

File: 195-30/CRUI

July 28, 2005

BY EMAIL

To: Regional Managers

From: Bill Howard
Director
Revenue Branch

Re: Amendment No. 1 to the *Cruising Manual*

I hereby approve Amendment No. 1 to the *Cruising Manual*, and attach a copy for your use. The following sections have been amended.

Section 2.1.2:	Updated for consistency with Section 2.7.1.2.
Section 2.2.2.2:	Housekeeping.
Chapter 6:	Position 60 changed to reflect the need to collect sap rot and sun check codes for dead potential white pine in the Interior.
Form FS 696:	Plot slope criteria added.
Form FS 697:	Format updated.

This amendment will come into force on August 1, 2005. Further amendments or revisions to this manual require my approval.



Bill Howard
Director
Revenue Branch

Attachment



Amendments

Amendment No. 1 - Effective August 1, 2005

For your convenience the current amendment updates appear in red text. All changed graphics are indicated with a red arrow ➡. Two arrows ➡➡ represents text removed.

Section	Description
Section 2.1.2	Section updated for consistency with section 2.7.1.2.
Section 2.2.2.2	Housekeeping.
Chapter 6 - Interior Log Grade Algorithm	Sap rot and suncheck code requirements for dead potential white pine.
Forms - FS 696	Plot slope criteria added to the form.
Forms - FS 697	Format updated.

2. Where this is not achieved, cruise at least 1.0 measure plot per hectare. Where 1.0 plot per hectare will not be achieved in the cruise plan, a grid smaller than 100 metres is required.
3. The maximum grid spacing:
 - cutting authorities less than 250 ha - 200 m square grid, and
 - cutting authorities greater than or equal to 250 ha - 250 m square grid.

Sections 2.1.2.1 to 2.1.2.3 are subject to the requirements listed under Section 2.1.2 unless otherwise stated.

2.1.2.1 Sampling Requirements

1.
 - a. Count plots are not permitted in partial cut cruises.
 - b. If there is at least 1.0 measure plot per hectare in the cruise, then count plots are allowed to a maximum of one count to one measure plot.
 - c. The number of count plots is not limited for clearcut cruises that meet the minimum sampling error requirement based on the measure plots only.
2. All plots must originate from the harvest area. Areas where no cutting is prescribed such as Riparian Management Zones with 100 percent retentions are to be excluded from the cruise.
3. If a range of leave tree or cut tree stems per hectare are reported in a site plan then the average of the highest and lowest number will be used to determine the percent reduction input into the cruise compilation.
4. Helicopter Single Stem - The trees to be harvested must be marked prior to cruising.

The cruising options are as follows:

- a. establish variable plots and the 15.0 percent sampling error requirement will be based on the cut trees,
- b. two measure plots per hectare with an average of 2.0 cut trees per plot, or
- c. 100 percent cruise.

2.1.2.2 Comparative Cruises

Refer to the *Interior Appraisal Manual* for situations when comparative cruise data may be used in appraisals.

1. Definitions:

- the new cutting authority is the area that will be appraised, and
- the parent cutting authority is the area from which cruise data will be borrowed.

2. Factors for determining the level of data to validate that the cruise is comparable:

Requires more data

Cutting Authority large - 100 000 m³

Licensee cuts a small percent of beetle

Nearby cruises not similar

Species and size vary in area

Type labels inaccurate

Sufficient time to harvest

Poor past performance

Requires less data

Cutting Authority small – 5 000 m³

Licensee cuts a large percent of beetle

Nearby cruises similar to each other

Species and size uniform in area

Type labels accurate

Insufficient time to harvest

Reliable past performance

The above factors must be considered by the Licensee's RPF and Ministry of Forests in determining the amount of work required to justify use of a specific comparative cruise. It is recommended that the licensee's RPF contact the Ministry to agree on the level of data required. The following matrix can be used as a guide.

