BRITISH COLUMBIA Ministry of Forests Revenue Branch

MEMORANDUM

File: 308-07/CRUI

July 21, 1999

To: Regional Managers

From: Bill Howard
Director
Revenue Branch

Re: ***Cruising Manual***

Attached is a *Cruising Manual* amendment which comes into effect on August 1, 1999.

This amendment clarifies some definitions as a result of the 1999 cruising seminars and addresses corrections to the manual.

Comments or questions about the manual should be referred to Maarten Prinsze, Cruising Policy Forester, Revenue Branch at 250-387-8357 or Don Rorison, Cruising Projects Specialist, Revenue Branch at 250-356-7674.

Any general public requests for the manuals or amendments should be referred to

Crown Publications, 521 Fort Street, Victoria, British Columbia, V8W 1E7
(telephone 250-386-4636, facsimile 250-386-0221).

The Internet address for the *Cruising Manual* is
http://www.for.gov.bc.ca/revenue/manuals/cruising/index.htm. Additional copies can be downloaded from this file.

WBHoward

Bill Howard
Director
Revenue Branch

Attachment

BRITISH COLUMBIA Ministry of Forests

MANUAL REVISION TRANSMITTAL

FOR FURTHER INFORMATION CONTACT:

Maarten Prinsze
Cruising Policy Forester
Don Rorison
Cruising Projects Specialist
Revenue Branch
Ministry of Forests
PO Box 9511 Stn Prov Govt
Victoria, B.C.
V8W 9C2
Phone: (250) 387-8357/356-7674
PROFS userid: Maarten.Prinsze@gems8.gov.bc.ca
Don.Rorison@gems1.gov.bc.ca
FAX: 387-5670

MANUAL TITLE
Cruising Manual

AMENDMENT NO.	ISSUE DATE
1	August 1, 1999

MANUAL CO-ORDINATOR
Judy Laton
Revenue Branch

AUTHORIZATION (Name, Title)
W. Howard
Director, Revenue Branch

Please make the following changes to your copy of the above Ministry manual. Please insert the following specified pages and **file this notice** immediately after the Amendments Tab.

ACTION (Remove/Insert)	(VOL.) CHAPTER-SECTION-SUBJECT TABLE OF CONTENTS	PAGE(S)	COMMENTS
INSERT	Amendments	All	After Title Page
REMOVE	Table of Contents	iii - x	
INSERT	Table of Contents	iii - x	
REMOVE	Chapter 3	13 -14	
INSERT		13 -14	
REMOVE		23 -24	
INSERT		23 -24	
REMOVE		31 - 34	
INSERT		31 - 34	
REMOVE	Chapter 4	5 - 6	
INSERT		5 - 6	
REMOVE		13 - 16	
INSERT		13 - 16	
REMOVE	Chapter 5	5 - 8	
INSERT		5 - 6	
REMOVE	Chapter 6	1 - 2	
INSERT		1 - 2	
REMOVE		13 - 14	
INSERT		13 - 14	
REMOVE		17 - 18	
INSERT		17 - 18	
REMOVE		23 - 24	
INSERT		23 - 24	
REMOVE	Chapter 7	11 - 14	
INSERT		11 - 14	
REMOVE	Chapter 8	1 - 4	
INSERT		1 - 4	

ACTION (Remove/Insert)	(VOL.) CHAPTER-SECTION-SUBJECT TABLE OF CONTENTS	PAGE(S)	COMMENTS
REMOVE	Tables	T21 - T24	
INSERT		T21 - T24	
REMOVE	Appendices	A-7 - A-10	
INSERT		A7 - A-10	
REMOVE		A-17 - A-20	
INSERT		A-17 - A-20	
REMOVE		A-23 - A-24	
INSERT		A-23 - A-24	
REMOVE		A-63 - A-72	
INSERT		A-63 - A-72	
INSERT		A-75 - A-76	
REMOVE	Forms	F-1 - F-8	
INSERT		F-1 - F-8	
REMOVE	Index	I-i - I-ii	
INSERT		I-i - I-ii	
INSERT	Transmittal Sheet		After Amendments tab

Amendments

Amendment No. 1 – August 1, 1999

For your convenience the current amendment updates appear in red text or if some text has been removed, a red arrow ► or ◄. All changed graphics are indicated with a red arrow ►.

