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June 28, 2019

BY EMAIL

To: Regional Executive Directors, Ministry of Forests, Lands & Natural Resource Operations

Re: 2017 Cruising Manual, Amendment No. 3

The purpose of the memo is to inform you that Amendment No. 3 to the 2017 *Cruising Manual* becomes effective July 1, 2019.

The manual will be available on the internet at the following link:

<http://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/timber-cruising/timber-cruising-manual>

Please find a copy of the *Cruising Manual, Amendment No. 3* highlights attached.

Comments or questions about this manual should be referred to Michael Wedel, Cruising Policy Forester, Timber Pricing Branch at (778) 974-2450.

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Director
Timber Pricing Branch

Attachment

pc: Jim Schafthuizen, A/Executive Director, Forest Policy and Indigenous Relations Division
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Cruising Manual

Effective April 1, 2017

Includes Amendments

Date

Amendment No. 3

July 1, 2019

Amendment No. 2

July 1, 2018

Amendment No. 1

November 7, 2017



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Highlights

Amendment No. 3 to the 2017 *Cruising Manual* is effective **July 1, 2019**. The manual is available at:

<http://www2.gov.bc.ca/gov/content/industry/forestry/competitive-forest-industry/timber-pricing/timber-cruising/timber-cruising-manual>

Section	Description
Chapter 1 Introduction	Cruising professionals are encouraged to exceed the minimum sampling intensity standards where necessary to provide a better cruise for appraisals or other forest management objectives.
Chapter 2: 2.3.4, 2.3.5, 2.4.1, and 2.4.3	Details are provided to clarify that additional count plots or a higher sampling intensity may be used in place of the minimum standards. An acceptable pattern of alternating full measure and count plots will be considered to meet requirements for a 1:1 ratio of count to measure plots. A standard requiring a 100m by 100m grid or a 70m by 70m grid can be met by an equivalent combination of overlain grids in the case where 95% SEE is not met in the original cruise.
Chapter 3: 3.2.1, 3.5, and 3.6	There are now requirements for signature of submitting professional, registration type and number, and original/revision indicator to be included in cruise plans and final cruise submissions. GPS standards have been changed to improve efficiency and provide more meaningful PRP information. The audit standard for GPS plot location has been simplified. The audit standard for plot slopes has been changed to allow one wrong slope for every ten or less plots checked.
Section 4.3.1.5: Plot Location Field Procedures	On the Coast, GPS may be used to establish plots only with prior approval from the District Manager. GPS has been used very little for Coastal cruising, and this provision is intended to provide lead time for revenue staff to gather GPS equipment for field audits. For GPS plot location, the minimum 5m PRP requirement has been deleted.
Section 4.3.1.23: Slope Percent	The plot slope procedure has been clarified with respect to plots near a falling boundary.
Section 4.3.2.6 Pine Ages	The inventory layer that best represents the interior Lodgepole pine in the cutting authority must be used to determine pine ages. This may include the dead pine layer in the BC Geographic Warehouse.

<p>Appendix 6.2 Fire Damage</p>	<p>Fire code definitions have been modified to improve clarity to the code A, B, and C criteria. The intended meaning of these definitions is unchanged.</p>
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1 Introduction

This manual outlines the cruising procedures to be used for stumpage appraisal purposes for timber on the Crown lands of British Columbia. It supersedes previous manuals and instructions.

The sale of Crown timber is a business proposition and both the buyer and the Ministry of Forests, Lands and Natural Resource Operations (seller) must know an estimate of the quantity and the quality of timber being sold. The cruise provides the essential data for determining stumpage rates, for establishing conditions of sale and for planning of the logging operations by the licensee.

In order to ensure that all purchasers of Crown timber are being treated equally and equitably, the manual sets out the minimum cruising standards that must be met. These include specifications for the statistical design of the cruise, the accuracy of field measurements and standard compilation procedures.

Cruisers and licensees are encouraged to exceed the minimum standards where a higher sampling intensity is desirable. This may include more plots in smaller or more variable types, higher tree counts, and more full measure plots where better DBH data is needed for percent reductions. All stakeholders benefit from a better cruise, which relies on professionalism and thoughtful sampling plans.

