

4

Field Procedures

4.1 Introduction

This Chapter outlines the general field procedures for timber cruising following the format of the Cruise Tally Sheet ([Figure 4.1 Cruise Tally Sheet – FS 205C \(front side\)](#)).

Cruise measurements taken on samples established in cutting authorities will be recorded on a digital or paper Cruise Tally Sheet that provides the information required in this chapter.

All information identified on the Cruise Tally Sheet is required to meet the [Cruising Manual](#) requirements. If facsimiles are submitted and required information (i.e. signatures) is on the back of the Cruise Tally Sheet, both sides must be copied.

Quality remarks and CGNF data is only required for coastal cruises.

The *CGNF Standards and Procedures for the Coast Forest Region* is available at:

www.for.gov.bc.ca/hva/manuals/cgnf.htm

All cutting permits require a closed or GPS traverse of each cutblock. Stations, tie points, reference points and boundaries must be well established on the ground for permanent future reference and must not be destroyed during or after harvesting operations. Refer to any established district policy on boundary marking where the cruise area is located (e.g., *Forest Practices Code Boundary Marking Guidebook*).

www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/bound/boundtoc.htm

Traverse notes shall include tie points and other boundary references. Refer to [Chapter 3 Quality Assurance](#) for the tolerances. Traverse notes must also include direction of travel between plots and any pertinent information regarding plot location. The original strip line, type line, boundary traverse notes and GPS coordinates must be made available to the check cruisers upon request.

All areas that are inside the block boundary and will be removed from the harvest area must meet the area error standards in Section [3.5](#).

Figure 4.1 Cruise Tally Sheet – FS 205C (front side).

CHECKED BY (PRINT)				DATE Y M D				CRUISED BY (PRINT)				DATE Y M D			
SIGNATURE				SIGNATURE (I CERTIFY THAT THIS IS A TRUE STATEMENT OF SAMPLING DONE BY ME AT THE PLACE SHOWN.)				SIGNATURE				DATE Y M D			
SIGNATURE				ECOSYSTEM				SNOW DEPTH							

QUALITY CODES				KNOT CODE QUARTERS (Q) WITH KNOTS				CROWN CLASS (CC)				PATH CODE BY TREE THIRD							
ITEM	CODE	LIMITS	ITEM	CODE	LIMITS	0	1	2	3	4	5	6	7						
SPRIAL GRAIN	0	0-5%	SWEEP OR LEAN	0	0-4.9°	0	NONE	ONE TO THREE BRANCHES OVER 10 cm				1	DOMINANT	TOP					
	1	6-15%		1	ONE Q	5					2	CO-DOMINANT	MID						
	2	16-25%		2	TWO Q	6					3	INTERMEDIATE	BOT						
	3-8	26-85%		3	THREE Q						4	SUPRESSED							
9	86+%		2	10°+	4	FOUR Q													

TREE CLASS (unless Coast age in 10s = 13 or 14)				INSECT CODES				FIRE CODE				CONDITION			
1	2	3	4	CODE	CONDITION	ALLOWED SPECIES	A	B	C	E	G				
Older Immature	Older Immature - Suspect	Older Imm Dead Potential	Dead Useless	1	GREEN ATTACK	B, PL, Py, Pw	Scorched bark and foliage, no charring in merch portion of trunk.	Charring of wood fibre > 100 cm but < 1/3 of free radius in merch portion of trunk.	Charring of wood fibre in 3 or more areas > 100 cm ² > 1/3 of free radius or > 1 check > 1/3 of free radius if dbh < 30 cm	LESS THAN OR EQUAL TO ONE CLEAN BREAK	MORE THAN ONE CLEAN BREAK OR ONE OR MORE SHATTERED BREAKS	For Age in 10s/Tree classes refer to Tree Class Modification of Loss Factor Tables at the end of Table 17 in Cruising Manual.			
Mature	Live Useless	Mature-Dead Potential	Younger Immature	2	RED ATTACK	S, F									
			Younger Imm Dead Potential	3	GREY ATTACK	F only									
				5	GREEN (ALIVE) STRIP	All									
				6	GREEN (DEAD) FULL	All									
				7	GREY ATTACK	All									
				8	RED ATTACK	All									
				X	DEFOLIATORS (LIVE)	All									
				Y	DEFOLIATORS (DEAD)	All									
				COMMENTS				REMARKS (OTHER DEFECTS AND QUALITY FACTORS AFFECTING LOGGING)				DISEASE CODES			
												4 BLISTER RUST ON PW			
												ROOT ROT			
												J LIGHT			
												K MODERATE			
												L HEAVY			

Figure 4.2 Cruise Tally Sheet – FS 205C (back side).

The following provides an example of cruise strip line traverse notes:

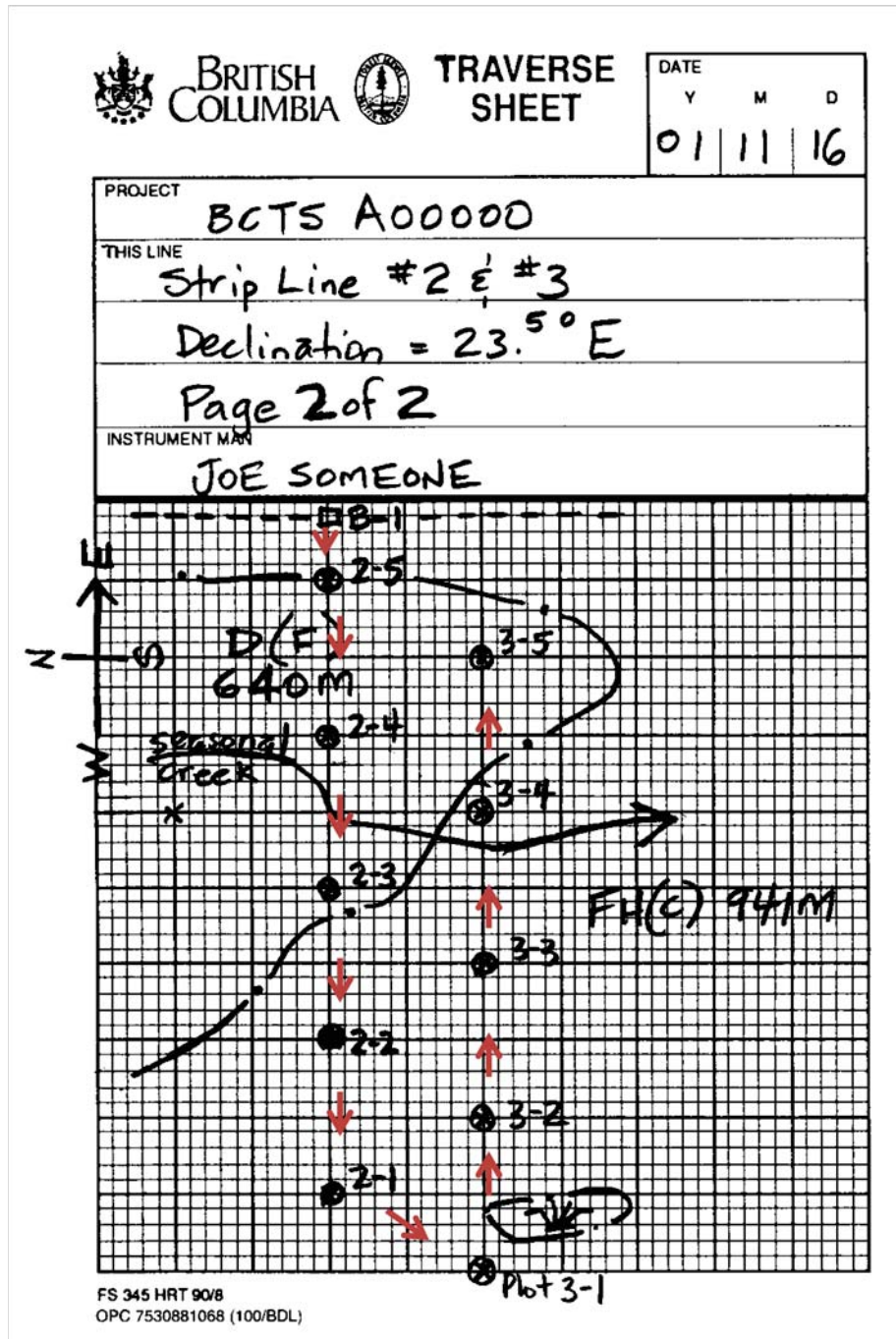


Figure 4.3 Cruise Strip Line Traverse Notes (front).

4.2 Entry of data in divided spaces or numbered columns

Alphabetic fields are left justified whereas numeric fields are right justified.

4.3 Front Side of Cruise Tally Sheet (FS [205](#))

The following section identifies the card position and information required following the format of the Cruise Tally Sheet. Where digital data capture software is used, the information collected must follow the format and standards of the Cruise Tally Sheet.

4.3.1 Card Type 9

This card is to be completed for every new plot. The data on this card provides the plot attributes. Optional fields are identified. These fields should be entered if known. Where fields are not identified as optional, they are considered mandatory.

4.3.1.1 Positions 2 to 7 Licence Number (Optional)

Enter the license as provided by the Licensee. This may be Alpha/numeric, and cannot exceed 6 spaces.

4.3.1.2 Positions 8 to 10 Cutting Permit (Optional)

Enter Alpha/Numeric, cannot exceed 3 spaces.

4.3.1.3 Positions 11 to 13 Block (within the Cutting Permit)

Enter: Alpha/Numeric, cannot exceed 3 spaces. Enter only 3 spaces for blocks with more than 3 digits/letters in the block name. (i.e. block ABC123 may be entered as 123, and identified in its entirety in the compilation program for reporting purposes)

4.3.1.4 Positions 14 to 15 Strip Number (Number of Strip on which Plot is Located, if strips are used).

If no strip lines are used, these two spaces may be utilized in cruises with 3 or 4 digit plot numbers.

When using strip lines, they will be run using compass, clinometer and metric surveyor tape or electronic measuring devices. Allowances for slope must be made since all distances must be horizontal. (See [Horizontal Distance Correction](#) in Appendices) Strip lines will be marked with survey tape so they can be used to locate plots in the future.

Where used, all of the cruise strip lines must be linked to the boundary. The tie point or reference point of each strip line must be well established on the ground so that it may be found at a future date.

4.3.1.5 Positions 16 to 17 Plot Number or Letter

Will accept alpha/numeric designations.

Plots are to be numbered without duplication on the same strip line (if used).

Three digit plot numbers may be truncated to 2 digits in some compilation software.

Moving plot centres from the measured/ traversed location presents significant bias and is only permitted in accordance with Section [2.4.2.2](#). If the plot cannot be completed safely, it will be dropped and the reason documented.

Establishing Cruise Plots using Conventional Methods

For cruises using conventional methods, the cruise must originate from valid tie points such as map locations like road locations, falling corners and GPS positions. The cruise must be tied to at least one (1) and preferably two (2) tie points. Tie points must be linked to the cruise grid with an accurate traverse.