Factors	Condition/Points	Condition/Points	Condition/Points
Cutting Authority size m ³	>100 000 / 5	20 000 – 100 000 / 3	<20 000 / 1
Licensee percent beetle cut	<25% / 5	25% - 75% / 3	>75% / 1
Cruise types similar	Dissimilar / 3	Similar / 2	Very Similar / 1
Species & size variability	Variable / 3	Average / 2	Uniform / 1
Type label accuracy	Inaccurate / 3	Average / 2	Accurate / 1
Sufficient time to harvest	Some / 15	Little / 5	No time / 1
Past performance	Poor / 10	Average / 5	Good / 1

0 to 13 points	Site Plan with a minimum of 2 plots per timber type
14 to 23 points	Site Plan with a minimum of 6 plots per timber type
24 points or greater	A full cruise

3. Requirements to ensure that the new and parent areas are comparable.

2.2 Types of Cruise

2.2.1 100-Percent Cruise

The Regional Manager may direct that for certain forest stands and valuable species, a 100-percent cruise is required.

2.2.2 Sampling Patterns-General

Samples within cutting blocks from previous operational cruises of the area may be used in the sampling plan if they meet the standards set in this manual.

Referring to the following types of sampling methods, systematic sampling in conjunction with a grid to locate the plots must be used for appraisal type cruises unless permission is granted by the Regional Manager to use one of the other sampling patterns.

2.2.2.1 Systematic Sampling

In systematic sampling, plots are at fixed intervals with a minimum of two full measure plots per timber type. One full measure plot in a timber type is acceptable if falling boundary amendments isolate some plots after cruising. The sampling grid spacing must be the same for each timber type. If the grids are different within a timber type in different blocks, then the types can be either labelled as unique types within a block or the areas can be re-cruised to meet the minimum sampling intensity.

In addition:

1. The cruise grid should be aligned in cardinal directions (i.e., North/South or East/West) unless otherwise approved in a cruise plan, and the grid should be referenced to the point of commencement (P. of C.) and should use 1/2 of the grid interval.
2. The maximum plot spacing listed in Section 2.1.2 (4) will ensure adequate coverage of the area for timber typing and tree and terrain information.
3. The sampling grid horizontal distances must be equidistant between plots and strips. The options are square grid or staggered grid. The option selected must be used consistently for the cutting permit. Refer to Figure 2.1 for an example of a staggered grid.
4. Where plots must be added to an existing cruise area, they must be positioned in a systematic random way so they cover the entire timber type(s) that has the highest coefficient of variation. The following method is recommended for adding plots to an existing cruise:

- a. determine the number of additional plots required using the coefficient of variation from the statistical summary report. Adding 10 percent to the number of plots is recommended for a safety margin. If the number of plots meets or exceeds 1.0 plots/ha for the whole cruise area, then the maximum sampling intensity will be 1.0 plots/ha,
- b. determine the new grid for the cutting authority area to obtain the additional number of plots required,
- c. lay the new grid over the original grid by positioning the new plot over top of the original plot that is nearest the P. of C.. Use the same cruise grid orientation,
- d. disregard the overlapping plot and locate the new plots on the cruise map, and
- e. determine the bearings and distances to the new plots from the nearest original plots. This will reduce the amount of traversing required to establish the new plots.

The new grid must be submitted with a cruise plan to the Ministry of Forests district office for approval at least 30 days prior to the commencement of field work.

2.2.2.2 Cruising Road Rights-of-Way

The following procedures are used where road rights-of-way require cruising:

- a. The fixed area plot centres will be located at the midpoint between the R/W edge and centre line and on alternating sides of the R/W centreline.
- b. The plots will be circular and 5.05 metre radius.
- c. The minimum sampling intensity will be 2.5 percent of the R/W area.
- d. Where timber on road rights of way within a cut-block is removed under a road permit (R.P.) after the block is cruised, the cruise plots that are within the area of the R.P. shall be included in the cruise compilation for the cutting permit and the area of R.P. will be removed from the cruise compilation.
- e. Refer to the requirements in section 2.1.2.2 of this manual where comparative cruising is permitted by the Appraisal Manual.