Chapter-Subject	Section	Comments
Heights	3.5.3	Added statement, project the original height of trees with broken tops
Cruise Plans	3.6.4	Corrected reference to the Forms Chapter
Volume and Taper Equations	4.2.2	Corrected the dated reference to taper equation to read 1993
Non- Stratified Sampling and Stratified Sampling	5.3.1 and 5.3.2	Revised sample statistics for fixed area cruises
Form Design – General	6.1	Revised statement "recorded on a Cruise Tally Sheet that provides the information in this chapter"
Cruise Tally Sheet, Position 48		Add the statement "Record live limb for the dead potential tree classes"
Map Area Statement, Card Type B		Clarification of the compilation standards
Method 2: Areas Greater than or Equal to 10 ha	8.3.2	Removed the redundant paragraphs
Table 17		Skeena – PSYU Kitwanga Portion – Correct Hemlock from table 94 to 93 and Balsam from table 96 to 95 Hecate PSYU – Add FIZ J Prince George/Quesnel Special Sale Area – Add FIZ G Westlake PSYU – Add FIZ I
Suspect Trees	A.4.1.1	Correct pathological table reference from Table 12 to Table 18
Signs and Defects Indicative of Decay in Standing Trees	A.4.2	Add references to pathological indicators on secondary leader

Blind Conks	A.4.2.2	Deleted reference to secondary leaders
Risk Group Clarification	A.7.1.3 to A.7.1.6	Risk group clarifications
Sampling Fall-down	A.7.3.2	Delete redundant examples and clarify that all trees with red, brown or green needles are classified as living trees, clarify the examples of Windshear/Snow Press and Uprooted Trees
Procedures	A.8.2	Add a statement for clarification, knot code 6 applies to the 5 metre log where the large knots occur
Appendix 9		Added Forest region and district boundary map
Forms Chapter		Forms updated
Index		

This page is intentionally left blank.

3.5.6.8 Tree Class 8 (Immature) 3-23
3.5.6.9 Tree Class 9 (Immature Dead Potential) 3-23
3.5.7 Quality 3-24
3.5.8 Damage Codes 3-24
3.5.9 Ages 3-24
3.6 Check Cruising 3-26
3.6.1 Objectives of Check Cruising 3-26
3.6.2 Allowable Non-Sampling Errors 3-27
3.6.2.1 Tree Data 3-27
3.6.2.2 Quality - as they affect grade (Coast Immature Cutting Authorities) 3-31
3.6.2.3 Slopes 3-32
3.6.3 Allowable Non-Sampling Errors - Original Versus Check Plots 3-32
3.6.3.1 Net Volume Standard 3-32
3.6.4 Cruise Plans 3-33
3.6.5 Standards for Some Basic Cruise Functions 3-33

4 Cruise Compilation Procedures

4.1 Input 4-2
4.1.1 Cruise Tally Sheet (FS 205) 4-2
4.1.1.1 Plot Record (Card Type 9) 4-2
4.1.1.2 Individual Tree Records (Card Type 2) 4-2
4.1.1.3 Sample Tree Details (Card Type 3) 4-2
4.1.2 Map Area Statement (FS 121) 4-2
4.1.2.1 Cruise Identity (Card Type A) 4-2
4.1.2.2 Compilation Standard (Card Type B) 4-3
4.1.2.3 Type Description (Card Type C) 4-3
4.1.2.4 Block Description (Card Type D) 4-3
4.1.2.5 Height/DBH Description (Card Type E) 4-3
4.1.2.6 Harvesting Method Description (Card Type F) 4-3
4.1.2.7 Silviculture Treatment Unit Description (Card Type G) 4-3
4.2 Compilation Programmes 4-4
4.2.1 Height-DBH Relationships for Stump Cruises and Severe Damage Timber Cruises 4-4
4.2.1.1 Height-DBH Regression Programme 4-4
4.2.2 Volume and Taper Equations 4-5
4.2.3 Net Volume Factors 4-7
4.3 Volume Compilation - Fixed Area Plot Cruising 4-8
4.4 Log Grade Volume Compilation 4-9
4.5 Volume Compilation - Variable-Plot Cruising 4-10
4.5.1 Compilation Methods - Using a Single Prism and Full Sweep (360°) 4-11
4.5.2 Compilation Methods - Using 2 Different Prisms And Full Sweep (360°) 4-12
4.5.3 Compilation Methods - Using One Prism With Full And Half-Sweeps 4-13