A map feature (falling corner, junction, etc) or GPS station must be selected to establish the Point of Commencement (POC).

To establish cruise plots, travel the distance and bearing identified on the cruise plan or map. When the required distance has been measured, a stake, pin or equally effective marker must be established at the plot centre. If this location is within a tree, mark the plot centre with an “X” at the point on the tree. The plot centre is the point at which the marker enters the ground and not the top of the marker.

A reference point (RP) must be recorded in the traverse notes or on the cruise tally card. It is acceptable to use a reference tree that is an “in” tree and record the bearing and distance from plot centre to the nearest point on the tree at breast height. The reference point will be used to determine the position of the plot centre for check cruising. It is recommended that the reference information is recorded below stump height to facilitate correct tree measurements and to ensure the information is available post-harvest.

Establishing Cruise Plots using GPS Technology

As of November 1, 2014, cruises may be rejected for not following these procedures when GPS is used to establish cruise plots.

1. Use the GPS to navigate to the cruise plot.
2. When you are within 10 to 20 metres of the cruise plot location, locate a suitable PRP (Plot Reference Point). The most suitable location for the PRP is generally the least obstructed or most open location. Optimally, the PRP should be 10 to 20 m from the plot location. Where few natural openings exist, the PRP must be an absolute minimum of 5.0 m from the plot location.

NOTE: The PRP must be a fixed feature that cannot be moved by hand, such as: a small standing tree (< 3m tall), cut stump, broken stump, root wad, fence post, etc. Large trees are not acceptable due to deflection and interference of GPS signals. If using a small tree, hold the antenna directly above the point where the tree enters the ground. If using another fixed object, paint a spot on the object and position the GPS antenna directly above this spot.

3. Review the data displayed on the GPS receiver screen. When the number of satellites, PDOP/HDOP and Mean Difference of Hits are within tolerances (see

- Section [3.5](#)), establish the PRP using the GPS receiver and software. Collect a minimum of 50 hits or coordinates and record the required data in the PRP table (see Section [3.5](#)).
4. If the default tolerances have been exceeded, the PRP must be re-located. Where GPS coverage is poor or a PRP cannot be established, the cruise plot may be located using conventional methods (ex. chain and compass) from existing tie point or cruise plot locations.
 5. Once the PRP has been established, calculate the final horizontal distance and bearing to plot center. Flag the PRP well and label it with the bearing and distance to the cruise plot. Because there is minimal interplot flagging with the use of GPS technology, the flagging at the PRP and cruise plot must be heavy enough to be visible from a reasonable distance and enable Ministry staff to audit plot locations.
 6. Use conventional methods (ex. chain and compass) to navigate to the cruise plot from the PRP. Establish the cruise plot and record the cruise plot location using the GPS. As mentioned above, a stake, pin or equally effective marker must be established at the plot centre. If this location is within a tree, mark the plot centre with an “X” at the point on the tree. The plot centre is the point at which the marker enters the ground and not the top of the marker.

4.3.1.6 Position 18 O/C

This field must be entered.

Enter: O if original measurements
 C if check cruise measurements

4.3.1.7 Positions 19 to 20 Type Number (Section [2.8](#))

Enter the number given to the timber type in which this plot is located (corresponds to positions 14, 15 on Card type C).

4.3.1.8 Positions 21 to 22 Age in 10's (Optional in Interior)

The age in 10's for Interior cruises defaults is 11. For Coastal cruises, the age in 10's is recorded as the dominant age class by volume (except when age class 13 and 14 trees are present in a plot).

This age in 10's is required for all measure and count plots and is used with the tree class in each measure plot to assign the correct loss factor table and maturity to each tree.

See Section [4.3.2.6](#) and [4.3.1.8\(4\)](#) for the coding of the age in 10's in relation to applicable tree class.

Age Limits (years)	Class	Age Limits (years)	Class
21-30	03	91-100	10
31-40	04	101-110	11
41-50	05	111-120	12
51-60	06	121-130	13
61-70	07	131-140	14
71-80	08	141-250	15 to 25
81-90	09	251 plus	26

It is important that these age class limits be observed as they govern the proper selection of loss factors and coastal log grades.

Coast - Second Growth Clarification

The [Coast Appraisal Manual](#) defines second growth timber as less than 141 years old for the purposes of timber pricing.

The volume of mature and second growth timber will be compiled on a tree basis and the percentage of the total coniferous cutting authority area volume represented by the second growth timber will be calculated.

Using this calculated percentage, any cutting authority area that contains 80 percent or greater second growth coniferous timber volume will be appraised as second growth timber using a Second Growth Average Market Value schedule.

Coastal Loss Factor Cruises

The above definition of second growth coniferous timber must not be confused with immature. Only trees less than 121 years old are considered to be immature. Trees between 121 years and 140 years old, while defined as second growth for appraisal purposes, will remain as mature trees for determination of loss factors, timber merchantability specifications and log grade algorithms.

In order to compile cruise plots correctly, please note the following:

1. All coniferous trees less than 141 years old contribute to the second growth percentage for appraisal purposes.
2. All coniferous trees from 121 to 140 years old will be compiled using mature loss factors.
3. If over 50 percent of the net volume in a block is in trees over 120 years old, it is considered a mature block and will be compiled accordingly (17.5 cm DBH and 15 cm top).
4. If the plot contains any coniferous trees that are from 121 to 140 years old, record the age in tens as 13 or 14 and record those trees as tree class 1, 2 or 3. Trees greater than 140 years old will be classed as tree class 5 (mature) or tree class 7 (mature dead potential) while trees less than 121 years old will be recorded as tree class 8 (immature) or tree class 9 (immature dead potential).
5. Using the age in tens and appropriate tree class, all trees less than 141 years old will contribute to the second growth volume. All trees less than 121 years old will be compiled with older immature loss factors. All trees over 120 years old will use mature loss factors for determination of net volume.

4.3.1.9 Positions 23 to 24 Height in Metres

This field is only applicable for interior cruises in the Bowron, Longworth, Monkman, Purden and Robson PSYUs and TFL 30. Tree heights in these PSYU's and TFL are used to determine mature red cedar loss factors (Loss Factor Table 0296). Enter the appropriate height class as shown below for the dominant and co-dominant trees of the major species in the plot. This classification is based on tree heights measured at the plot.

Height Class Limits for Height in Threes					
Height	Limits	Height	Limits	Height	Limits
3	0.0-4.4	24	22.5-25.4	45	43.5-46.4
6	4.5-7.4	27	25.5-28.4	48	46.5-49.4
9	7.5-10.4	30	28.5-31.4	51	49.5-52.4
12	10.5-13.4	33	31.5-34.4	54	52.5-55.4
15	13.5-16.4	36	34.5-37.4	57	55.5-58.4
18	16.5-19.4	39	37.5-40.4	60	58.5-61.4
21	19.5-22.4	42	40.5-43.4	63	61.5-64.4

4.3.1.10 Position 25 Plot Type (See Section [2.7](#))

- Blank or "M" for measure plot,
- "C" for count plot, and
- "S" for stump cruise.

4.3.1.11 Position 26

This column is not in use.

4.3.1.12 Positions 27 to 39 Main Plot Size (not required for 100% Cruise)

These positions describe the plot size of the main stand element being sampled and the minimum DBH.

4.3.1.13 Positions 27 to 30 Hectares (Fixed Plot) (See Section [2.6.2](#))

Enter the plot size in hectares for circular or rectangular shaped fixed plots. Leave the positions blank if prism plots or a 100% Cruise are used.

Circular Fixed Plots

Having established the plot centre, the plot circumference is then determined and marked with string or plastic flagging tape. More radii measurement will be required when there are many trees on or near the plot boundary. At the end of each radius measurement the tree on the plot circumference or nearest to the circumference within the plot must be marked with plastic flagging tape or paint.

When plots are established, slope allowances must be applied to each radius distance. That is, plots must not be established by assuming an average slope and making one slope correction for all radii. The plot radius slope allowance is added along the same slope in which the plot radius is being measured. Plot radii slope corrections are shown in the [Correction Table for Plot Radii](#) (See Appendices).

Rectangular Fixed Plots

A tree on the strip line at the start and end of each plot must be blazed on four sides. A metal tag and/or plastic flagging tape, showing strip number, compass bearing, distance on line and plot number must be attached.

The strip line must constitute the centre line of the plot, and slope allowances must be made in measuring this line. Slope allowances for various short distances are shown in the [Correction Table for Chaining](#) (See Appendices). The plot centre line must be marked with plastic flagging tape every 5 m from the beginning to the end of the plot.

Plot width will be checked along the centre line and the boundary marked with plastic flagging tape. Plot width must be corrected for slope.

Borderline Trees (Fixed-Area Plots)

The horizontal plot radius or plot width must be checked for each borderline tree. A tree will be included "in" the plot if at least half of the diameter of the tree measured at breast height is inside the plot.

Fixed Area Border Plots (Plots Falling On Type or Block Boundaries/ Half Plots)

Fixed area plots which are affected by harvesting boundaries are split through the plot centre parallel to the harvesting boundary. The trees inside the sample area are recorded and the plot recorded as a B for border/half plot. Count plots are not used with fixed area plots.

Fixed area plot centres which fall outside the sample area will be dropped.

The following plot sizes are recommended:

Size (hectares)	Circular Plots Radius (metres)	Square Plots One Side (metres)
0.005	3.99	7.07
0.010	5.64	10.00
0.02	7.98	14.14
0.03	9.77	17.32
0.04	11.28	20.00
0.05	12.62	22.36
0.06	13.82	24.49
0.08	15.96	28.28
0.10	17.84	31.62
0.20	25.23	44.72

4.3.1.14 Positions 31 to 35 Basal Area Factor (BAF Variable Plots) m²/ha (See Section [2.6.3](#))

Enter the BAF for the main stand element being sampled. It must be entered to three decimal places.

Imperial/Diopter Conversions

BAF (m²/ha) = BAF (sq. ft./acre) x 0.229568
where 1 square foot per acre = 0.229568 m²/ha

BAF (m²/ha) = 10,000/(1 + (200/diopters)²)

Where 1 diopter represents a right-angled deflection of one unit per one hundred units in distance or 0.5728888° (decimal degrees).

4.3.1.15 Position 36 Prism Sweep

Enter: F for Full Sweep

Enter: B for Border Plot (Fixed plots only)

Variable Plot Cruises (Prism or Relascope)

Having established the plot centre, the prism is used to determine which trees are "in" the plot. Then species, DBH, pathological remarks and quality are measured or determined for each tree.

Sampling Procedures

The cruiser holds the prism exactly over plot centre and looks at a tree across the upper edge of the prism, and so views it simultaneously above the prism and also through the prism. The tree image seen through the prism will be laterally displaced. The prism must be over the sample centre as the prism forms the vertex of the angle being projected.

