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BY EMAIL

To: Regional Executive Directors

Re: 2021 Cruising and Compilation Manuals

The purpose of the memo is to inform you that the following manuals become effective July 1, 2021:

- Cruising Manual, Amendment No. 1
- CGNF Standards and Procedures for the Coast Forest Area, Original
- Cruise Compilation Manual, Amendment No. 1
- CGNF Compilation Standards for the Coast Forest Area, Amendment No. 1

The manuals 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>

Please find a copy of the highlights for these four manuals attached.

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

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Attachments

pc: Melissa Sanderson, Assistant Deputy Minister, Forest Policy and Indigenous Relations
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TIMBER PRICING BRANCH

Cruising Manual

Effective: July 1, 2020

Includes Amendments

Amendment No. 1

Effective Date

July 1, 2021



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Highlights

The **2021 Cruising Manual** is effective **July 1, 2021**. 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
1.1: Definitions	Definitions are added for Marked to Leave Percent Reductions and Marked to Leave Selective Cutting.
2.3.4 and 2.3.5: Cruise Based Percent Reductions	Only Marked to Leave percent reductions are allowed in Coastal cruise based cutting authorities.
3.2.1 Marked to Leave	Marked to Leave Percent Reduction trees are required to be located on the final cruise map.
3.4: Re-sweeps	Clarification is added to ensure re-sweep data is submitted in a timely manner to facilitate auditing.
4.3.2.3: Heights	Clarification is added for heights on species with drooping leaders consistent with historic taper equation development.
7.17.2.9 Dead or Broken Top	Clarification is added to for the location of the dead top call when the dead portion extends below the upper third.

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

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

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

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

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

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

“MFLNRORD” means the Ministry of Forests, Lands, Natural Resource Operations, and Rural Development;

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

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

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

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

“Pathological Indicators” means conk, blind conk, scar, fork or crook, frost crack, mistletoe, rotten branch, and dead or broken top;

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

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

“PRF (Plot Radius Factor)” means a factor which multiplied by the DBH (cm) of a tree represents

post-reduction cruise volume compiled to the interior standard merchantability specifications.

2. Cutting authorities must:
 - a. achieve a 12.0% sampling error objective at 2 SE using measure and count plots, or
 - b. the sampling error requirements 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

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 cutblock, or
2. The sampling error will be waived if the following conditions have been met:
 - a. For cutting authorities of 40.0 ha net merchantable area or larger in size:
 - i. A systematic grid consisting of all full measure plots on a 100m by 100m grid (or 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 cutblock 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 cutblock 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.

Only Marked to Leave Percent Reductions are allowed in general cruise based cutting authorities.

Other reduction methods (e.g. Faller Select and Marked to Leave Selective Cutting) are not permitted and in those cases the net merchantable volume will be based upon 100% removal of the net merchantable volume in Coastal cruise based cutting authorities.

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 cutblock, or
2. The sampling error will be waived if the following conditions have been met:
 - a. For cutting authorities of 40.0 ha net merchantable area or larger in size:
 - 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 cutblock 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 cutblock has been met, and:
 1. A systematic grid of equal intervals and spacing of not greater than 70 metres by 70 metres has been established, or
 2. 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. For example, where ‘o’ represents measure plots and ‘x’ represents count plots, the following two designs are acceptable:



Cutting authorities in the Northern GBR will not require CGNF cruising as loss factor cruising will

be used for appraisal purposes. The exception is BCTS who must continue to collect both loss factor and CGNF cruise data until CGNF is fully implemented across the Coast for appraisal purposes.

Only Marked to Leave Percent Reductions are allowed in GBRN cruise based cutting authorities. Other reduction methods (e.g. Faller Select and Marked to Leave Selective Cutting) are not permitted and in those cases the net merchantable volume will be based upon 100% removal of the net merchantable volume in Coastal cruise based cutting authorities.

2.3.6. Right of Way Cruises

1. Cruises of rights of way or cruise based road permits and amendments in the Great Bear Rainforest North (GBRN) must meet the following:
 - a. 10.0% sampling error requirement at 2 SE using variable radius plots, or
 - b. The sampling error will be waived if the following conditions have been met:
 - i. An average of at least 4.0 trees per plot per cutblock has been achieved, and
 - ii. Full measure variable plots have been established along the road centre line using a grid spacing that will achieve a minimum of 2.0 full measure plots per hectare. Type polygons less than 1.0 hectare must contain 2 full measure plots. The first plot is to be located at half the calculated grid spacing along the first tributary road that accesses the cutblock.

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

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

2. For cruise based road permits or road permit amendments in the Great Bear Rainforest North, where timber on the road right of way within a cutblock is removed under the road permit (RP), instead of the cutting permit, all cruise plots from the timber type within the cutblock containing a road segment may be used in the cruise compilation for the RP. For these segments:
 - a. The area of the RP must be removed from the CP's cruise compilation,
 - b. Road segments internal to a cutblock or type must be typed separately from the external road segments.
3. Where BCTS or Coastal Cruise Based (see [Sections 2.3.4](#) and [2.3.5](#)) road rights of way external to a cutblock are to be cruised and appraised with the cutblock harvest area, the following three options are available:
 - a. Extend the cruise grid of the adjacent timber type through the road right of way and establish any plots that fall within the right of way, or
 - b. Identify the road right of way as a separate type at the cruise plan stage, and:
 - i. Establish full measure variable plots along the right of way centre line using a grid spacing that will achieve a minimum of 2.0 full measure plots per hectare.

