soil, as measured using tree height (metres) attained at the breast height age of 50 years;

“**Soundwood**” means soundwood as defined in the *Scaling Manual*;

“**Standard Deviation (SD)**” means the square root of variance. It characterizes dispersion of individuals about the mean and gives some idea whether most of the individuals in a population are close to the mean or spread out;

“**Standard Error (SE)**” means an expression of how close the sample mean is to the true mean. Two standard errors (2 SE) means there is a 95% chance that the true mean is within the sampling error of the cruise;

“**Stratification**” means the process of delineating strata boundaries within a population, where each stratum has unique characteristics such as species composition, height, stand volume or age;

“**Stratum**” or “**Strata**” means a delineated portion of a population for which separate volumes and sampling statistics are calculated. A population may be made up of one or many subpopulations or strata. These are commonly known as types, timber types, or timber type polygons;

“**Strip Line**” means a ribboned line located through the forest and tied to the boundary at one or both ends. Cruise plots are located at regular intervals along each strip;

“**Stubbed**” means the practice of harvesting or removing a portion of the tree so that part of the bole (stem) above stump height remains;

“**Stumpage Rate**” means a charge levied by the Crown determined in accordance with the policies and procedures approved by the minister;

“**Suspect tree**” means a tree which bears one or more of the following external indications of decay on or immediately adjacent to the bole of the tree: conk, blind conk, scar, fork or pronounced crook, frost crack, mistletoe trunk infection, rotten branches, dead or broken top.

“**Tie Point**” means a specific point on the ground whose location is readily identifiable on a digital image, aerial photograph or map (e.g., road intersection, corner of a field or swamp, field located traversed or GPS station);

“**Timber Cruising**” means the estimation of the volume and quality of standing and down timber determined by sampling a cutting authority;

“**Timber Supply Area**” means large contiguous areas of Crown land on which an annual allowable cut is calculated;

“**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); and

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

2.2. Cruise Plans

Cruise plans are professional documents and must be:

1. prepared by a qualified registered or associate member (RPF, RFT, ATE) of Forest Professionals British Columbia, or
2. supervised by a registered member (RPF, RFT) of Forest Professionals British Columbia.

It is mandatory for licensees and Timber Sale Managers to submit plans to the District Manager prior to the commencement of a timber cruise. In areas where district staff do not check cruise BCTS, the Timber Sale Manager must maintain the cruise plans **and all other cruising related information** on file.

Cruise plans must be submitted to Ministry staff to allow for the development of field quality assurance schedules and to provide a basis for comparison against the final cruise submission.

Cruise plans must contain the items specified in:

- Section 3.2.1, and
- Forms section - Figure 7.6 FS 693 - Provincial Cruise Plan (Page 1 of 2).

For an example of a cruise plan map, please see the following link:

[Sample Cruise Plan Map.pdf](#)

All forest and non-forest type areas must be identified on the cruise plan prior to field sampling. A non-forest type, as identified on the cruise plan map, is not sampled for appraisal (i.e., rock bluff, swamp, constructed linear tenure, creek, riparian reserve area, slide track and gravel pit). (See [Section 2.8](#))

Timber type polygons must be unique to each cutblock. If forest types are not identified on the cruise plan each cutblock must be compiled as a single forest type.

Timber types that are 1.0 hectare or larger must contain at least 2 full measure plots and timber types that are less than 1.0 hectare must contain at least 1 full measure plot. See Section 2.4.2 for additional information on locating the minimum number of plots.

Each cutblock will be administered as being in the district that contains fifty percent or more of the net merchantable cruise area.

The cruise plan is a professional document and forms the basis for the statistical sample. It must identify the population to be sampled and the design that will be used to meet the minimum cruise standards. The cruise plan is the key document that provides assurances to the Ministry that the data supplied to the appraisal was collected in an unbiased manner.

Changes to a cruise plan must be rare and minor in nature and must only be undertaken to affect unforeseen issues that affect good forest management or other minor operational issues.

- i. An average of at least 4.0 trees per plot per cutblock has been achieved, and
- ii. Full measure variable plots have been established along the road centre line using a grid spacing that will achieve a minimum of 2.0 full measure plots per hectare. Timber types less than 1.0 hectare must contain 2 full measure plots. The first plot is to be located at half the calculated grid spacing along the first tributary road that accesses the cutblock.