4.5.4 Compilation Methods - Using Count-Plots 4-13
4.6 Computer Compilation Output 4-15
4.6.1 Summary of Required/Optional Reports 4-16

5 Cruise Analysis

5.1 General 5-2
5.2 Calculation of Sampling Error - Variable Plots 5-3
5.2.1 Stratified Sampling 5-3
5.2.2 Unstratified Sampling 5-4
5.3 Calculation of Sampling Error - Fixed Area Plots 5-5
5.3.1 Non-Stratified Sampling 5-5
5.3.2 Stratified Sampling 5-5
5.4 Interpretation of Sampling Error 5-6

6 Ministry of Forests Cruise Tally Sheet (FS 205)

6.1 Form Design - General 6-1
6.2 Entry of Data in Divided Spaces or Numbered Columns 6-1
6.3 Front Side of Cruise Tally Sheet (FS 205 HVA 96/8) 6-3
6.3.1 Card Type 9 6-3
6.3.2 Card Type 2 6-10
6.3.3 Card Type 3 6-20
6.4 Reverse Side of Cruise Tally Sheet (FS 205 HVA 96/8) 6-24
6.4.1 Card Type 5 6-24
6.4.2 Miscellaneous 6-24

7 Ministry of Forests Map Area Statement (FS 121)

7.1 Card Type A 7-2
7.2 Card Type B 7-10
7.3 Card Type C 7-16
7.4 Card Type D 7-21
7.5 Card Type E 7-23
7.6 Card Type F 7-28
7.7 Card Type G 7-30

8 Stump Cruising

8.1 Introduction 8-2
8.2 Boundaries 8-3
8.3 Measurement Methods 8-4
8.3.1 Method 1: Areas Less than 10 ha 8-4

8.3.2 Method 2: Areas Greater than or Equal to 10 ha 8-4
8.4 Tree Heights 8-5
8.4.1 Stump Cruise Tally Sheet (FS 205S) 8-5
8.4.2 Major Species (≥ 20 percent of the UTH area gross volume) 8-5
8.4.3 Minor Species (< 20 percent of the UTH Area Gross Volume) 8-6
8.4.3.1 Option 1 8-6
8.4.3.2 Option 2 8-6
8.4.3.3 Option 3 8-6
8.5 Timber Available For Measuring 8-7
8.5.1 Tally Card - FS 205S 8-7
8.5.2 Field Measurements 8-7
8.6 Timber Not Available For Measuring 8-8
8.6.1 Tally Card FS 205S 8-8
8.6.2 Stump Measurements 8-8
8.6.3 Roads and Land Clearing 8-9
8.6.4 Measurement Options 8-9
8.6.4.1 Option 1 8-9
8.6.4.2 Option 2 8-10
8.6.4.3 Option 3 8-10
8.7 All Stumps Removed From the UTH Area (i.e., Land Cleared, Road has Been Built) 8-11
8.7.1 Option 1 8-11
8.7.2 Option 2 8-11
8.7.3 Option 3 8-11
8.8 Portions Of Trees Removed (i.e., Shake Blocks or Special Forest Products Removed From a Segment Of Tree(s)) 8-12

9 Regional Guidelines

9.1 Vancouver Forest Region Operational Cruising Requirements 9-2
9.1.1 Information Sources Regarding Policy and Procedures 9-2
9.1.2 Responsibility for Operational Cruising 9-2
9.1.3 Tenures Requiring an Operational Cruise 9-2
9.1.4 Submission of Cruise Plans 9-3
9.1.5 Acceptability of Cruise Data 9-4
9.1.5.1 Check Cruising 9-4
9.1.5.2 Use of Older Cruise Data 9-4
9.1.6 Technical Criteria 9-5
9.1.6.1 Sampling Error Requirements 9-5
9.1.6.2 Sampling Patterns 9-6
9.1.6.3 Plot Data 9-6
9.1.6.4 Prism Size (Basal Area Factor) 9-8
9.1.6.5 Heights 9-9
9.1.6.6 Field Marking 9-9
9.1.6.7 Diameter at Breast Height Measurement (DBH) 9-10
9.1.6.8 Cut Block Label - Mature and Immature 9-11

9.1.6.9 Plot Establishment 9-11
9.1.7 Timber Typing 9-12
9.1.8 Cruising of Cutting Authority Amendments 9-13
9.1.9 Cruise Reports 9-13
9.1.9.1 Cruise Compilations 9-13
9.1.9.2 Form and Content of Cruise Reports 9-16
9.1.10 Re-compilations 9-17
9.1.11 Cruising Damaged Stands and Exceptional Circumstances 9-17
9.1.12 Sampling in Unsafe Conditions 9-18