If the displacement is greater than the diameter of the tree, the tree is "out"; if smaller the tree is "in"; if the same, the horizontal distance to the tree must be measured because it is borderline (see [Figure 4.4 "In", "Out" and "Borderline" Trees.](#)). The prism will be "swept" around plot centre and all live and dead trees equal to or larger than the minimum specified size for the "in plot" trees will be recorded.

If a tree that constitutes part of the harvest boundary is "in", it must be measured and recorded twice because it is a walkthrough tree if it will be harvested or stubbed.

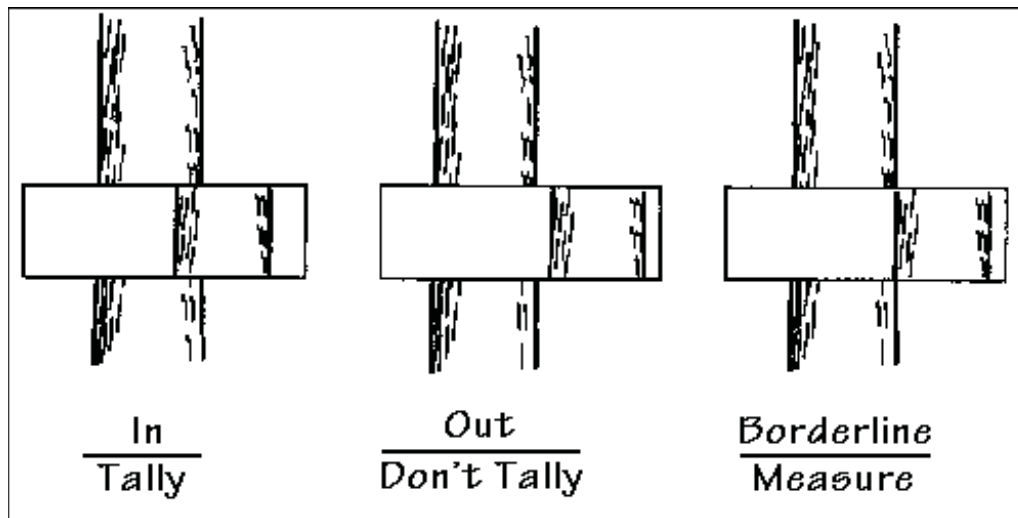


Figure 4.4 "In", "Out" and "Borderline" Trees.

BAF Selection

Changing BAFs within a timber type polygon should be avoided as this may introduce a bias in the reporting of summary stand statistics and may lead to increased data recording errors.

Each timber type polygon should only contain one BAF. Within variable timber type polygons, the BAF may be changed once. Once the change is made, the BAF cannot be changed again regardless of stand composition. More than one BAF change in a timber type polygon may result in the rejection of the cruise. The determination of the BAF must not be made at plot centre. When a BAF change is made, the location of the BAF change must be noted on the cruise field notes.

Prism Slope Correction

Since each tree on the area may have its own unique slope angle from the centre, each tree must be considered individually in making slope corrections (see [Horizontal Distance Correction](#) in Appendices). In borderline situations, trees are to be measured as described in the following section.

Borderline Trees (Variable Plot Cruises)

When sighting a tree through a prism or relascope, the exact in/out status cannot always be determined. The correct status of borderline trees in measure and count plots must be determined by using the following procedure:

1. Determine the horizontal distance from the plot centre to the face of the tree trunk at breast height. The plot centre is the point at which the plot marker (stake, pin, etc) enters the ground and not the top of the marker.
2. Add one half of DBH to the horizontal distance to determine the horizontal distance from the tree centre to the plot centre.
3. Multiply the plot radius factor times DBH. This represents the plot radius for the tree. In variable cruising every tree has its own plot radius depending on its diameter and the angle of the prism being used (see Variable Plot Sampling in Appendices).
4. If the horizontal distance from the tree to the plot centre is less than or equal to the plot radius, the tree is considered "in". If the horizontal distance from the tree to the plot centre is greater than the plot radius, the tree is considered "out".
5. Record the measured slope distance and slope percent on the cruise tally card and run a single pencil line through the tree details if the tree is "out".

All "borderline" trees must be measured and the measurements recorded for checking purposes.

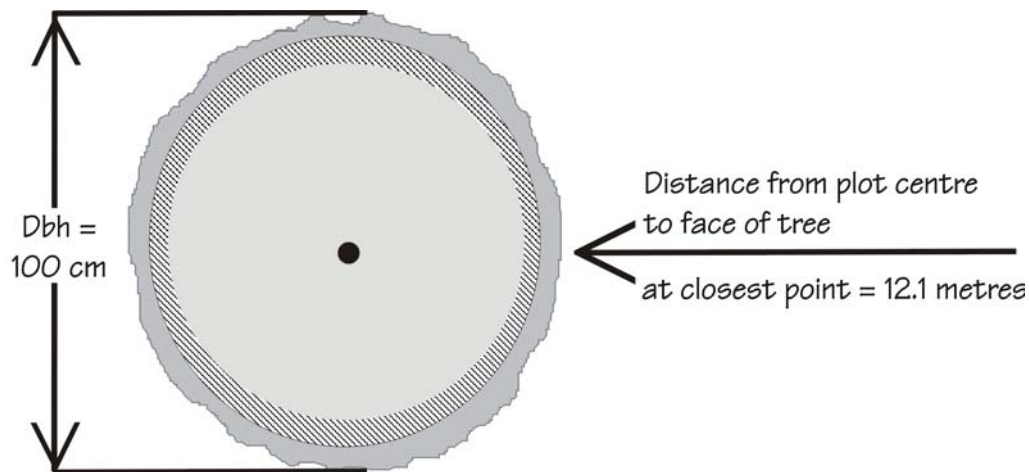


Figure 4.5 Borderline Tree Measurements - Variable Plot.

Example:

Borderline tree of 100 cm DBH, measured with a BAF 16 Prism (see [Figure A.1 Illustration of Basal Area/Hectare.](#))

$$\text{PRF} = \frac{1}{2\sqrt{\text{BAF}}} = \frac{1}{2\sqrt{16}} = 0.125$$

Plot radius of 100 cm tree = $0.125 \times 100 = 12.50$ m.

Distance to centre of tree = $12.1 \text{ m} + \left(\frac{100\text{cm}}{2} = 0.5\text{m} \right) = 12.60 \text{ m}.$

The measured distance exceeds the plot radius of the tree, therefore the tree is out and not tallied. Record the measured horizontal distance on the tally card and run a single pencil line through the tree details if the tree is out.

This method will be used for check cruising:

(PRF minus 0.005) times DBH = the plot radius distance for the tree from plot centre to the face of the tree.

The following table shows plot radius factors for a selection of prism basal area factors:

Basal Area Factor	Plot Radius Factor Tree Center	Plot Radius Factor Tree Face	Basal Area Factor	Plot Radius Factor Tree Center	Plot Radius Factor Tree Face
2	0.3536	0.3486	13	0.1387	0.1337
3	0.2887	0.2837	14	0.1336	0.1286
4	0.2500	0.2450	15	0.1291	0.1241
5	0.2236	0.2186	16	0.1250	0.1200
6	0.2041	0.1991	18	0.1179	0.1129
6.25	0.2000	0.1950	20	0.1118	0.1068
7	0.1890	0.1840	20.25	0.1111	0.1061
8	0.1768	0.1718	24	0.1021	0.0971
9	0.1667	0.1617	25	0.1000	0.0950
10	0.1581	0.1531	30.25	0.0909	0.0859
11	0.1508	0.1458	32	0.0884	0.0834
12	0.1443	0.1393	64	0.0625	0.0575

Leaning or "Down" Trees

Leaning and down trees must be measured from the centre of the tree at breast height to the plot centre in order to determine whether a tree is "in" or "out". When a tree is laying

on the ground, the measurement is made from the centre of the top side of the tree at breast height to the plot centre.

Hidden Trees

If a tree cannot be sighted easily it must be treated as a borderline tree, the trees plot radius calculated and the distance from the plot centre to the tree measured.

Walkthrough Method

The Walkthrough Method must be used for variable plot appraisal cruises. The walkthrough method is based on a description of the procedure from Dr. Iles book entitled *"A Sampler of Inventory Topics"*.

The following general procedures must be followed in the establishment of a walkthrough plot:

Do not tally trees that fall outside the cruise area. Walkthrough plots must not be used near boundaries that are difficult to define in the field, such as timber type and harvest method boundaries. In those situations it is appropriate to use a full sweep plot.

All "in" or "out" tree distance measurements are recorded on a horizontal basis and are measured at 1.3 metres breast height.

Regular Boundary – see [Figure 4.6 Walkthrough Method - Regular Boundary](#).

Measure the bearing and distance from the plot centre to the centre of the "in" tree and then measure an equal distance beyond the centre of the tree on the same bearing from plot centre. Record the tree details twice if the measurement is outside the cruise area. Record separate tree numbers for each tree. Record the tree details once if the measurement is inside the cruise area.

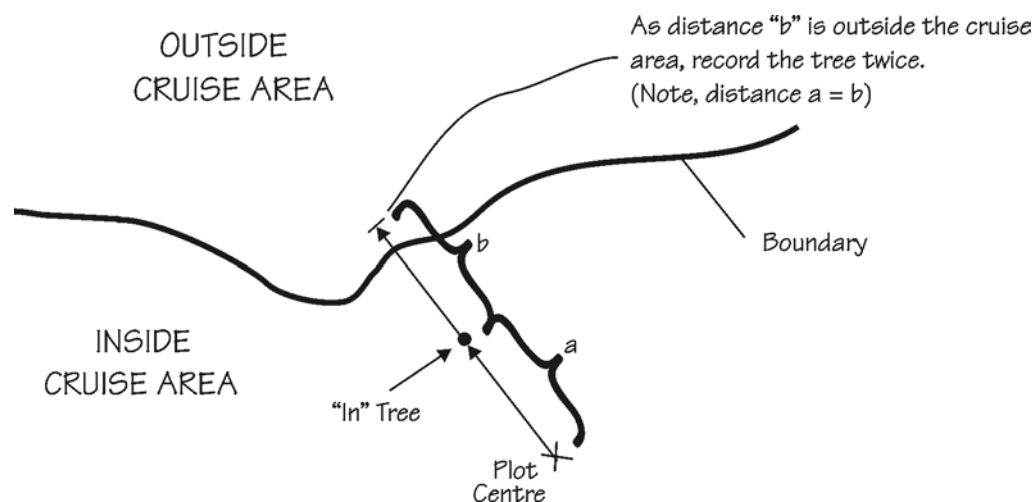


Figure 4.6 Walkthrough Method - Regular Boundary.

Use the walkthrough method at all flagged and traversed harvest boundaries, non-forest type boundaries identified on the cruise plan and road rights of way centrelines (as specified later in this section).