In the GBRN, if the minimum tree count cannot be achieved with a BAF of 12.25 (or less), then the minimum tree count requirement will be waived.

When sampling road segments under road permit they must be compiled as cutblocks that are clearly defined on the cruise plan maps. A cutblock may contain multiple road segments.

2. For cruise based road permits or road permit amendments in the Great Bear Rainforest North, where timber on the road right of way within a cutblock is removed under the road permit (RP), instead of the cutting permit, all cruise plots from the timber type within the cutblock containing a road segment must be used in the cruise compilation for the RP. For these segments:
 - a. The area of the RP must be removed from the CP's cruise compilation,
 - b. Road segments internal to a cutblock or type must be typed separately from the external road segments.
3. Where BCTS or Coastal Cruise Based (see [Sections 2.3.4](#) and [2.3.5](#)) road rights of way external to a cutblock are to be cruised and appraised with the cutblock harvest area, the following three options are available:
 - a. Extend the cruise grid of the adjacent timber type through the road right of way and establish any plots that fall within the right of way, or
 - b. Identify the road right of way as a separate type at the cruise plan stage, and:
 - i. Establish full measure variable plots along the right of way centre line using a grid spacing that will achieve a minimum of 2.0 full measure plots per hectare. Type polygons less than 1.0 hectare must contain 2 full measure plots. The first plot is to be located at half the calculate grid spacing within that type.
 - c. Use the cruise data from the cutblock if the District Manager or BC Timber Sales Manager has accepted a written rationale from a qualified registered professional stating why the cruise data from the cutblock is representative of the road right of way area.
4. For scale based cutting authorities, where timber on a road right of way within a cutblock is removed under a road permit (RP) after the cutblock is cruised, the cruise plots that are within the area of the RP shall be included in the cruise compilation for the cutting permit and the area of the RP will be removed from the cruise compilation.
5. Right of way areas not removed under the road permit must be included in the net

2.5. Other Timber Cruising Conditions

This section describes the timber cruising procedures that are required for situations where timber must be re-cruised, where it is unsafe to cruise, where patch cuts are used and where there is a combination of different land classifications or tenures.

2.5.1. Standards for Re-cruising

Re-cruising is required:

1. If the cruise is of mature timber and 10 years has elapsed since the fieldwork was performed.
2. If the cruise is of immature timber and 5 years has elapsed since the fieldwork was performed.
3. If requested by a statutory decision maker as required in the *Coast* or *Interior Appraisal Manuals*.
4. As required by a check cruise (Chapter 3 Quality Assurance).
5. As determined by the Area Director.

In order to determine the maturity of timber for the purposes of this section, the following procedure will be used:

Review the Net Immature % of the Block Summary report from the post-reduction compilation. If the Net Immature is >50.0 %, the timber is immature. If the Net Immature is ≤50.0 %, the timber is mature.

2.5.2. Unsafe to Cruise

Where individual plot or tree data are unsafe to cruise the cruiser can estimate the attributes, provided the estimates are signed off by a registered or associate member of the FPBC.

If an individual plot cannot be completed safely, it will be dropped and the reason documented.

If multiple cruise plots cannot be completed safely, all plots that can be cruised must be completed and the methodology of determining the cruise volume and value of the uncruised plots **is subject to approval** by the Area Director.

Where it is unsafe for cruisers to sample an entire cutblock, or timber type, the methodology of determining cruise volume and value is subject to approval by the Area Director.

As appropriate, the damage codes and slope will be determined by a procedure approved by the Area Director.

2.5.3. Cruising Patch Cut Silviculture Systems – Interior Only

This procedure must be followed for cruising cutblocks with Patch Cut silvicultural systems, as defined in the *Silvicultural Systems Handbook for British Columbia* (<https://www.for.gov.bc.ca/hfp/publications/00085/silvsystemshdbk-web.pdf>). A patch cut system must include several patches smaller than 1.0 ha and may include interspersed larger patches. The area between patches generally has only incidental harvest related to skid trails and road right of way. This procedure does not apply to salvage operations described in the Interior Appraisal Manual. The sampling error requirements for scale based and general cruise based cutting authorities apply as described in Sections 2.3.1 and 2.3.2. Cutblocks using this procedure must have pre-defined harvest boundaries ribboned in the field and mapped prior to cruising.