Positions 52 to 56

These columns are not in use.

Position 59 Selective Cutting

L	leave tree
Blank or C	cut tree

Position 60 Miscellaneous - optional data collection.

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 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 50 percent lumber,
- c. coding is the same as pathological indicator tree positions,
- d. also see Position 45, spiral grain for code definitions, and
- e. knot code 6 (see Section 6.3.2, Position 50 and 51) in the first 5 m log will grade the first log lumber reject and a knot code 6 in the second 5 m log will grade the second log lumber reject.

Refer to Appendix 7 for a more detailed description of the algorithm.

Sap rot and suncheck codes are required for the dead potential white pine algorithm. The procedures is outlined A.7.2(3).

Positions 61 to 63 Damage Codes (see Section A.6)

Damage codes are to be used at all times, and shall be recorded as they appear at the time of the cruise with no attempt to predict the future condition of the trees. Where damage is tallied it will be compiled and reported.

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

Position 61 Insect and Disease Codes (see Appendix 6.13)**Position 62 Fire Damage Codes (see Appendix 6.2)****Position 63 Down Trees (see Appendix 6.3)****6.3.3 Card Type 3****Position 36, Columns 37 - 39 Sample Tree Details**

Do not estimate heights for card type 3 sample trees. Sample tree details may be entered for count plots.

Refer to Sections 3.5.3.4 and 8.4 for details regarding the use of height/diameter curves.

Refer to Section 3.5.9 for details regarding the collection of tree ages.

Counted Age at DBH

This is the Breast Height Age referenced above.

Horizontal Distance from Plot Centre

This is the measured distance from the plot centre to the face of standing trees at DBH plus half the DBH and on the top side at mid point for down trees.

FS 695 Provincial Office Check of Field Cruise Data



PROVINCIAL OFFICE CHECK OF FIELD CRUISE DATA

TENURE:	C.P.:
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A. CRUISE PLAN and FINAL CRUISE MAP	YES	NO
1. Is Cruise Plan approved?		
2. Was the Cruise Plan followed?		
3. Is the FINAL Cruise Map acceptable		

B. PLOT CARDS	YES	NO
4. Are all of the plot cards submitted?		
5. Is each plot card properly filled out?		
6. Is each plot card SIGNED and DATED ? (<i>Cruising Manual</i> , Section 3.1.1)		
7. Is the prism (or fixed area plot) size consistent within each timber type?		
8. Do the plot locations by type, strip and cutblock concur with the final cruise map?		
9. If count plots are used, indicate the count/measure ratio	COUNT	MEASURE

C. MERCHANTABLE STEM COUNT:								
PRISM CRUISES		"Minimum" average of 5.0 merchantable trees per plot (<i>Cruising Manual</i> , Section 2.1.2.1) if SE 15% not achieved (does not include tree classes 4 and 6). Double the tree count in border and half plots.						
FIXED AREA CRUISES		"Recommended" average tree count is not less than 10.0.						
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	TOTAL
10. Total Number of Plots								
11. Average Number of stems per plot.								
12. No. Plots with < than the recommended average stem no.								

D. AGES – TREE CLASSES	YES	NO
13. Are adequate age samples collected?		
14. Are age/height corrections done properly?		
15. Are 95% of all trees in the correct maturity class for loss factor deductions?		

Remarks:

Accepted:	Rejected:	Date:
Action:		
Signature:		
Approval/rejection letter sent by:		Date:

FS 695 HVA 2003/04

Figure F.4 FS 695 - Provincial Office Check of Field Cruise Data.

FS 696 Provincial Field Check Cruise Summary


**PROVINCIAL
FIELD CHECK CRUISE SUMMARY**

TENURE: _____

C.P.: _____

IS CHECK CRUISE REQUIRED? _____

(Note: If no, inform licensee.)