Irregular Boundary – see [Figure 4.7 Walkthrough Method - Irregular Boundary](#).

If the point bearing and distance places the point back inside the cruise area then record the tree once.

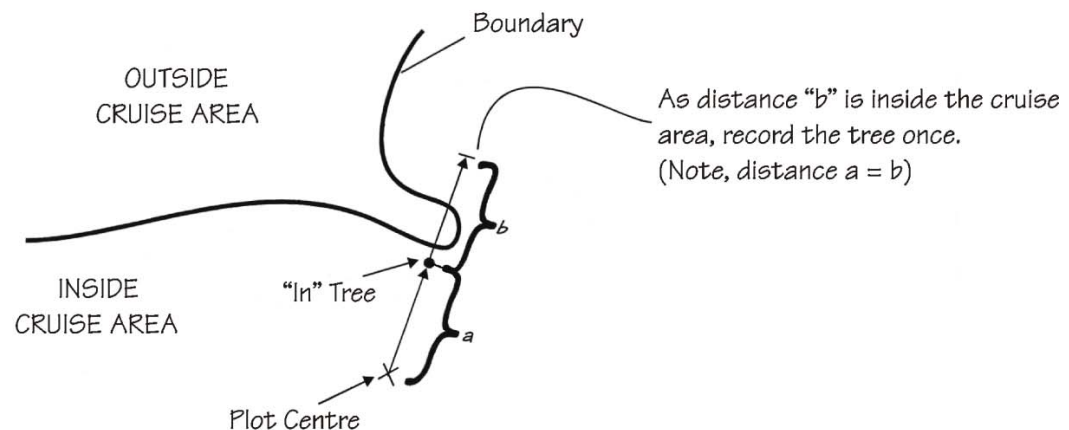


Figure 4.7 Walkthrough Method - Irregular Boundary.

Unmarked Boundary – see [Figure 4.8 Walkthrough Method - Unflagged and Harvested Rights of Way](#).

When an unmarked opening boundary is encountered (e.g. a cleared road right of way, NP patch identified on cruise plan), the block edge for walkthrough purposes is determined by projecting a line between the outer most face of the trees on the edge of the opening. If this does not result in a reasonable block edge, then the edge may be determined by projecting a line along the edge that represents a normal stand form in that location.

If a non-harvested road right of way (R/W) forms the block boundary and the road R/W is to be harvested under road permit but is not marked in the field, the road centreline can be used as the block boundary. Removal of road R/W area under the road permit will remove area from the cutting permit, but the sampled cruise plots will be included in the cruise compilation for the cutting permit.

If a road centreline is used as a boundary rather than the correct block boundary, there will be a small bias involved with sampling area between the block boundary and

road centreline. This small bias is acceptable to the MFLNRO.

If the road R/W is to be harvested under cutting permit or the licensee is not sure under what tenure the timber will be removed, the block harvest area and cruised area must include the full R/W boundaries (both sides of the centreline).

If the type of tenure for the road area is changed after cruising, it will be considered a change to the cruise plan and assessed accordingly.

Please refer to [Figure 4.8 Walkthrough Method - Unflagged and Harvested Rights of Way](#) for examples of how to apply the walkthrough method to unflagged and harvested rights of ways.

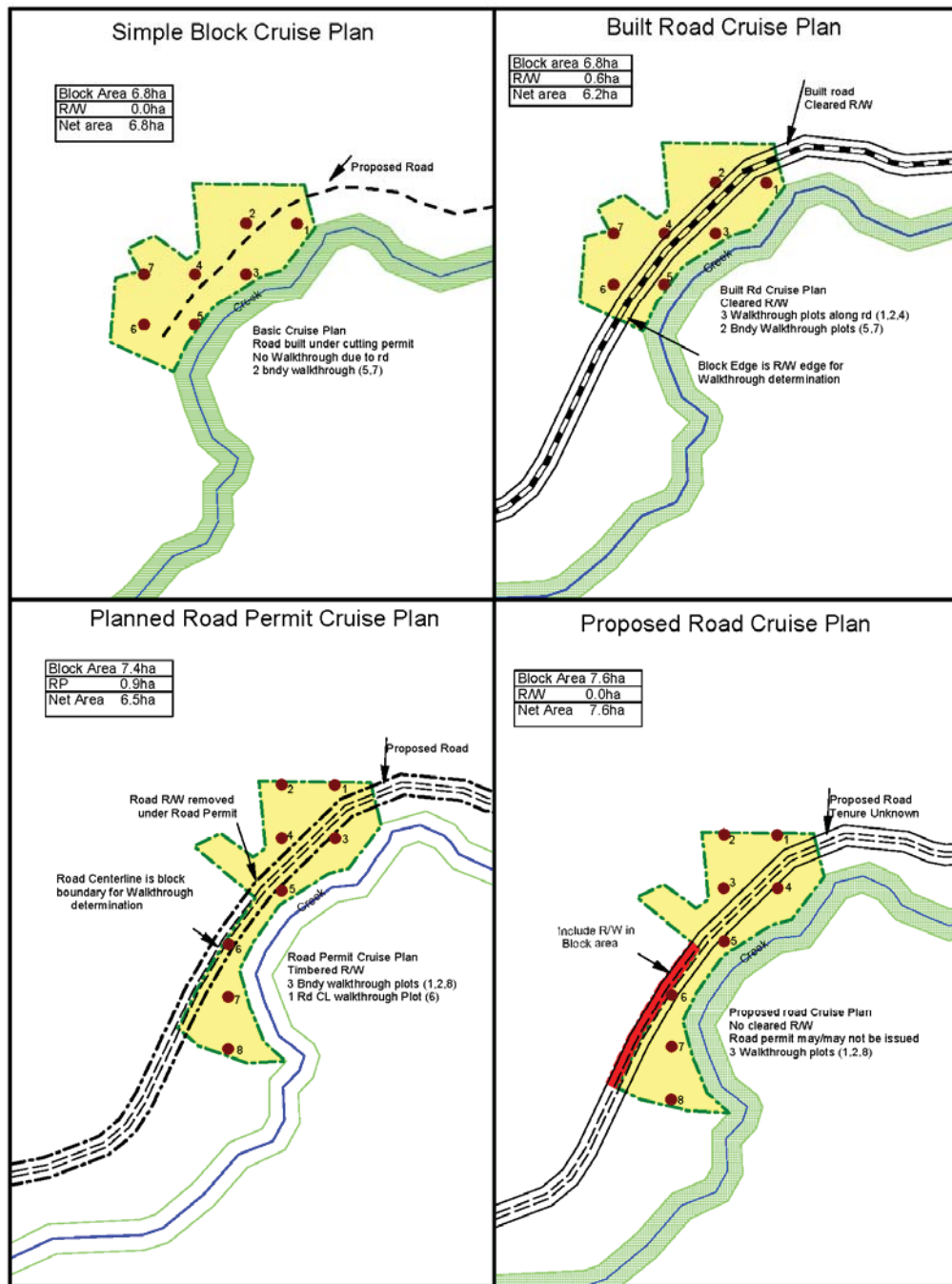


Figure 4.8 Walkthrough Method - Unflagged and Harvested Rights of Way.

4.3.1.16 Positions 37 to 39 DBH Limit

The minimum DBH to which the trees on the main plot are measured to meet the timber merchantability specifications for appraisal purposes.

The timber merchantability specifications for coast cruises are dependant upon the maturity level of the block. See Section [5.4.3](#).

Coast Cruises

1. Immature - code 12.0 cm (less than 121 years old for coniferous, less than 41 years old for deciduous).
2. Mature - code 17.5 cm (greater than 120 years old for coniferous, greater than 40 years old for deciduous).

Interior Cruises

1. PL - code 12.5 cm.
2. All other species - code 17.5 cm.

The Map Area Statement (MAS) determines the compilation level of the cruise (see Section [5.4.3](#)). Measured trees below this minimum can be tallied but, based on diameter, will be ignored in the compilation. For count plots the minimum DBH tallied must be the same as the DBH entered on the MAS (See Section [5.2.7](#)). DBH must be recorded for count plot trees where timber merchantability specifications may indicate a different DBH limit level from the field tally level.

Marking Trees

A paint line or tag must be displayed on the tree at the point of DBH measurement, with the numbers facing the plot centre, to facilitate checking. Borderline "in" trees must be numbered; "out" trees will be labelled with an "X". Trees are to be marked the same in both count and measure plots. Live useless and dead useless stems are not tallied in count plots.

4.3.1.17 Positions 40 to 52 Sub-Plot Sizes

In stands with a high density of stems in the smaller diameter classes, a sub-plot may be established for the smaller diameter classes. The same sub-plot size should be maintained throughout the timber type. The sub-plot should always be smaller than the main plot. Sub-plots are not generally used for appraisal cruising.

4.3.1.18 Positions 40 to 43 Hectares (Fixed Plot)

If smaller plot areas are required, the following are acceptable:

Hectare	Radius (m)
0.005	3.99
0.008	5.05
0.010	5.64
0.020	7.98

4.3.1.19 Positions 44 to 48 Basal Area Factor (BAF) Variable Plots

See description as per the Main Plot entries in Positions 31 to 35 (see section [4.3.1.14](#)).

4.3.1.20 Position 49 Prism Sweep

See description under the Main Plot entries in position 36 (see section [4.3.1.15](#)).

4.3.1.21 Positions 50 to 52

The minimum DBH to which trees on the subplot are measured.

4.3.1.22 Positions 53 to 54 Harvesting Method (Optional)

The harvesting method that will be used:

SL	=	heli selection – land drop	Coast
SW	=	heli selection – water drop	Coast
FL	=	heli single standing stem – land drop	Coast
FW	=	heli single standing stem – water drop	Coast
HW	=	helicopter clearcut - water	Coast
HL	=	helicopter clear-cut - land	Coast
HC	=	helicopter clear-cut	Interior
HS	=	helicopter selective	Interior
CC	=	cable clear-cut	Both
CS	=	cable selective	Both
LC	=	sky line clear-cut	Both
LS	=	sky line selective	Both
HO	=	horse	Interior
SC	=	ground system-clear-cut	Both
SS	=	ground system - selective	Both
SP	=	specified operation	Interior

4.3.1.23 Positions 55 to 57 Slope Percent

Record the most severe slope measurement in any direction to a point 15 m slope distance from the plot centre and within the block. Plot slope must be recorded in both measure and count plots. If the slope is not recorded, it will be compiled as zero slope.

The plot slope reading must be confined to the harvesting method area that the plot centre is located within if the harvesting method boundary is known when the field work is performed.

Plot slope data is required for all road rights-of-way areas contained within a cutting authority. Plot slope is not recorded on road cuts or fills.

It is recommended that a ribbon is hung at the point where the plot slope was taken to assist with check cruises.

4.3.1.24 Positions 58 to 61 Year/Month

Record the year and month that the fieldwork was performed. The date must be recorded by the cruiser and entered into the cruise compilation.