1. On the cruise plan map, outline the proposed cutblock to include all patches and the area between them.
2. Establish the POC as in Section 2.4.1. All plot grids in the cutblock must originate from the common POC.
3. All timber types must meet the required minimum number of plots **and timber typing rules outlined in Section 2.2.**
4. All plots on the grid that can be established within patch boundaries must be cruised. Plots that land outside the patches will be dropped. Some patches may not have any plots, which is acceptable **so long as minimum sampling requirements are met.**
5. Any square grid spacing may be used to achieve the desired number of plots on the cruise plan. The procedure for reducing grid size in Section 2.4.2.1 does not apply to patch cut cruises.
6. Do not place any plots in the area between patches. This area is part of the merchantable area with partial cutting related to skid trails. This area is to be included as part of the **timber type with the largest net harvest area**, as a separate treatment unit with a percent reduction.
7. To waive sampling error requirements the cutblock must achieve an average 4.0 trees per plot and each timber type must contain a minimum 1.0 full measure plots per ha of clearcut equivalent area at the cruise plan stage. It is acceptable if the final cruise has less than 1.0 full measure plots per ha due to dropped plots. The equivalent clearcut area must be stated on the cruise plan. See the example below.
8. Use the walkthrough method for plots near any identifiable harvest boundary.

As an alternative to the above procedures, patch cut systems without pre-defined patch boundaries (if and where authorized **by the District Manager, Timber Sales Manager or Deputy Minister**) **must** be cruised using the same standards as a clearcut. **All plots must be included in the compilation with an appropriate percent reduction applied. This methodology must only be used in an area where an unbiased, geometric harvest pattern is used.**

Example of a patch cut cruise. (Refer to Figure 2-2)

This cutblock has been planned with the option of waiving sampling error requirements. Type 6 includes all patches smaller than 1.0 ha and the area between patches. It has a total clearcut equivalent area of 4.4 ha (3.8h in TU A + 0.6 in TU B); therefore this type requires a minimum of 5 plots. With a 75m by 75m grid it achieved 7 plots, despite three polygons that did not get a plot. The grid sizes below are examples only. Actual grid sizes may vary to meet the required number of plots at the cruise plan stage.

Type	Retention %	Area (ha)	# Plots	Grid	Patch Size	Notes
I	0	1.0	2	60m	≥ 1.0ha	
II	0	1.7	3	100m	≥ 1.0ha	
III	0	1.7	2	80m	≥ 1.0ha	
IV	0	1.4	2	90m	≥ 1.0ha	
V	0	1.2	2	70m	≥ 1.0ha	
VI TU A	0	3.8	7	75m	<1.0ha	Aggregate of 10 patches using a common plot grid
VI TU B	96	14.4	0	No plots req'd	Area between patches	0.3 ha skid trails (estimated) 0.3 ha ROW between patches <hr/> Equivalent Clearcut Area 0.6 ha
Totals		25.2	18			

2.9. Comparative Cruises

The Interior and Coast Appraisal Manuals specify the situations when comparative cruise data may be used for appraisal purposes.

The use of comparative cruise data is an exception and must be approved by:

- the Regional Executive Director or BCTS Executive Director when the estimated volume is greater than 5,000 m³, or
- the District Manager if the estimated volume is 5,000 m³ or less.

Sample design and methods used in a comparative cruise are subject to approval by the appropriate government representative specified in this section.

3.1. Introduction

Ministry, including authorized BC Timber Sale Areas, audits timber cruises to ensure all appropriate standards are followed, support revenue objectives, ensure the correct calculation of stumpage rates, and to ensure the consistent application of cruise data in the market pricing system (MPS).

As such, the Ministry is responsible for setting the minimum standards for timber cruising, while licensees are responsible, under contract, to meet these minimum standards. Information from the cruise that meets these standards may be used for appraisal.

The Ministry may consider exceptions to these minimum standards in extenuating circumstances on a case-by-case basis.

For quality assurance purposes, cruising field work will be assessed according to the Cruising Manual in effect at the time the field work was completed.

Objectives

The objectives of the quality assurance review are to ensure:

1. The integrity of the sample design. This is achieved by assessing the cruise plan as specified in section 3.2.
2. The measurements of the tree or site attributes meet the minimum standards. This is achieved by comparing a sample of cruiser's measurements against the check cruiser's measurements as specified in sections 3.3, 3.4, 3.5, and 3.6.
3. The reports generated from the approved cruise compilation program and final cruise submission are consistent with the cruise plan and reflect the data collected in the field. This is achieved by assessing the cruise compilation and final cruise submission as specified in section 3.8.