Implementation of the procedures and standards is a regional responsibility and the manual provides for sufficient flexibility that special circumstances can be accommodated. The appropriate Regional office should be consulted periodically for any revisions to the manual, for copies of Regional Guidelines, or the issuance of specifications for cruising salvage sales, minor product sales, etc. Refer to Chapter 4 of the *Coast Appraisal Manual* and *Interior Appraisal Manual* for further guidance.

The reliability of any cruise is based on statistical concepts and the cruise provides an estimate of the volume on the area cruised. The reliability of this estimate is a function of the intensity of sampling, the uniformity of the timber on the area cruised and the degree of fit of the volume equation and loss factors to the particular stand. It is for these reasons that two cruises of the same stand, carried out to the same standard may yield different volumes. For administrative purposes it is assumed that the calculated volume is the true volume.

BC Forest Professionals (ABC FP). Associate members and registered members are professionally accountable for their work.

Visit <http://www.abcfp.ca> for more information.

1.2 Terms of Reference

The *Forest Act*, Section 103 to 108 and regulations provide the statutory authority for the determination of stumpage rates for crown timber.

The *Forest Act*, Section 105, requires an agreement holder to ensure that any document that is submitted to government for use in determining, redetermining, or varying a stumpage rate, or for any purpose under this Act is complete and accurate at the time the information is submitted.

The Association of BC Forest Professionals, Bylaw 12 (Standards of Professional Practise) requires members to maintain competence, independence, integrity, due diligence, stewardship, and safety.

Cruisers and submitting professionals must follow the procedures and intent of this manual. Collaboration between industry and government is strongly encouraged where interpretations are needed, or special circumstances exist. Bias or deviation from these procedures is unlawful.

The *Coast Appraisal Manual* and *Interior Appraisal Manual* specify that cruise data must be gathered and compiled according to procedures established in the *Cruising Manual* and the *Cruise Compilation Manual*. The *Cruising Manual* and *Cruise Compilation Manual* are approved by the Director, Timber Pricing Branch.

1.2.1 Calculation Conventions

Each calculation will be calculated to the nearest tenth. This is consistent with the data precision level of the compilation reports.

The rounding rules to be used in this manual are the same as those in the *Cruise Compilation Manual* (see Appendix 16 of the *Cruise Compilation Manual*). (i.e. digits 0-4 are rounded down and 5-9 are rounded up).

For example, meeting a check cruise standard:

- 10.03 = 10.0 and does not exceed 10.0%
- ☒ 10.05 = 10.1 and exceeds 10.0%

For example, meeting a minimum threshold:

- 34.99 = 35.0 and meets the 35.0% threshold
- 34.94 = 34.9 and does not meet the 35.0% threshold

2. Cutting authorities must:
 - achieve a 12.0% sampling error objective at 2 SE using measure and count plots, or
 - the sampling error will be waived as per the scale based standards specified in section 2.3.1).
3. Cutting authorities that do not meet the MPB standards must meet the standards in section 2.3.2 to be a cruise based cutting authority.

2.3.4 General Cruise Based Cutting Authorities – Coast Only

The following standards apply to all general cruise based cutting authorities within the Coast area as described in the Coast Appraisal Manual:

Cutting authorities must:

1. achieve a 10.0% sampling error objective at 2 SE using measure and count plots, and an average of at least 4.0 trees per plot per block, or
2. The sampling error will be waived if the following conditions have been met:
 - a. For cutting authorities of 40.0 ha net merchantable area or larger in size:
 - i. A systematic grid consisting of all full measure plots on a 100m by 100m grid (or a higher intensity cruise sample that may include additional count plots or a smaller grid) has been established, and
 - ii. An average of at least 4.0 trees per plot per block has been achieved.
 - b. For cutting authorities less than 40.0 ha net merchantable area in size:
 - i. A systematic grid of equal intervals and spacing of not greater than 70 metres by 70 metres has been established, and
 - ii. A maximum ratio of 1.0 count plot to 1.0 measure plot has not been exceeded and an average of at least 4.0 trees per plot per block has been met
 - c. In addition, within any stand-alone polygon less than 5 ha net merchantable area in size (regardless of cutting authority size) the following requirements must be met:
 - i. A systematic grid of equal intervals and spacing of not greater than 70 metres by 70 metres has been established, and
 - ii. A maximum ratio of 1.0 count plot to 1.0 measure plot has not been exceeded.