4.3.2 Card Type 2

4.3.2.1 Position 1 Tree Details

This card contains the individual tree details.

4.3.2.2 Positions 25 to 26 Tree Number

Number trees consecutively from number 1 (do not duplicate numbers on any plot). Plot trees selected as sample trees maintain the same number in Sample Tree Details (Card Type 3).

4.3.2.3 Positions 27 to 29 Total Height

All heights entered here will be used in the calculation of individual tree volume. Heights must be recorded to the nearest 0.1 m.

The "One Hundred Percent Method" is the mandatory method of tree height determination. All tree heights must be either measured or estimated. The use of a clinometer or electronic measuring device is recommended for tree height measurements and estimates. A lower top reading generally indicates a more precise measurement, so readings should be kept below 100 percent.

The height curve method is restricted to use in stump cruises or where severe damage due to wind shear or freezing has occurred (see Chapter [6 Stump Cruising](#)). Severely damaged stands must be identified on the cruise plan and submitted to the Regional Executive Director or their designate for sampling alternatives.

Project the original height of trees with broken tops (as per [Figure 4.9 Example of Where to Measure the Height on Trees with a Broken Top or Fork/Crook](#) below).

4.3.2.3.1 Trees with Broken Tops

If a tree has a broken top, the height of the tree must be estimated. There are three methods used to estimate the height of a tree with a broken top:

1. If the broken top segments are available on the ground, add the length of these segments to the standing portion of the stem.
2. Project the original height of the tree with a broken top (see [Figure 4.9 Example of Where to Measure the Height on Trees with a Broken Top or Fork/Crook](#)). Use adjacent trees and comparable tree heights to estimate heights of trees with broken tops. Trees that are acceptable for comparison are:
 - a) Same/ similar species,
 - b) same 10 cm diameter class (10-20, 21-30, 31-40, etc.),
 - c) live top,
 - d) if no live tops, then an intact dead top.
3. Where no suitable trees exist within the stand to base an estimate on, project the height of the tree based on the species' natural taper.

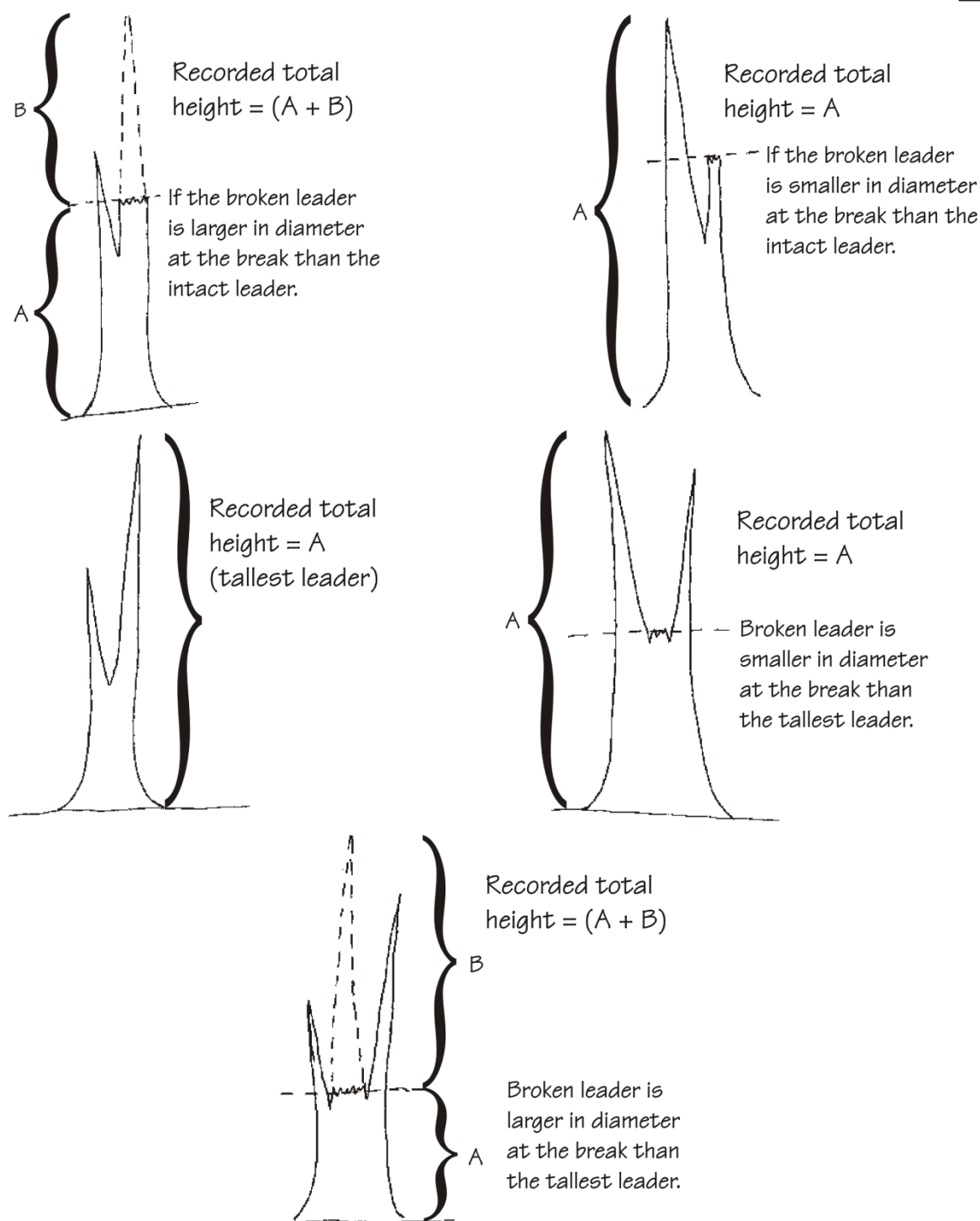


Figure 4.9 Example of Where to Measure the Height on Trees with a Broken Top or Fork/Crook.

4.3.2.3.2 Leaning Trees

The following method should be used for measuring the tree length of trees leaning more than ten degrees (B) from the vertical (see [Figure 4.10 Measuring Height of Leaning Trees.](#)). The angle A must be 90 degrees.

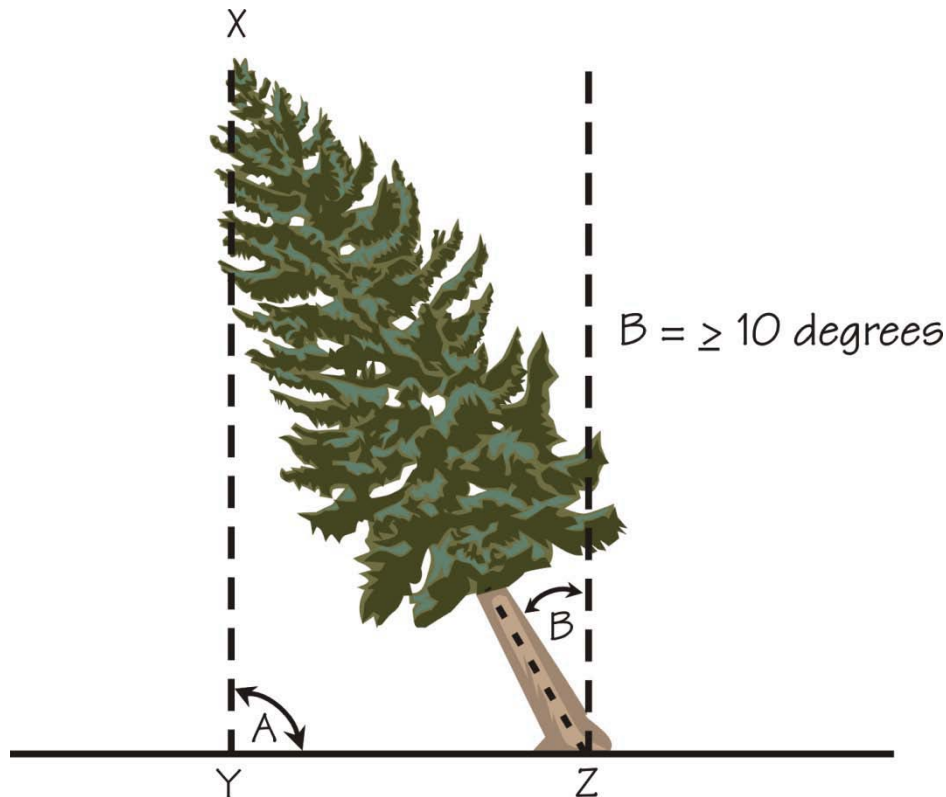


Figure 4.10 Measuring Height of Leaning Trees.

1. Calculate the vertical distance from the ground (Y) to the top of the tree (X) using a clinometer or electronic measuring device from a point perpendicular to the lean of the tree (i.e., A = 90 degrees).
2. Measure the horizontal distance from the centre of the tree (Z) to a point directly under the top of the leaning tree (Y).
3. Calculate the tree length by using the Pythagorean formula for right triangles:

$$\text{Tree Length}(m) = \sqrt{(\text{length } XY(m))^2 + (\text{length } YZ(m))^2}$$

The degree of lean will not be a check cruising item, however, tree length will be considered the true tree height.

4.3.2.3.3 Deciduous Tree Heights

In order to obtain a reasonable height for deciduous trees, ensure the height is measured from an adequate distance from the tree when measuring the highest point. It is recommended that the angle of measurement is less than 100 percent. This will assist in distinguishing the highest point on the tree from lower branching or forks.

4.3.2.4 Positions 30 to 31 Species

All living and dead, standing and down trees which are listed in this section (except dead and down tree class 4 that do not meet the minimum CGNF standard on the Coast) and which meet or exceed the timber merchantability specifications must be recorded when present in a plot.

Enter the appropriate commercial species symbol. Genus symbol letters must be "Capitalized" or upper case. Species symbols should be upper case also (entry is left oriented).

Genus Symbols - These symbols must always be entered for the proper implementation of the volume equations and loss factors.

Species Symbols:

1. The specific symbol for broadleaf maple (Mb), the pines (Pl, Pw, Pa, Py), aspen (At) and cottonwood (Ac) must be entered for the proper implementation of the loss factors and volume equations.
2. The species symbols for other species such as the spruces, hemlock and balsams (*Abies* sp.) should only be used when positive identification can be made in the field and the appraisal requires it. Species specific symbols for *Abies amabilis*, *grandis* and *lasiocarpa* must be entered for Interior cruises. Coastal Call Grade Net Factor cruises must use species specific symbols for *Tsuga mertensiana* (Hm), if known. *Tsuga heterophylla* can use H or Hw.