If any of the preceding components of the cruise are not acceptable, the licensee must undertake corrective actions to ensure the cruise meets the minimum Ministry standards.

In addition, if the cruise is not consistent with the procedures included in this manual the Ministry may require that corrective action be undertaken before the cruise data is used for appraisal purposes.

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 (including a forest cover map of the cruise and adjacent areas for cruises containing Lodgepole Pine)	Yes (Forest Cover map not required for Coast)	Yes
i	Plots identified as measure or count plots and numbered	Yes	Yes
j	Cutblock numbers (including any old numbers if changed)	Yes	Yes
k	Cutblock and type net areas	Yes	Yes

3.3. Principles

The following summary outlines the general principles that guide the check cruising process:

The check cruiser has the necessary experience and knowledge to perform the audit.

The check cruiser will strive to select plots to audit using a random process or by a process agreed to by the cruiser and the check cruiser. The check cruiser must define the sample population prior to auditing and the results will apply to that pre-defined sample population.

In order to accept or reject a cruise on the basis of tree data attributes or plot slopes, the check cruisers will audit at least 10.0% of the plots or 5 plots within the sample population (e.g. submission, cutting authority, cutblock, cruiser), whichever is greater. If a cruise is being rejected for measure plot data, the minimum number of plots must be based on measure plots. Otherwise, the minimum number of check plots can include both count and measure plots. If there are fewer than 5 plots in the population, all plots must be audited. If fewer plots have been audited and there is mutual agreement between the cruiser or licensee representative and the check cruiser, the cruise may be rejected or accepted.

The check cruiser should provide an opportunity for the cruiser or company representative to attend the audit by providing advance notice.

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

A copy of the check cruise report will be provided to the cruiser in a format that is acceptable to the respective Area Director.

Benefit of the doubt will be extended to the cruiser. If a call is considered borderline or difficult to discern, a brief rationale should be noted by the cruiser on the cruise card and where appropriate, in the field. The cruiser's decision will be accepted where the decision is reasonable in the particular circumstances.

Plot centres, plot centre reference trees, sample trees and strip lines (where used) must be marked in the field and in a fashion so as to provide a reasonable level of identification to support the audit function.

3.3.1. Check Cruise Submission Form

The Check Cruise Submission Form allows the Ministry to assess the need for a field check cruise. When submitting the form licensees must use the most recent version of the Check Cruise Submission Form. The form must be completed and submitted to the District Manager prior to a field audit of a timber cruise **and before the cruise data is submitted into ECAS**. A copy of the fillable form can be downloaded on the Ministry's timber cruising website:

[Timber Cruising - Province of British Columbia \(gov.bc.ca\)](http://www.gov.bc.ca)

If not already submitted, the District Manager may request the submission of the form and associated cruise data anytime after the field work is complete in order to perform a field audit. In these cases licensees must, at a minimum, submit the form and associated cruise data for the requested cutblocks via email within five (5) business days.

The minimum criteria for cutblocks to be included in a Check Cruise Submission Form:

1. All cutblocks must be in the same District,
2. All cutblocks must be for the same licensee, and
3. The form must be endorsed by a forest professional or associate member with the FPBC (RFT, RPF, ATE or AFP-LL) who takes responsibility for all data on the document.

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](#))

4. **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.

5. **Damage Codes** (Section [4.3.2.18](#))

The following standards apply to the measurement of damage codes:

- a. No more than 5.0 percent of all trees checked can have an incorrect code.
- 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.

The original and the updated damage code for each re-classified tree.
 - iv. Due to the rapid nature of change associated with the needle colour attribute versus other timber attributes, insect code classification will only be counted as an incorrect damage code if the cruiser's code is greater than the code determined by the Ministry (e.g., the cruiser called a red attack (code 2) and

the check cruise assessed the tree as green attack (code 1).

- v. The intent of allowing licensees to re-sweep for insect, fire and down tree codes is to provide the most recent description of the damage. As such, the Ministry check cruise efforts will focus primarily on the correct determination of the insect, fire and down tree code attribute; however if in the general practice of completing the insect, fire and down tree code assessment, the Ministry becomes aware of other significant inconsistencies with respect to the cruise standards, these issues will be addressed on a case by case basis.