Cruised by: _____

Cruise Date: _____

plots: _____

Checked by: _____

Check Date: _____

plots: _____

A. PLOT ESTABLISHMENT & DISTANCE MEASUREMENT:	NUMBER (IF REQUIRED)	ACCEPTABLE (Y/N)	NOT CHECKED
1. Distance AND Bearings between plots			
2. Distance AND Bearings for Reference Trees			
3. Boundaries checked: (Indicate Yes, No or NOT Checked)			
B. SPECIES IDENTIFICATION: - (Section 3.6.3.1, 2)			
4. % of Stems incorrectly identified:			
C. NUMBER OF STEMS: - (Section 3.6.3.1, 1)			
5. Stem count difference for tree classes 1,2,3,5,7,9 (1 STEM IN 50 allowed)			
6. Live and dead useless stem count difference (1 in 50 allowed) - Interior			
D. BREAST HEIGHT: - (Section 3.6.3.1, 7)			
7. Total Number of Stems Checked:			
8. Number of Stems > 5% HIGH			
9. Number of Stems < 5% LOW			
10. Average Error of All Samples:			
E. DIAMETERS: - (Section 3.6.3.1, 7)			
11. Number of Diameters Checked			
12. % of Diameters in Error by > ± 2%:			
13. Average Absolute Variation of all Diameters Checked:			
F. PATHOLOGICAL INDICATORS/DAMAGE CODES: - (Section 3.6.3.1, 4 and 5)			
14. Number of Trees with > 1 Risk Group Change			
15. % Risk Group changes --- all trees			
16. % trees checked with incorrect fire/blowdown/insect codes			
G. HEIGHT SAMPLES: - (Section 3.6.3.1, 3)			
17. Number of Heights Checked			
18. % Average Absolute Variation of all of Heights Checked			
H. AGES: - (Section 3.6.3.1, 6)			
19. 95% of ALL trees in correct maturity class for loss factor deductions			
I. QUALITY (Coast Immature Only): - (Section 3.6.3.2)			
20. i. % trees with path incorrectly coded in 1 st and 2 nd third			
ii. % of quality indicators ± 1 code change			
iii. Knots and knot indicators - # of 5 m log quarters > 2 quarters difference			
Note Spiral grain - code > 4 does not require checking			
J. PLOT SLOPE: - (Section 3.6.3.3)			
21. i. At least 90% plots within +/- 5 plot slope % (Y/N)			
ii. Average Variation of all check plots within +/- 5 slope % (Y/N)			
K. REMARKS: - (Section 3.6.2, 3.6.5)			

Accepted:	Rejected:	Date:
Action:		
Signature:	Forest District:	
Approval/rejection letter sent by:		Date:

FS 696 HVA 2005/07

NOTE: ANY UNACCEPTABLE FINDINGS MAY BE GROUNDS FOR REJECTION.

DISTRICT TO FORWARD COPY TO REGION

Figure F.5 FS 696 - Provincial Field Check Cruise Summary.

FS 697 Provincial Compilation Check Form



PROVINCIAL COMPILATION CHECK FORM

TENURE: _____ C.P.: _____

A. CRUISE/TENURE INFORMATION		YES	NO
1. Was this cruise field checked?			
2. Licensee			
3. Forest District			
4. a) Forest Inventory Zone (FIZ)			
b) Forest Sustained Yield Unit (PSYU)			
c) Forest Inventory Region No.			
d) Forest Inventory Compartment No.			
B. MAP AREA STATEMENT		YES	NO
5. Net Merchantable Area agree with appraisal?			
6. a) Do the map merchantable areas agree with compilation and appraisal?			
b) Do the number and area of the Cutblocks on the map agree with the compilation and appraisal?			
c) Do the number and area of the Timber Types on map agree with compilation?			