4.3.2.4.1 Commercial Tree Species Names and Symbols

Common Name of Genus/Species	Scientific Name of Genus/Species	Genus Symbol*	Species Symbol*
Alder	<i>Alnus</i>	D	
Red Alder	<i>A. rubra</i>		Dr
Balsam (<i>Abies</i> sp.)	<i>Abies</i>	B	
Alpine fir	<i>A. lasiocarpa</i>		Bl
Amabilis fir	<i>A. amabilis</i>		Ba
Grand fir	<i>A. grandis</i>		Bg
Birch	<i>Betula</i>	E	
Common paper birch	<i>B. papyrifera</i>		Ep
Alaska paper birch	<i>B. neoalaskana</i>		En

Cedar	<i>Thuja</i>	C	
Western red cedar	<i>T. plicata</i>		Cw
Cypress	<i>Chamaecyparis</i>	Y	
Yellow cedar	<i>C. nootkataensis</i>		Yc
Douglas-fir	<i>Pseudotsuga</i>	F	
Douglas-fir	<i>P. menziesii</i>		Fd
Hemlock	<i>Tsuga</i>	H	
Mountain hemlock	<i>T. mertensiana</i>	CGNF cruises	Hm
Western hemlock	<i>T. heterophylla</i>	CGNF cruises	Hw or H
Larch	<i>Larix</i>	L	
Alpine larch	<i>L. lyallii</i>		Li
Tamarack	<i>L. laricina</i>		Lt
Western larch	<i>L. occidentalis</i>		Lo
Maple	<i>Acer</i>	M	
Broadleaved maple	<i>A. macrophyllum</i>		Mb
Pine	<i>Pinus</i>	P	
Lodgepole pine	<i>P. contorta</i>		Pl
Western white pine	<i>P. monticola</i>		Pw
Whitebark pine	<i>P. albicaulis</i>		Pa
Yellow pine	<i>P. ponderosa</i>		Py
Poplar	<i>Populus</i>	A	
Aspen	<i>P. tremuloides</i>		At
Balsam poplar	<i>P. balsamifera</i>		Ac
	<i>sub. sp. Balsamifera</i>		
Black cottonwood	<i>P. balsamifera</i>		Ac
	<i>sub. sp. trichocarpa</i>		
Spruce	<i>Picea</i>	S	
Black spruce	<i>P. mariana</i>		Sb
Englemann spruce	<i>P. engelmannii</i>		Se
Sitka spruce	<i>P. sitchensis</i>		Ss
White spruce	<i>P. glauca</i>		Sw
Yew	<i>Taxus</i>	T	Optional
Western Yew	<i>T. brevifolia</i>		

- * The bolded symbols are the standard to be used for operational cruises. *Species* symbols which are not bolded may also be used if required. The symbol(s) chosen must be used consistently in all plots. The genus symbols M (maple), P (pine) and A (poplar) cannot be used alone and require the species symbol as well. The genus and species symbol is required for Mountain hemlock in Call Grade Net Factor cruises. Yew is not required for appraisal cruising.

4.3.2.5 Positions 32 to 35 DBH

Enter the diameter at breast height to the nearest 0.1 centimetre for each tree equal to or above the timber merchantability specifications. Whole numbers are recorded as decimals (e.g., 12.0 not 12).

4.3.2.5.1 High Side

High side is defined as the highest point of the ground around the base of the tree. Kick aside any loose litter and debris. If obstacles obstruct the base of the tree at the high side, measure breast height (1.3 m) from the high side of the ground and *not* from the top of the obstacle. Road fills are considered obstacles.

If high side is lower than the point of germination (POG), then measure breast height (1.3 m) starting from the POG.

If the lower portion of the stem has sweep, pistol grip or the tree is on the ground, then measure breast height (1.3 m) along the curve and parallel to the centre line of the tree.

4.3.2.5.2 Horizontal Distance from Plot Centre

This is the measured horizontal distance from the plot centre to the face of standing trees at breast height (1.3 m) plus half the DBH. Leaning and down trees must be measured from the centre of the tree at breast height to the plot centre (see Section 4.3.1.15). When a tree is laying on the ground, the measurement is made from the centre of the top side of the tree at breast height to the plot centre.

4.3.2.5.3 Diameter of trees forked at or near DBH

A tree that is forked below breast height will be measured as two trees. If the diameter tape cannot be wrapped around the circumference of the tree at breast height because the forks are too close together, then measure the diameter at the nearest opportunity above the fork and adjust for DBH accordingly. Note on the tally card that the diameter has been estimated. Refer to [Figure 4.11 Two Trees or One.](#)

A tree that is forked at or above DBH will be measured as one tree. If there is swelling at DBH due to the fork, measure the tree at the nearest available location and estimate the diameter at DBH. Note on the tally card that the diameter has been estimated. Refer to [Figure 4.11 Two Trees or One.](#)

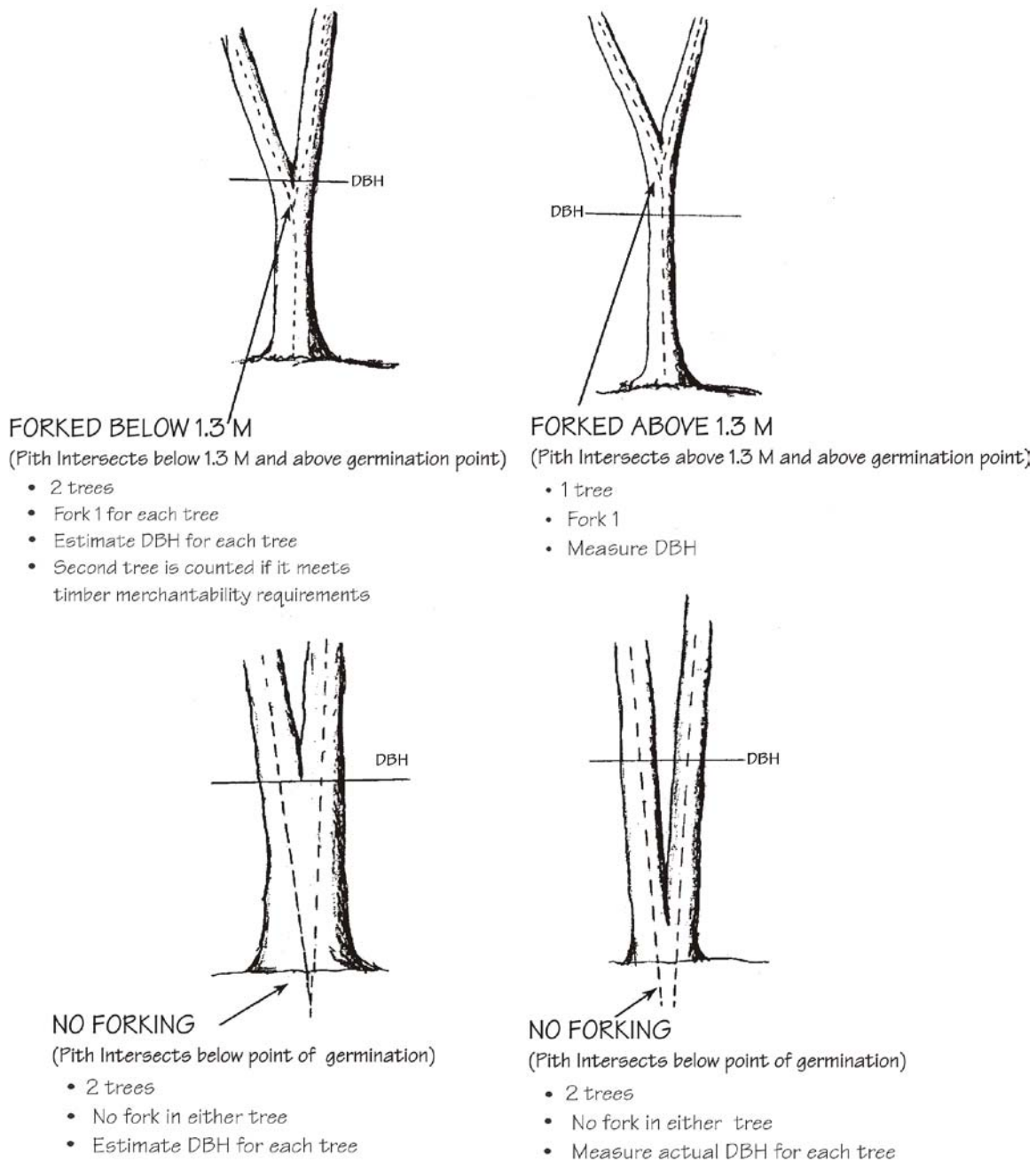


Figure 4.11 Two Trees or One.

Also see [Pathological Classification of Trees](#) (Appendix 4) for details regarding forks and crooks.

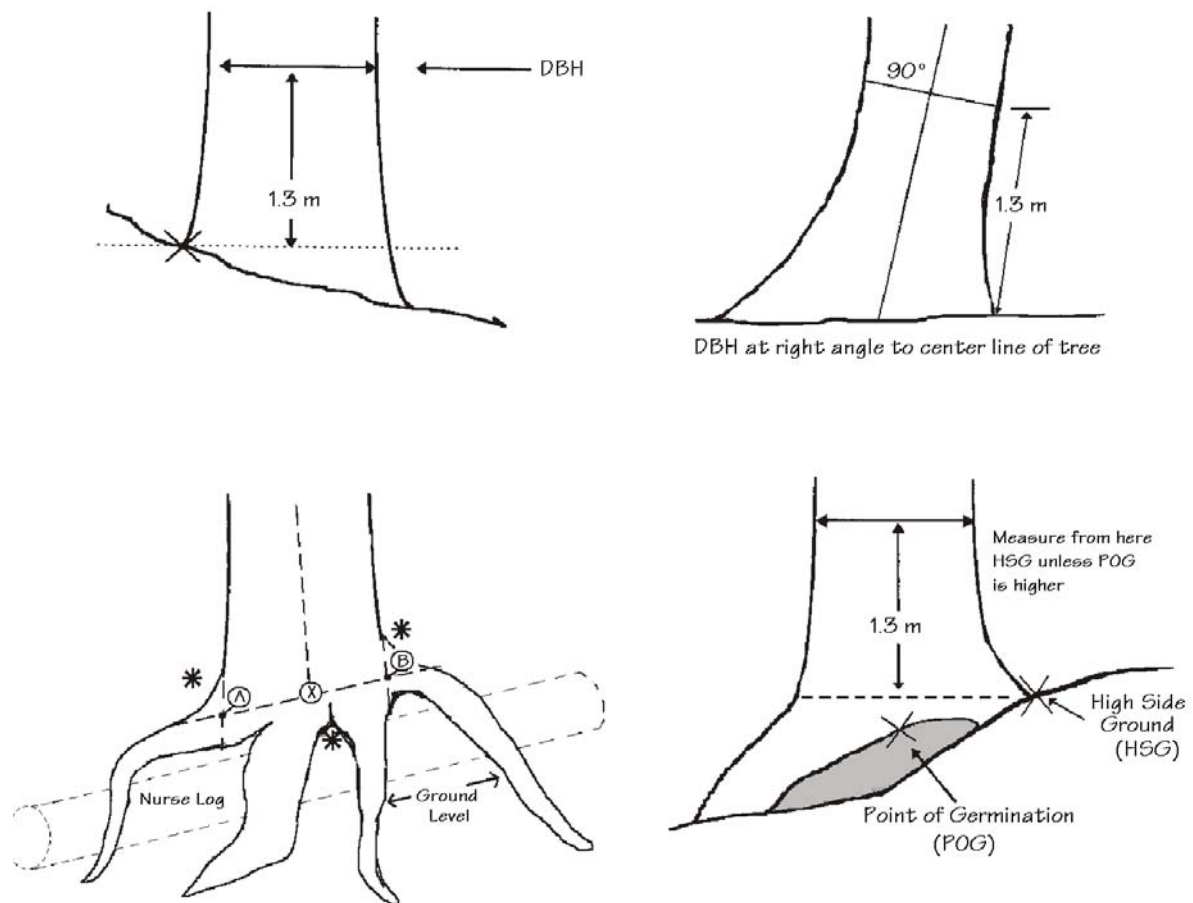
If there are burls, galls or swelling obstructing a normal taper measurement for a tree at breast height, then measure above and below the abnormalities and estimate the diameter from the two measurements. Note on the tally card that the diameter has been estimated.