6. Tree Ages (Section 4.3.2.6)

The standards applied to the measurement of tree ages are:

- a. Tree ages determined by increment boring:
 - i. The age in 10's and tree classes must be consistent with the Tree Class Modification of Loss Factor Tables (Table 7.5.5 in Appendix 5), where applicable. The age in 10's must reflect the dominant age class by volume (except when age class 13 and 14 trees are present in a plot). See Section 4.3.1.8.
 - ii. At least ninety-five (95.0) percent of all trees must be placed in the correct age in 10's and tree class, where applicable.
 - iii. Coast Only - age in 10's of 13 and 14 - all of the tree classes must be verified since tree classes 1, 2, 3, 8 and 9 contribute to the percent second growth reporting.

7. Diameter at Breast Height (Section 4.3.2.5)

The height of the diameter line marked at breast height must not exceed plus or minus 5 percent (plus or minus 6.5 cm) from the true breast-height of 1.3 m above high side. When this limit is exceeded, the true position is used for a. and b. below.

The DBH measurement standards are shown in Table 3-5. Both a. and b. must be exceeded before the standard is not met.

5.10. Compilation Output

The cruise compilation shall accurately represent the area and net volume by species, grade, LRF, diameter class, timber type and risk group to be appraised and harvested and shall be compiled with the most recent version of the cruise compilation as of the date of the appraisal data submission to the Ministry.

The cruise compilation version must be approved by Timber Pricing Branch.

Modifications to the cruise compilation reports utilizing a calculator are not acceptable for initial compilations used in new appraisals. Manual or hand compilations shall only be used in exceptional cases as approved by the Area Director.

5.10.1. Summary of Required/Optional Reports and digital files

The following reports must be submitted electronically as specified in the *Interior* and *Coast Appraisal Manuals*:

Required for all compilations

1. Cruise Statistics
2. CP, Type and Cutblock Volume Summaries
3. Detailed Plot Summary
4. Harvest and all Harvest Method Summaries
5. Appraisal Summary
6. Digital data in ASCII format (.dat, .pr, .red)
7. Digital data in csv file format (CP Summary, Cutblock Summaries and Harvest Method Summaries - full and reduced, where applicable)
8. Percent reduction input values (when used)
9. Double sampling ratios (when count plots are used)

Required if requested by Ministry

1. Edit Report (data listing) of cruise data
2. Extended Timber Type Stand and Stock Tables
3. Partial **Cut Percent Reports**

4. **CP. Block and Type Damage Summary Reports**
5. Stand, Stock and Leave Tree Tables
6. Volume and Lumber Recovery Information

Required for Stump Cruises

1. Scattergram of all heights and diameters
2. Scattergram of sample trees/regression coefficients
3. Original scattergram of sample trees/regression coefficients, if suggested curve is overridden. Actual keyed values and explanation is required.
4. Edit Report if height curves used

Optional

1. Plot Summary by Maturity
2. Harvest Method Treatment Unit Summaries

If a percent reduction is being applied, the following reports will also be required:

- i. the **original** reports before percent reduction was applied,
- ii. the reports after percent reduction was applied, and
- iii. percent reduction table showing keyed input values for the percent reductions.

The source documentation for percent reductions must be provided to the Ministry upon request.

5.10.2. Valid Compilation Programs

The valid compilation programs can be viewed at the following web link:

[Valid Compilation Programs](#)

the cruise tally sheet (Figure 4.1 Cruise Tally Sheet – FS 205C (front side).):

7.6.2.1. Light Damage - Code A

Damage consisting of scorched bark and/or foliage but little or no charring in the merchantable portion of the stem (less than 100cm²). Bark scorching greater than or equal to 5 years after the date that the fire was recorded by the Ministry of Forests does not qualify for the fire damage coding.

7.6.2.2. Moderate Damage - Code B

Damage of any age consisting of shallow charring of wood fibre in the merchantable portion of the stem.

7.6.2.3. Heavy Damage - Code C

Damage of any age consisting of extensive shallow charring or deep charring in the merchantable portion of the stem. Multiple deep checks in trees less than 30 cm DBH with fire damage also qualify for heavy damage.

The risk groups of all fire damaged trees will be determined by tree class and pathology.