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

4. Pathological Indicators (Section 4.3.2.7)

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

5. Damage Codes (Section 4.3.2.18)

The following standards apply to the measurement of damage codes:

- a. No more than 5.0 percent of all trees checked can have an incorrect code.
- b. Incorrect codes that result in a risk group change will contribute to the number of pathological indicators and risk group changes (not applicable to CGNF cruises).
- c. In the case of a reappraisal due to damage as specified in the *Interior Appraisal Manual*, the following standards will apply:
 - i. All reclassification of insect damage and down tree codes must be based on field data collection.
 - ii. In order to provide the MFLNRORD with adequate time to perform check cruises, re-sweep data must be provided to the MFLNRORD at least 10 business days prior to the commencement of any harvest activity, or some other mutually agreed upon time frame. In turn, the MFLNRORD must respond to the licensee within that time frame if there are any concerns with the cruise, otherwise the cruise will be considered acceptable. **If re-sweep data is not submitted as required in this section the data may not be included in the appraisal.**
 - iii. In order to check and verify the re-sweep insect and down tree code data and confirm who performed the cruise, the following information must be made available to the MFLNRORD:

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

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

The original and the updated damage code for each re-classified tree.
 - iv. Due to the rapid nature of change associated with the needle colour attribute versus other timber attributes, insect code classification will only be counted as an incorrect damage code if the cruiser's code is greater than the code determined by the MFLNRO (e.g., the cruiser called a red attack (code 2) and the check cruise assessed the tree as green attack (code 1)).
 - v. The intent of allowing licensees to re-sweep for insect and down tree codes is to provide the most recent description of the damage. As such, the MFLNRO check cruise efforts will focus primarily on the correct determination of the insect and down tree code attribute; however if in the general practice of

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. **Heights of intact trees must be measured to the highest point of the leader as presented when the tree is standing. It is wrong to increase the height to account for drooping leaders (i.e. in western hemlock).**

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.

producing fungi, thereby potentially infecting the adjacent trunk.

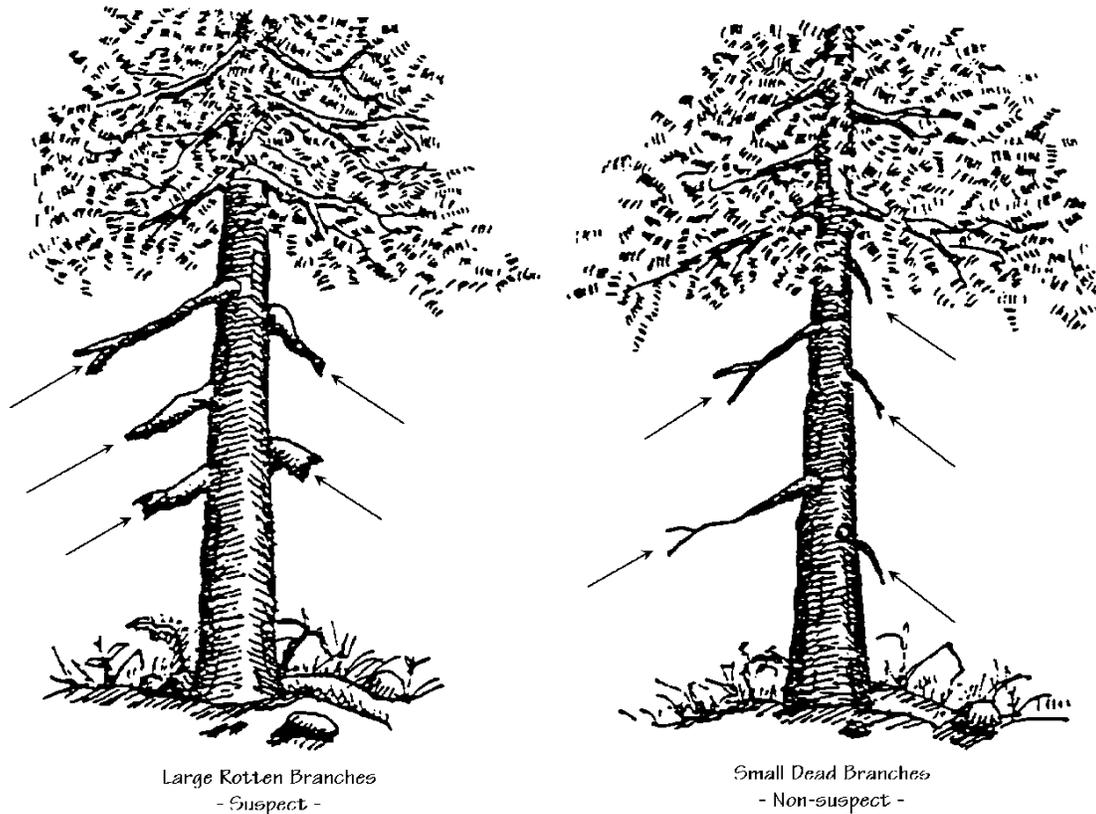


Figure 7-31 Rotten Branches

7.17.2.9. Dead or Broken Top

Definition:

Where the tree top or complete stem has died due to various physiological causes. **By convention if the complete and intact stem has died, under “D. or B. Top” enter “3”.**

Examples:

1. **A dead potential tree with exposed wood (loose or shedding bark) running continuously from the base to the top is assigned the following path: Under “Scar” enter “4” and under “D. or B. Top” enter “3”. The intent of this convention is to avoid double calling pathology indicators in the top.**
2. **An intact live tree with live branches only in the lower third and an injury with exposed wood in the middle third is assigned the following path: Under “Scar” enter “2” and under “D. or B. Top” enter “3”.**