Tables

Table 1 Correction Table for Chaining Short Horizontal Distances T-2
Table 2 Plot Radii Slope Allowance T-3
Table 3 Distribution of "t" T-5
Stump and Breast Height Diameter Tables for the British Columbia Merchantable Tree Species (Tables 4 to 8) T-6
Table 4 Constants for Species and Zones T-7
Table 5 Butt Taper - Mature - FIZ A, B and C - Coast T-8
Table 6 Butt Taper - All Ages - FIZ D to J - Interior T-10
Table 7 Butt Taper - All Ages - FIZ K and L - Interior T-12
Table 8 Butt Taper - Immature - FIZ A, B and C - Coast T-14
Table 9 to 16 ..... T-15
Table 17 Cruise Compilation Loss Factor Table T-16
1 Tree Farm Licences T-16
2 Other Tenures T-19
4 Tabular Listing Of Table Numbers T-20
Table 18 Risk Group Ratings by Pathological Indicators T-32
Table 19 Sound Wood Factors for Saprot T-40

Appendices

A.1 Site Index and Age Correction Tables A-1
A.1.1 Use of Site Curves and Tables for British Columbia A-2
A.2 Magnetic Declination and Annual Change for February 9, 1999 ..... A-4
A.3 Forest Inventory Zones A-6
A.4 Pathological Classification of Trees A-7
A.4.1 Class of Trees A-7
A.4.1.1 Suspect Trees A-7
A.4.1.2 Residual Trees A-8
A.4.2 Signs and Defects Indicative of Decay in Standing Trees A-9
A.4.2.1 Conks A-9
A.4.2.2 Blind Conks A-10
A.4.2.3 Scars A-12
A.4.2.4 Fork or Pronounced Crook A-18
A.4.2.5 Frost Cracks A-20

A.4.2.6 Mistletoe Trunk Infections A-22
A.4.2.7 Large Rotten Branches A-23
A.4.2.8 Dead or Broken Top A-24
A.4.3 Abnormalities which are not Recorded A-25
A.4.3.1 External Evidence of Butt Rot not Associated with Suspect Abnormalities A-25
A.4.3.2 Flutes A-25
A.4.3.3 Candelabra Branches A-26
A.4.3.4 Branch Fans A-26
A.4.3.5 Black Knots A-27
A.4.3.6 Burls and Galls A-27
A.4.3.7 Sweep A-28
A.4.3.8 Exposed Roots A-28
A.4.3.9 Other A-29
A.4.4 Some Common Decays of Forest Tree Species in British Columbia A-31
A.4.4.1 The Indian Paint Fungus A-32
A.4.4.2 The Pine Root Fungus A-34
A.4.4.3 The Picture Conk A-36
A.4.4.4 The Conk Fungus A-38
A.4.4.5 The Red Belt Fungus A-40
A.4.4.6 The Velvet-Top Fungus A-42
A.4.4.7 The Sulphur Fungus A-44
A.4.4.8 The Spongy Butt Rot Complex A-46
A.4.4.9 The Bleeding Conk A-48
A.4.4.10 The False Tinder Fungus A-50
A.4.4.11 Poria Obliqua A-54
A.5 Woods Safety and Emergency Procedure A-54
A.5.1 Ground to Air Signals A-54
A.5.2 Emergency Signals - downed aircraft, ground emergency, etc. A-54
A.5.3 Forest Inventory Branch Food Drop Signals A-55
A.5.4 Fire Fighting and Water Dropping Signals A-55
A.5.5 Basic First Aid A-56
A.5.6 If You Must Leave Your Partner in the Bush A-57
A.5.6.1 Make Sure They are Comfortable and Treat All Injuries Before you Leave A-57
A.5.6.2 Leave Them With A-57
A.5.6.3 Tell Them Your Plans A-58
A.5.6.4 Mark Their Location Well With Flagging, etc. (you may have to return in the dark) A-58
A.5.6.5 Flag or Blaze Your Way out Using Your Compass. Take Aerial Photo Having Marked Their Location Before Leaving A-58
A.5.6.6 If Lost A-58
A.5.6.7 Flare Kit Instructions A-59
A.6 Abbreviations and Symbols A-60
A.7 Damaged Stands A-61
A.7.1 Pest Damage A-61