Surface checking may occur as the result of fire damage but this does not affect the tree classification.

7.6.3. Down Trees

The following Down Tree Codes apply to all appraisal cruises and will be entered in column 63 of the Tally Sheet (Figure 4.1 Cruise Tally Sheet – FS 205C (front side)). If they are located **between POG and the merchantable top diameter** of living or dead potential trees and the tree is:

7.6.3.1. Damage Code E

- Uprooted
- Uprooted with one clean break.
- Standing and one clean break in the bottom or middle third.
- Standing and any shattered breaks in the middle third.

A clean break is shorter in length than the diameter of the stem at the break. The compilation program will assign the risk group by tree class and pathological indicators.

A tree with a **clean or shattered break that does not extend above stump height** will be considered uprooted.

A tree felled by a beaver will be considered equivalent to a chainsaw cut and does not cause a blowdown code.

No blowdown code will be applied if a broken top is less than 50% sound and a merchantable log has taken over as a new leader.

7.6.3.2. Damage Code G

- Uprooted with more than one clean break .
- Uprooted with any shattered breaks.
- Standing with any shattered break in the bottom third.
- Standing with one clean break in the bottom third and an additional break in the merchantable portion of the tree.

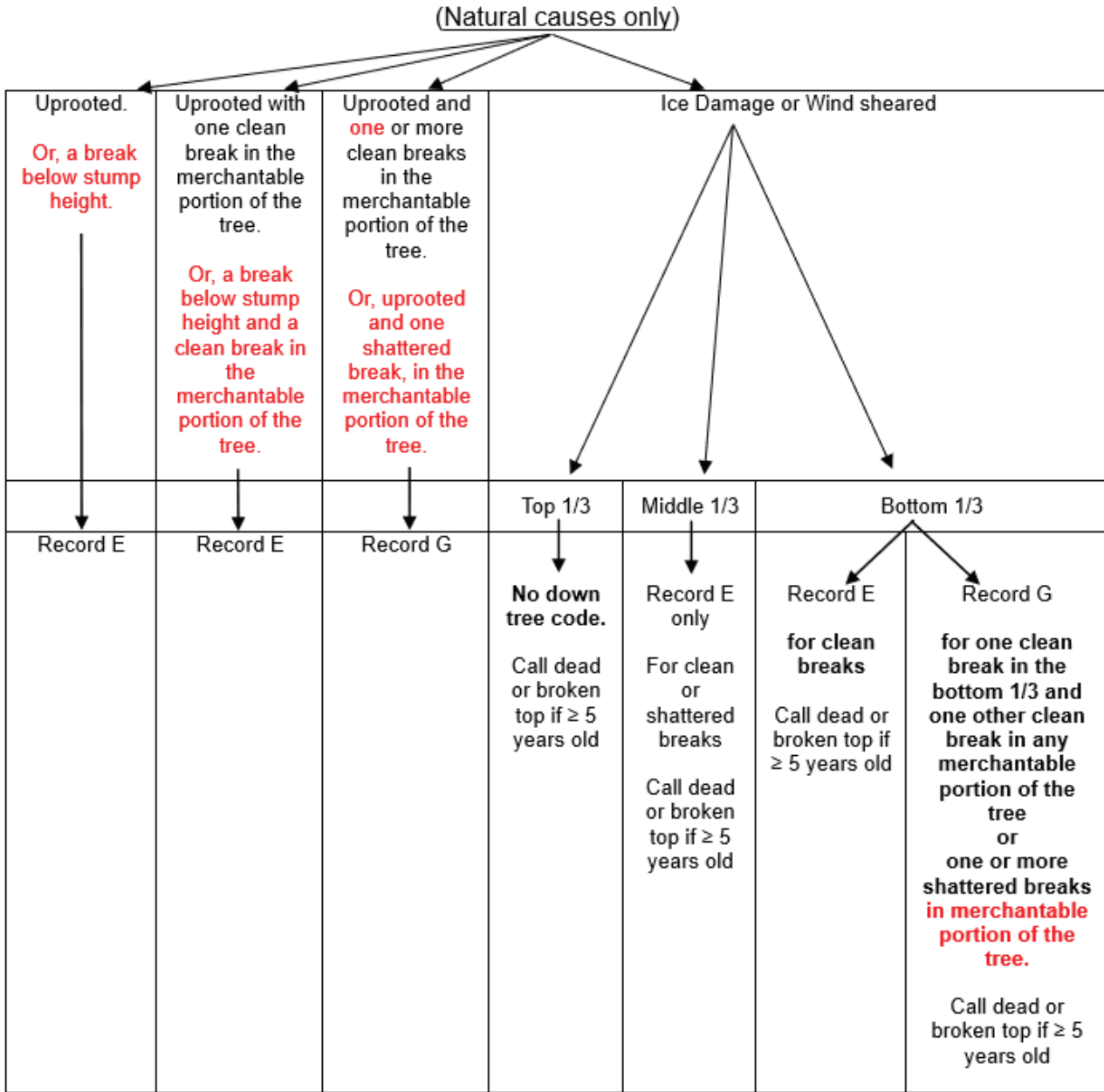
A shattered break is longer in length than the diameter of the stem at the break. A tree with a break below stump height and above POG will be considered uprooted. If the break extends into the merchantable portion of the stem¹ then the entire length of shatter above POG will be assessed to determine if it is a clean break or a shattered break.