Cruise based cutting authorities under this section, other than BCTS sales, will not require loss factor cruising as Call Grade Net Factor (CGNF) cruising will be used for appraisal purposes. BCTS must continue to collect both loss factor and CGNF cruise data until CGNF is fully implemented across the Coast for appraisal purposes.

Please note that for general cruise based cutting authorities within the Coast area, percent reductions (See Section 5.9) are not permitted and the net merchantable volume will be based upon 100% removal of the net merchantable area.

2.3.5 Cutting Authorities within the Great Bear Rainforest North

The following standards apply to all cruise based cutting authorities, except road permits and road permit amendments, within the Great Bear Rainforest North (GBRN) as defined within the Coast Appraisal Manual:

Cutting authorities must:

1. achieve a 10.0% sampling error objective at 2 SE using measure and count plots, and an average of at least 4.0 trees per plot per block, or
2. The sampling error will be waived if the following conditions have been met:
 - a. For cutting authorities of 40.0 ha net merchantable area or larger in size:
 - i. A systematic grid consisting of all full measure plots on a 100m by 100m grid (or a higher intensity cruise sample that may include additional count plots or a smaller grid) has been established, and
 - ii. An average of at least 4.0 trees per plot per block has been achieved.
 - b. For cutting authorities less than 40.0 ha net merchantable area in size:
 - i. A maximum ratio of 1.0 count plot to 1.0 measure plot has not been exceeded,
 - ii. An average of at least 4.0 trees per plot per block has been met, and:
 - a) A systematic grid of equal intervals and spacing of not greater than 70 metres by 70 metres has been established, or
 - b) A systematic grid of full measure plots not greater than 100 metres by 100 metres has been established with count plots offset halfway between the measure plots along either the North-South or East-West grid lines.

- ii. If count plots are used in the cruise design, the most westerly plot on the most southerly line in the net merchantable area must be a measure plot.

All possible sample points that can be established in the net merchantable area must be cruised, whether or not they were included in the original cruise plan. All plots must originate from the net merchantable area.

Plots cannot be moved within a timber type polygon, except as required in Section 2.4.2 to achieve the minimum number of plots in a timber type polygon.

The grid may be square or staggered and of equal interval (rectangular grids are not permitted), however the option selected must be used consistently within an identifiable unit. Licensees must notify the district as to whether grids will be square or staggered within an identifiable unit and once chosen, the cruise plans must be consistent with this notification.

A “checkerboard” or equivalent consistent pattern of alternating full measure and count plots will be considered to meet the 1:1 ratio requirements described in Sections 2.3.1, 2.3.3, 2.3.4 and 2.3.5. This is acceptable despite irregular cutblock shapes that may hinder the mathematical achievement of the intended ratio.

2.4.2.1 Office Cruise Plan Procedure

Within the timber type, reduce the grid interval (using the same grid system) on the cruise plan by increments of 10 metres until the largest grid spacing that will meet the minimum plot establishment standards is achieved. The grid should be reduced from the point where the grid originates (See Section [2.4.1](#)), but only for the type in which additional plots are needed, not for the entire block or cruise.

2.4.2.2 Field Procedure

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

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

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

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

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

Where the added plots result in an overall sampling intensity equivalent to a 100m by 100m grid, or a 70m by 70m grid, they may be used to meet an applicable standard requiring a 100m by 100m grid or 70m by 70m grid. Smaller grids maybe be used in a sample design at the discretion of the person preparing the cruise plan.

	Requirements	Cruise Plan Submission	Final Cruise Submission
u	Physiographic features	Only if they affect sampling	Only if they affect sampling
v	Legal survey features	Only if they affect sampling	Yes
w	Forest and non-forest type boundaries	Yes	Yes
x	Cutting boundaries	Yes	Yes
y	Name of person or company who produced map and date map was produced	Yes	Yes
z	Name of person(s) who complete the cruise field work	Yes - proposed	Yes
Aa	Signature of submitting professional	Yes	Yes
Ab	Registration type (ATE, RFT, RPF) and registration number	Yes	Yes
Ac	Indicate if the submission is original or a revision	Yes	Yes

3.5 Survey and Area Measurement Standards

This section outlines the distance and area measurement standards used to locate plots and or harvest boundaries. Cruisers or check cruisers may use any appropriate method to measure and or initially verify a distance or area. For audit purposes, the true distance and or area measure may be derived from conventional measurement systems such as a survey chain and compass except when GPS is used to establish cruise plot locations. In these situations, plot location must be audited using a GPS unit that meets the standards specified in this section.