Do not make allowances for missing bark at breast height.

Breast height must still be established at 1.3 m from the high side ground when there is snow on the ground.

Trees that have been cut into pieces or that have had pieces removed will be measured if 50 percent or more of their gross volume is still on site (or the remaining piece meets the minimum standard for Coastal CGNF). Measure DBH 1.0 metre from the butt end of the log. The tree height will be measured or estimated from the butt end of the log to the top plus 0.3 metres to allow for a stump height.

The plot radius for the logs will be measured to their DBH using the same method as for uprooted trees (see Section [4.3.1.15](#)).



High side location when POG clearly above ground level, nurse logs/stumps, hummucky/rocky ground, erosion and upturned stumps.

- (X) POG defined by the midpoint of the low root centre and a transect line to the midpoint of the highroot centre.
- (A) to (B) The POG is the point where this transect line intersects the pith.
- * Indicates incorrect locations for highside and POG on this tree.

Figure 4.12 Breast height in Relation to High Side.

4.3.2.6 Position 36 Tree Class

The tree class must be consistent with the age in 10's reported for the plot.

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

Refer to [Pathological Classification of Trees](#) (Appendix 4) for diagrams and further information about pathological indicators.

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

Interior	<p>Enter 11 for the Age in 10's on the cruise tally card type 9. The tree classes will be coded as follows:</p> <table> <tr> <td>Older immature</td><td>– tree class 1</td></tr> <tr> <td>Older immature -Suspect</td><td>– tree class 2</td></tr> <tr> <td>Older Imm. Dead Potential</td><td>– tree class 3</td></tr> <tr> <td>Dead useless</td><td>– tree class 4</td></tr> <tr> <td>*Mature</td><td>– tree class 5</td></tr> <tr> <td>Live Useless</td><td>– tree class 6</td></tr> <tr> <td>*Mature-Dead Potential</td><td>– tree class 7</td></tr> <tr> <td>Younger Immature</td><td>– tree class 8</td></tr> <tr> <td>Younger Imm. Dead Potential</td><td>– tree class 9</td></tr> </table> <p>* = except FIZ K and L Aspen and Cottonwood - see Forest Inventory Zone Series Numbers (Table 17 in Appendices)</p>	Older immature	– tree class 1	Older immature -Suspect	– tree class 2	Older Imm. Dead Potential	– tree class 3	Dead useless	– tree class 4	*Mature	– tree class 5	Live Useless	– tree class 6	*Mature-Dead Potential	– tree class 7	Younger Immature	– tree class 8	Younger Imm. Dead Potential	– tree class 9
Older immature	– tree class 1																		
Older immature -Suspect	– tree class 2																		
Older Imm. Dead Potential	– tree class 3																		
Dead useless	– tree class 4																		
*Mature	– tree class 5																		
Live Useless	– tree class 6																		
*Mature-Dead Potential	– tree class 7																		
Younger Immature	– tree class 8																		
Younger Imm. Dead Potential	– tree class 9																		
Coast	<p>Use the same coding as above for younger and older immature stands if there are not any trees older than 120 years in a plot.</p> <p>If there are trees older than 120 years in the plot then refer to Section 4.3.1.8 for details regarding the age in 10s and tree class reporting.</p>																		

Tree Class 1

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

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](#) (Table 18 in Appendices) for risk group assignments by pathological indicators.

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

Tree Class 3 is dead standing or down timber which is estimated to contain at least 50 percent of its original gross volume in sound-wood content. All dead potential standing and down trees must be tallied.

Trees with green and/or red needles are considered live trees and will be classified based on pathological indicators. Standing or windfall trees with grey or no needles will be considered dead trees; except for mountain pine beetle attacked lodgepole pine 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](#) (Table 19) and the [Ten Metre Log Table](#) in the Appendices 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.

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

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

Pathology is required on all dead potential trees on the coast and dead potential hemlock, white pine and balsam (*Abies* sp.) in the interior for use in the log grade algorithms.

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

Indications – One or More Must be Present

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

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

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

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

Tree Class 4 (Dead Useless)

Dead standing trees that have less than 50.0 percent of their original gross volume in firmwood content or otherwise fail to meet the criteria of a dead potential tree as described above as Tree Class 3 will be classified as "dead useless" trees.

In the Interior, only standing Tree Class 4 trees greater than 3 metres in height are tallied. In the Interior, the actual observed height and the estimated DBH must be recorded.

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 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 trees that exhibit extreme decay and are generally described as broken stems with a hollow or rotten centre and have only one or two live limbs. 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.

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

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

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 volume. Tree Class 7 shares the characteristics of both the immature dead potential (Tree Class 3) and mature tree classes (Tree Class 5). Therefore, the guidelines for Tree Class 3 and Tree Class 5 apply.

Dead potential Lodgepole pine will use Risk Group 2 loss factors unless the tree has conk or blind conk. If a dead potential Lodgepole pine has conk or blind conk, it will use the highest risk group.

Tree Class 8 (Younger Immature)

Tree Class 8 trees are younger immature trees which are:

- a. Coniferous trees, other than Lodgepole pine, equal to or less than 80 years of age.
- b. Lodgepole pine trees equal to or less than 60 years of age.
- c. Deciduous trees equal to or less than 20 years of age.

Two exceptions exist:

- a. Aspen and Cottonwood in FIZ K and L where tree classes 8 will be used for trees less than 81 years of age,
- b. Coastal cruises where the age in 10's is 13 or 14, tree class 8 will be used for trees equal to or less than 120 years of age.

Tree Class 9 (Dead Potential; Younger Immature Dead Potential in Interior)

Tree class 9 dead potential trees are immature and contain at least 50.0% of the tree's original volume. Tree Class 9 shares the characteristics of both the immature dead potential (Tree Class 3) and younger immature tree classes (Tree Class 8). Therefore, the guidelines for Tree Class 3 and Tree Class 8 apply.

Ages

In over mature stands, the establishment of age is not critical except for interior cedar over 141 years as it requires a different top diameter for compilation.

The age correction to breast height is found in the [Site Index Tables for British Columbia – All Species](#) in the appendices.

Tree class 3, 7 and 9 trees – record age as counted and corrected. Do not add the number of years that the tree has been dead.

Age of sample 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, except Lodgepole pine where the inventory age will be used to determine the correct age classes. The number of trees that need to be drilled will be dependent upon the maturity profile in each plot.

Use the following procedure for determining the tree classes for interior Lodgepole pine (PL):

- Overlay the most recent Forest Cover Inventory or Vegetation Resource Inventory (VRI) polygon coverage on the cruise plan map.
- Identify the projected age or the age class code for each overlaying polygon. The projected age can be retrieved from the Vegetation Tab in Mapview or from the licensee forest cover mapping system. The age class codes can be retrieved from the most recent TFL or WL inventory maps.

<https://webmaps.gov.bc.ca/imfs/imf.jsp?site=mapview>

- The age of each interior Lodgepole pine tree tallied in a plot is the projected age or the corresponding age of the inventory polygon in which the plot is located.

Refer to the age class code from the table below to determine the corresponding age range.

Code Age	Age Class Limits	Allowable Tree Classes
1	1 to 20 years	8, 9
2	21 to 40 years	
3	41 to 60 years	
4	61 to 80 years	1, 2, 3
5	81 to 100 years	
6	101 to 120 years	
7	121 to 140 years	5, 7
8	141 to 160 years	
9	250 + years	

Note: Tree Classes 4 and 6 are allowed for all age classes.

Examples of determining PL tree age and tree classes:

1 - Mapview

The polygon projected age is 125 years old. Therefore, the PL trees in the plots in the polygon are classified as mature tree classes 5 or 7.

#2 - Tree Farm Licence

The polygon age class is 4, which corresponds to 61 to 80 years. Therefore, the PL trees are older immature tree classes 1, 2 or 3.

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 A.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 4, 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) blocks representing the bottom third, the middle (MID) block the middle third, and the top (TOP) block the top third. The shading indicates in which third or thirds the defects occur based on the codes 1 through 7. If the defects occur in the bottom third only, "1" is entered in the defect column. If a defect occurs in both the middle and top thirds, "5" is entered; etc.

Path Code by Tree Third							
	1	2	3	4	5	6	7
TOP							
MID							
BOT							

The column heads under "PATH REMARKS" are self-explanatory except for the last two: "Rotten Br." means "Rotten Branch"; "D. or B. Top" means "Dead or Broken Top". All the pathological indicators listed must be recorded in the third(s) where they occur.

Refer to the [Risk Group Ratings by Pathological Indicators](#) in Table 18 for pathological occurrence by species and forest inventory zones.

Examples:

1. A tree has conks on the middle and top thirds of the trunk and an open basal scar on the lower third. Under "Conk" enter "5" and under "Scar" enter "1".
2. A tree has a fork on the middle third, blind conks on the top third and a broken top. Under "Fork" enter "2", under "Blind Conk" enter "3" and under "D. or B. Top" enter "3".
3. A tree has a fork on the middle third, with a frost crack extending from the ground to the fork; one of the leaders of the fork is broken and the leader is not of merchantable size. Under "Fork or Crook" enter "2", under "Frost Crack" enter "4".

4.3.2.8 Positions 45 to 51 Quality Remarks (Mandatory on Coast, Optional in Interior)

The quality information will be collected on all age classes and will apply to all commercial living trees plus dead potential standing or down trees found on the plot and on the largest leader on a forked stem. This is in addition to the eight pathological indicators of decay which can also be considered as affecting the quality of products obtained from a given tree.

Codes are indicated in the "Quality Code" box on the back of the plot sheet.