The compilation program will down grade these trees to the highest risk group.

If the tree is partially uprooted or broken and supported by another standing tree, assign the appropriate down tree code (except Tree Classes 4 and 6). Blowdown codes are not assigned to Tree Class 4 or 6 trees.

If a shatter extends through DBH and either the standing or down portion of the tree fall outside of the plot, use the portion of the tree with greater than 50% of the basal area at breast height to determine if the tree is “in” or “out” and assign applicable damage codes (See Section 4.3.1.15).

¹The merchantable portion of the stem is from 30cm stump height to a 10cm or 15cm top diameter inside bark as per the appropriate timber merchantability standards.



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

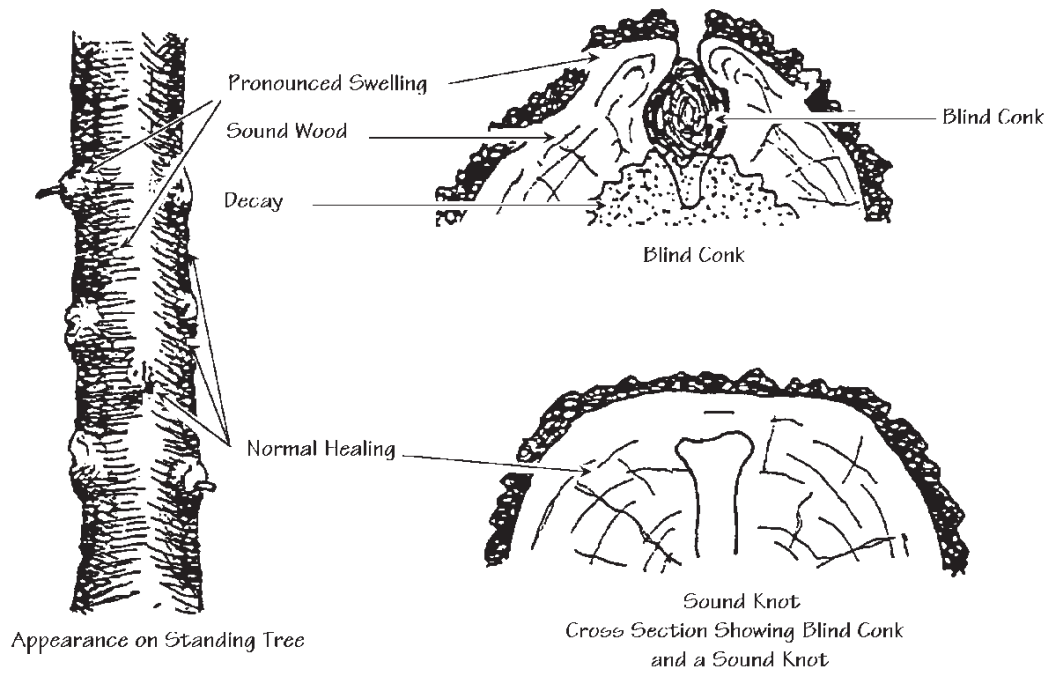
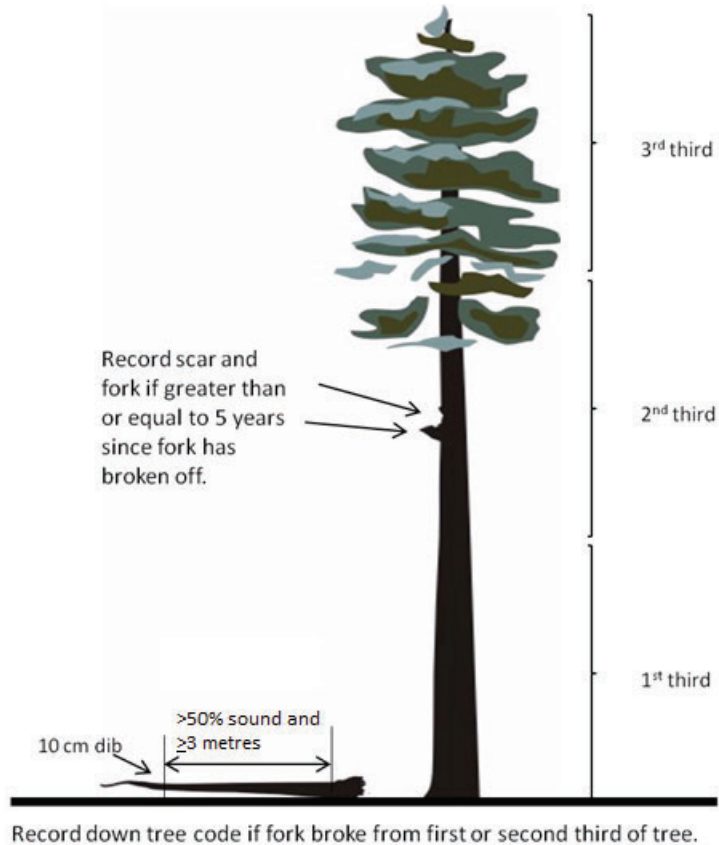