1 – Strip or Tie Lines (Conventional Methods Only - Sections [4.3.1.4](#) and [4.3.1.5](#))

Strip lines are only used with conventional measurement systems (i.e. without GPS technology).

The following standards apply to the strip or tie line measurements used to locate the plot centre. These standards apply from plot to plot or for any combined strip interval distance. The check cruiser will follow the same route (i.e. direction of travel) that the original cruiser traversed. The plot will be re-cruised if the plot location is not within the following standards:

Horizontal distance: plus or minus 2.0 percent (2.0 m per 100m).

Bearing: plus or minus 2.0 degrees (+/- 3.5 m per 100m).

Moving plot centres from the measured/ traversed location presents significant bias and is not permitted.

2 – Plot Measurements (Section [4.3.1.5](#))

Establishing Cruise Plots Using Conventional Methods

The standards applied to the distance measurement used to locate the plot reference tree and the plot are shown in Table [3-6](#):

- PRP coordinates – specify UTM or BC Albers*
- Cruise plot coordinates - specify UTM or BC Albers*

The required format of the PRP table is shown in Table 3-7.

*The map projection system used (i.e. BC Albers, UTM, etc.) must be consistent with the cruise plan.

Table 3-7 Sample of Required Format for PRP Table

CB	T Y P E	P L O T	H D (m)	B R G (°)	P D O P	H D O P	# S A T	# H I T	MDH (m)	Local Date, Time	PRP Easting	PRP Northing	PT Easting	PT Northing
											UTM	UTM	UTM	UTM
7	2	1	16.6	110	3.4	1.9	6	50	0.3	13:52:23 8/16/2019	683417.473	5657508.768	683433.292	5657503.723
7	2	2	9.7	329	3.9	2.3	8	50	0.1	14:12:50 8/16/2019	682934.854	5657577.685	682929.529	5657585.834
7	2	3	8.9	157	2.3	2.9	8	50	0.5	15:30:51 8.16.2019	683125.834	5657600.981	683129.624	5657592.922
7	2	4	11.6	063	2.0	1.7	9	50	0.4	16:01:20 8/16/2019	683219.529	5657590.781	683229.672	5657596.466
7	2	5	11.7	349	2.0	2.2	9	50	0.2	16:30:59 8/16/2019	683332.437	5657588.624	683329.720	5657600.010

Cruise plots that are located with GPS must meet the following standards. In order for a cruise to be rejected for cruise plot location data, either both of the first 2 standards (1 and 2) must be exceeded or the last standard (3) must be exceeded:

1. The average variation of all cruise plot locations checked must be within 3.0 m of the check cruise plot locations.
2. Individual variations between check cruise plot locations and the original cruise plot locations must be within 5.0m. A tolerance of one plot location outside of 5.0m will be allowed for every ten (or less) plots checked.
3. The distance and bearing between the cruiser's PRP and cruise plot must meet the same standards as those for conventional methods:
 - a) Horizontal distance: plus or minus 2.0 percent
 - b) Bearing: plus or minus 2.0 degrees

In order to require a re-cruise based on these standards, a minimum of 5 cruise plot locations or 10% of the cruise plot locations, whichever is greater, must be checked with a GPS unit that meets the aforementioned standards.

For additional information on precision standards for GPS plot locations, please see Circular Error Probability Method in the appendices.

3.6 Plot Slopes (Section 4.3.1.23)

The following standards apply to the measurement of plot slope. To support the audit process, the cruiser may establish flagging tape at the location used to determine the maximum slope at 15m slope distance from plot centre.

Either (a) or (b) must be exceeded before the standard is determined to be incorrect.