Stem quality information forms the basis for a computerized grading system. They are recorded when observed 30 cm or more above the high side of the tree. This data collection is currently optional in the interior.

The quality information will be collected on all commercial living and dead potential trees (refer to Positions 45-51).

4.3.2.9 Position 45 Spiral Grain

Spiral grain is also known as "twist". The direction of the grain can best be seen in exposed wood such as the open scars in living trees or dead trees with sloughing bark. Spiralling bark fissures and frost cracks also provide useful evidence of spiral grain.

Spiral grain shall be estimated at the halfway point between stump height and 10.3 m and expressed as a percentage.

For Loss Factor Cruises Only - Estimate the most severe spiral grain on the 1 m section at 5.3 m above the high-side. The offset from the vertical line in centimetres is the percent spiral grain per metre. Use the spiral at breast height as a guide for estimation.

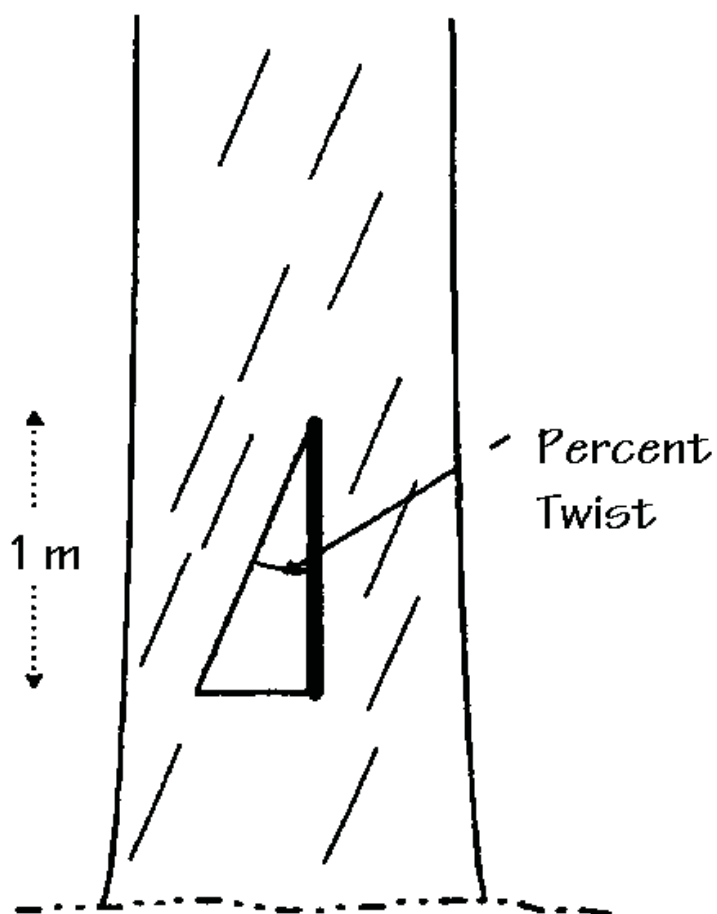


Figure 4.13 Determination of Percent Twist.

Recording Code	% Displacement	Recording Code	% Displacement
0	0 - 5%	5	46 - 55%
1	6 - 15%	6	56 - 65%
2	16 - 25%	7	66 - 75%
3	26 - 35%	8	76 - 85%
4	36 - 45%	9	86 +

4.3.2.10 Position 46 Sweep

Currently not required.

4.3.2.11 Position 47 Lean

Currently not required.

Live Limb, Stub and Knots

These quality indicators are recorded in 5 m log lengths starting at the timber merchantability specification stump height (0.3 m). Live limb and stub are recorded as the log containing the required indicator. The knot indicators are recorded by dividing the log into quarters and recording the number of quarters containing knot indicators. Once the quarters have been determined, the quarters must remain the same in all 5 m logs of the tree.

4.3.2.12 Position 48 Live Limb (Grade Change)

Definition: The 5 m log where quality changes from: *no knots* to *knots or knot indicators* or from *small knots* to *large knots* or from *well spaced knots* to *excessive knots*.

The purpose of recording live limb is to identify the first 5 m log grade change as you move up the tree.

This will assist the log grade algorithm to better determine the cruise grade distribution produced by the cruise compilation program.

If the branching is consistent in frequency and size from the base to the merchantable top diameter of the tree, record live limb as a one (1).

On deciduous trees, live limb is recorded as the 5 m log where the natural forking starts. Record live limb for dead potential tree classes by estimating it from similar standing trees.

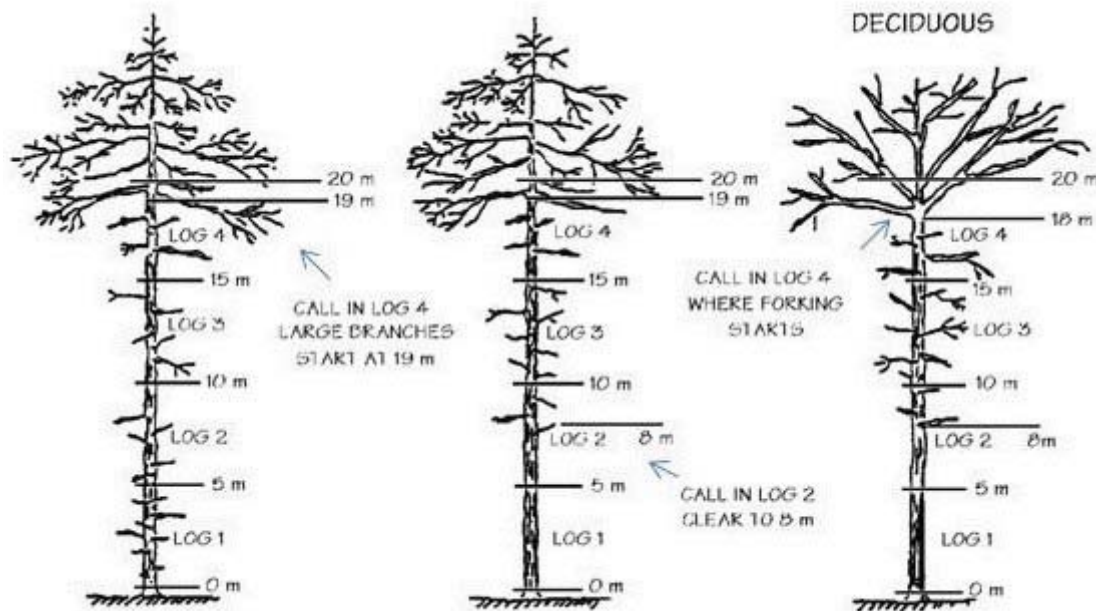


Figure 4.14 Example of Live Limb.

4.3.2.13 Position 49 Log No. of 1st Stub

Enter the log number on which the first stub or first branch occurs, irrespective of diameter or length. This may occur on the same log as the base of the crown or at some point below.

Any stub and live or dead branch is considered when identifying the log number of the first stub (see the following section for discussion of epicormic branching).

4.3.2.14 Positions 50 and 51 Knots, 1st 5 m and 2nd 5 m

The location of clear surface area in the first two 5 m logs indicates the potential grade of a log. The location of the four quarters on the second 5 m log must be the same as the location of the four quarters on the first 5 m log.

A clear quarter must be free of any open knot, knot indicator, branch stub, dead or living side branch, bunch knots or forks.

Epicormic branches, suckers and candelabras are not classed as knots.

Forks are considered knots.

Record the number of clear quarters for the first log (0.3 - 5.3 m from the high side of ground) and for the second log (5.3 - 10.3 m) as follows:

Code	Remarks
0	No quarters with knots (four clear quarters)
1	Knots in one quarter (three clear quarters)
2	Knots in two quarters
3	Knots in three quarters
4	Knots in four quarters
5	One to three knots, branches or stubs estimated to be greater than 10 cm dib, irrespective of the number of clear quarters.
6	Four or more knots, branches or stubs greater than 10 cm dib, irrespective of the number of clear quarters.

Epicormic branches are small sprout-type limbs that originate from dormant or adventitious buds. According to current literature, this type of branching is not generally prevalent on conifers except on the true fir (*Abies*) species. Since these branches do not originate from the pith and if present, live for only a short period (4-6 years), they have no effect on the quality of the wood.

4.3.2.15 Positions 52 to 56

These columns are not in use.

4.3.2.16 Position 59 Selective Cutting

L	leave tree
Blank or C	cut tree

4.3.2.17 Position 60 Miscellaneous

Root Rot	Description
J = light	Tree within a disease centre or within 10 m of a tree or stump that is symptomatic or killed by root disease.
K = moderate	Tree with root disease crown symptoms.
L = heavy	Tree with root disease confirmed by stain, decay, fruiting bodies or basal resinous.

Interior Dead Potential White Pine Log Grade Algorithm

Sap rot and weather checks can be collected in the root rot column, column 60.

The sap rot and weather check codes are as follows:

- a. record by tree third as per pathological indicator location codes 1 to 7,
- b. record codes 1 to 7 for tree thirds that will not be suitable to produce at least 50 percent lumber.

Refer to the [Interior Dead Potential White Pine Log Grade Algorithm](#) (Appendix 7) for a more detailed description of the algorithm.

The hemlock and dead white pine grade algorithms are used for interior appraisals. The hemlock algorithm is found in Section [A.7.2](#) (Interior Hemlock Algorithm Flow Chart) and the white pine algorithm is found in Section [A.7.1.3](#) (Dead Potential White Pine Log Grade Algorithm). Sap rot and suncheck codes are required for the dead potential white pine algorithm. The procedure is outlined in [A.7.1.2](#).

4.3.2.18 Positions 61 to 63 Damage Codes

Damage codes are to be recorded as they appear at the time of the cruise with no attempt to predict the future condition of the trees.

The codes are for appraisal reporting purposes and for net volume adjustment purposes in the compilation.

All damage types will be compiled for net volume. Where multiple damage is recorded for a single tree, the most severe damage type will be compiled for that tree.

All damage types will be reported in the cruise as a percentage of the cruise net volume.

See the [Damaged Stands](#) appendix (Appendix 6) for further information.

4.4 Reverse Side of Cruise Tally Sheet ([FS 205 HVA](#))

Date

Record the year, month and day that the field card is signed by the cruiser.

Signatures

The data collected by timber cruisers is used to determine stumpage rates and in the case of cruise based billing, the volume for billing.

Refer to Section [3.8\(4\)](#) for details on the signing of cruise cards.

Miscellaneous

Ecosystem	Record the Biogeoclimatic subzone and variant if known.
Snow Depth	Note average depth of snow in centimetres at the time of cruise for the cruise plot, along with the date on which the cruise plot was completed.
Cruised By	Signature, full name and professional designation (where applicable)
Checked By	Signature and full name If the check cruiser uses the original cruise tally sheets, they must be signed and dated by the check cruiser.

Growth rates, the number of rings in the last 10 cm, and 10 year growth can be noted in the Remarks section.

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