Figure 7-18 Blind Conk and Sound Knot

Residual Trees (Do not record these indicators – See Figure 7.42 Residual Indicators)		Suspect Trees (Record these indicators – See Figure 7.41 Suspect Indicators)	
Roots and Butt Rots			
Species	Common BC Native Host Species	Species	Common BC Native Host Species
<i>Armillaria</i> spp.	Ba, Bg, Bl, Lw, Se, Sw, Ss, Pl, Pw, Py, Fd, Tw, Cw, Hw, Ep, At, Act, Qg, W spp.	<i>Phaeolus schweinitzii</i>	Ba, Bl, Cw, Fd, Hw, Lt, Lw, Pl, Pw, Py, Ss, Sw, Qg
<i>Heterobasidion annosum</i>	Ba, Bg, Sw, Ss, Fd, Cw, Hw, Mb, Dr		
<i>Inonotus tomentosus</i>	Ba, Bl, Fd, Hw, Lw, Pa, Pl, Py, Se, Sw, Ss		
<i>Phellinus weirii</i>	Fd, Bg, Hm, Se, Ss, Bl, Hw, Lw, Pl, Pw, Py		
<i>Rhizina undulata</i>	Cw, Fd, Hw, Lw, Pl, Se, Ss, Sw		
Heart Rots			
<i>Ceriporiopsis rivulosa</i>	Ba, Cw, Fd, Hw, Sw, Ss	<i>Echinodontium tinctorium</i>	Ba, Bg, Bl, Cw, Fd, Hw, Hm, Ss, Sw
<i>Fomes fomentarius</i> *	D spp., Act, Acb, E spp.	<i>Fomitopsis pinicola</i> - Only if found on bole of live tree.	Ba, Bg, Bl, Cw, Fd, Hm, Hw, He, Lw, Pl, Pw, Py, Se,



Segment of Cruise Tally Card (FST 205)

Tree Number	Height	Species	DBH	Tree Class	Conk	Blind Conk	Scar	Fork/Crook	Frost Crack	Mistletoe	Rotten Branch	Dead/Broken Top	Down Tree
01	40.0	F	60.0	2			2	2					m

Figure 7-27 Fork/crook

Record a down tree code (clean break) since the **broken** fork is long enough to produce a merchantable log **and is greater than 50% sound**. Record fork and scar if the injury is at least 5 years old. See Section 7.6.2 Appendix 6: Fire Damage for the down tree codes. See Section 7.17.2.4 details regarding the coding of scars and see Section 7.17.2.1 for details regarding the coding of pathology on secondary leaders.