- a. **Plot slopes:** **Individual** plots must be within plus or minus 5.0 slope percentage points of the **correct** slope reading. **One plot slope outside this tolerance will be allowed for every ten (or less) plots checked.**
- b. **Block or Cutting Permit:** the average variation of all slopes checked must be within plus or minus 5.0 slope percent.

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 **not permitted**. Plots may only be **relocated** in accordance with Section [2.4.2](#). If the plot cannot be completed safely, it will be dropped and the reason documented.

Plot Establishment Procedures for Both Conventional Methods and GPS Technology

The following are the steps to be taken when establishing cruise plots:

1. Travel the distance and bearing identified on the cruise plan or map.
2. 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.
3. 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 a tallied tree within the plot. The slope or horizontal distance and bearing from plot centre to either a marked point below stump height (preferred) or the nearest point on the tree at breast height must be recorded. The cruiser should record whether they measured slope or horizontal distance and to which part of the tree the measurements were taken (breast height or stump height). The reference point will be used to determine the position of the plot centre if the original plot marker is missing and should be permanent enough to be available at the time of check cruise.

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).

Establishing Cruise Plots using GPS Technology

GPS may be used to establish cruise plots as prescribed in the following procedures. On the Coast, GPS may be used to establish plot locations only with prior approval from the District Manager.

1. Use the GPS to navigate to the cruise plot.
2. When you are within 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.

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. Trees that may be large enough to incur deflection and interference of GPS signals are not acceptable. 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 must 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.

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.

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 **along a line that is entirely within** the harvesting method **area that contains the plot centre** (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 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 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. **The inventory layer that best represents the population of the interior lodgepole pine in the cutting authority is to be used. This may include the VRI dead pine layer, which can be found in the B.C. Geographic Warehouse (BCGW) and can be accessed via Arc GIS. It is also expected to be made accessible in MapView in the near future. The source of interior lodgepole pine ages must be indicated in the cruise plan.**

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

- 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.
- 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.

Grey Attack Code 7 (Highest Risk Group for Fir/Highest Mature Risk Group for Spruce).

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

Red Attack Code 8 (Risk Group 2, Fir)

This code is reserved for Douglas fir where the red foliage remains on the tree for an average of two years. The compilation program downgrades these trees to Risk Group 2. If they have conk or blind conk they will be compiled as Risk Group 3.

A.6.1.4 Defoliators (Path/Tree Class = Risk Group, All Species)

This damage category includes hemlock looper, budworms, moths and other defoliators. If the classification is doubtful, assess the cambium on the north side at DBH.

- Code X - trees with living cambium. Tree classes 1, 2, 5, 6, 8, and
- Code Y - trees with dry cambium. All tree classes are allowed.
- All other insect attack codes take precedence over defoliator, codes x and y except code 4, Blister Rust.

A.6.2 Fire Damage

“Merchantable section” means the section of the stem between 30cm stump and the 10cm or 15cm top diameter inside bark as per the appropriate timber merchantability standards. Damage outside of these limits was not include dint eh the loss factor data.

“Charring” means the actual destruction of wood by fire. There must be identifiable damage to wood fibre.

“Shallow charring” means charring with is greater than 100 cm² in surface area and less than one-third of the radius of the tree (e.g. 10cm x 10cm).

“Extensive Shallow charring” means charring in the bottom third of the tree that has 3 or more area (each at least 100 cm²) of exposed and charred wood fibre or cumulative total of charred areas is greater than 300cm² (e.g. 10cm x 30cm).

“Deep Charring” means where charring is deeper than one-third of the radius of tree.

“Multiple Deep Checks” means where more than one check is deeper than one-third of the radius of the tree.

The following fire damage codes apply to all appraisal cruises and will be entered in column 62 of the cruise tally sheet (Figure 4.1 Cruise Tally Sheet – FS 205C (front side).):

A.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, Lands and Natural Resource Operations does not qualify for the fire damage coding.

A.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.

A.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.

A.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 in the merchantable portion¹ of living or dead potential trees and the tree is:

¹ *The merchantable portion of the tree is from 30cm stump height to a 10cm or 15cm top diameter inside bark as per the appropriate timber merchantability standards. Damage outside of these limits was not included in the loss factor data.*