COMPILATION DATA

C. COMPILATION VERSION		YES	NO
7. Is the compilation version correct?			
D. SAMPLE ERROR ACHIEVEMENT (Total Volume Compilation)		YES	NO
8. SE % ACHIEVED? (See Section 2.1.2 Cruising Manual)			
9. If SE % NOT ACHIEVED, have minimum number of trees/plot and 1 plot per hectare been achieved?			
E. FIR LRFs		YES	NO
10. a) Type of Compilation..... <u>WET</u> or <u>DRY</u> Belt Fir (see Chapter 7, Position 14 of the Cruising Manual)			
11. b) Proper Fir LRF's used? (<u>Wet Belt/Dry Belt</u>) - (see LRF Reports)			
F. PLOT SUMMARIES AND LOSS FACTORS		YES	NO
12. Have the correct Forest Inventory Loss Factors been used for each species? (Table 17 & Figure T.1 of Cruising Manual)			
13. Are the plots in the compilation and appraisal only from the harvest area?			
G. REDUCTION COMPILATIONS (Factored, Partial Cut, etc)		YES	NO
14. Total (Full) volume compilation submitted (NO REDUCTIONS)?			
15. Factored compilation consistent with source documentation?			
H. APPRAISAL DATA SHEET --- CRUISE DATA		YES	NO
16. Is the cruise data entered on the Appraisal Data Sheet the same as the compilation?			

REMARKS :

Accepted:	Rejected:	Date:
Action:		
Signature:		
Approval/rejection letter sent by:		Date:

FS 697 HVA 2005/07

Figure F.6 FS 697 - Provincial Compilation Check Form.

FS 698 Provincial Comparative Cruise Checklist



PROVINCIAL COMPARATIVE CRUISE CHECKLIST

FOREST REGION _____

FOREST DISTRICT _____

PARENT LICENCE: _____

PARENT C.P.: _____

NEW LICENCE: _____

NEW C.P.: _____

A. FIELDWORK	YES	NO
1. Fieldwork date (Parent cruise: mature must be less than 10 years/ Immature less than 5 years)		
2. Biogeoclimatic (BEC) Subzone – Both cruises the same BEC subzone		
3. Frequency of plots – Minimum of 6 measure plots per timber type or 1 plot per hectare in the parent and new cruises.		
B. DATA	YES	NO
4. Is there a location map provided showing proximity of parent and new cruises?		
5. Is the new Cruise Plan Map acceptable – systematic grid?		
6. Are all of the plot cards submitted for the new cruise properly completed and signed?		
7. Is the data collected to the <i>Cruising Manual</i> standards?		
8. Is there an average of 5.0 trees per plot in the new cruise?		
9. Were all of the tree diameters and heights measured in the new cruise?		
10. Are at least 2 ages measured of co-dominant and dominant trees per plot in the new cruise?		
C. COMPILATION	YES	NO
11. Were all summary pages submitted for the parent and new cruise?		
12. Cruise compilation version – parent and new must be compiled on the most recent version.		
13. Timber merchantability specifications – parent and new must be compiled to timber merchantability specifications.		
14. Species composition – must be within $\pm 5\%$ for major species and $\pm 10\%$ for minor species.		
15. Merchantable Vol/ha – must be within $\pm 10\%$		
16. Are the maturity classes similar for the parent and the new cruises?		
17. Lumber Recovery Factors – must be within ± 5 LRF points.		
18. Merchantable Vol/Tree – must be within $\pm 10\%$, not less than 0.20.		
19. If new cruise is less than $0.20 \text{ m}^3/\text{tree}$, the parent cruise must be less than $0.20 \text{ m}^3/\text{tree}$.		
20. Recompiled parent cruise meets $\pm 15\%$?		
21. New plots added to the recompile of the parent cruise?		

Notes:

- References – Section 4.2 of the *Interior Appraisal Manual* and Section 2.1.2.3 of the *Cruising Manual*.
- Attach the original copy of this checklist to the cutting permit application.

REMARKS :

Submitted by Licensee: (signature)	
Approved by District Manager: (signature)	
Approval/rejection letter sent by:	Date:

FS 698 HVA 2005/06
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Figure F.7 FS 698 – Provincial Comparative Cruise Checklist.