A.7.1.1 Bark Beetle Codes A-62
A.7.1.2 Bark Beetle Descriptions A-62
A.7.1.3 Attack codes for balsam, white pine, yellow pine and lodgepole pine A-63
A.7.1.4 Blister Rust Code 4 (Risk Group 2, White Pine) A-64
A.7.1.5 Attack Codes for Spruce, Douglas Fir A-64
A.7.1.6 Defoliators (Path/Tree Class = Risk Group, All Species) A-65
A.7.2 Fire Damage A-66
A.7.2.1 Light Damage - Code A A-66
A.7.2.2 Moderate Damage - Code B A-66
A.7.2.3 Heavy Damage - Code C A-66
A.7.3 Uprooted Stands (Windthrow, Flood Damaged) A-68
A.7.3.1 Pre-Assessment of Fall-down A-68
A.7.3.2 Sampling Fall-down A-68
A.7.4 Extremely Damaged Stands (Windthrow, Flood Damaged, Fire, Insects or Disease) A-70
Appendix 8 Interior Log Grade Algorithm A-71
A.8.1 Assumption A-71
A.8.2 Procedures A-71
Appendix 9 Region and District Codes A-73

Forms

FS 693 Provincial Cruise Plan F-2
FS 694 Provincial Cruise Plan and Map Check List F-4
FS 695 Provincial Office Check of Field Cruise Data F-5
FS 696 Provincial Field Check Cruise Summary F-6
FS 697 Provincial Compilation Check Form F-7

Glossary

Index

Table of Figures

Figure 3.1 Final Cruise Map. 3-6
Figure 3.2 In, Out and Borderline trees. 3-9
Figure 3.3 Border plot procedure. 3-13
Figure 3.4 Measuring height of leaning trees. 3-15
Figure 3.5 Crown classes. 3-18
Figure 3.6 DBH in relation to high side. 3-20
Figure 3.7 Cruise Plan Map. 3-34
Figure 4.1 Illustration of Basal Area/Hectare. 4-12
Figure 4.2 Required/optional reports. 4-16
Figure 6.1 Front Side of Cruise Tally Sheet (FS 205 HVA 99/05). 6-2
Figure 6.2 Determination of percent twist. 6-15
Figure 6.3 Reverse Side of Cruise Tally Sheet (FS 205 HVA 99/05). 6-23
Figure 7.1 Front Side of Map Area Statement Form (FS 121 HRV 99/01). 7-3
Figure 7.2 Reverse Side of Map Area Statement Form (FS 121 HVR 96/11). 7-20
Figure 7.3 Height/Diameter Description Card. 7-24
Figure 7.4 Height/Diameter Description Card. 7-26
Figure 8.1 Examples of recommended stump measurements. 8-12
Figure 8.2 Examples of risk group determinations for stumps. 8-13
Figure 8.3 FS 205S Ministry of Forests Stump Cruise Tally Sheet (side 1 of 2). .. 8-14
Figure 8.4 FS 205S Ministry of Forests Stump Cruise Tally Sheet (side 2 of 2). .. 8-15
Figure 9.1 Example of live limb. 9-8
Figure T.1 Forest Inventory Zone Series Numbers. T-31
Figure T.2 Sound wood factors for saprot. T-40
Figure A.1 Forest inventory zones. A-6
Figure A.2 Residual trees. A-8
Figure A.3 Host list. A-11
Figure A.4 Blind conk and sound knot. A-12
Figure A.5 Closed scars. A-13
Figure A.6 Open scars. A-13
Figure A.7 Cankers caused by fungi. A-16
Figure A.8 Scars caused by rock slides and falling rocks. A-16
Figure A.9 Types of forks and crooks which are recorded. A-20
Figure A.10 Appearance of frost crack on standing trees. A-21
Figure A.11 Trunk infections of mistletoe. A-22
Figure A.12 Trunk infections of mistletoe. A-22
Figure A.13 Rotten branches. A-23
Figure A.14 Flutes. A-25
Figure A.15 Candelabra branches. A-26
Figure A.16 Branch fans. A-26
Figure A.17 Black knots. A-27
Figure A.18 Burls and galls. A-27
Figure A.19 Sweep. A-28
Figure A.20 Exposed roots. A-28
Figure A.21 Bird damage. A-29

Figure A.22 Illustrates forks and crooks which are not suspect. A-30
Figure A.23 Indian paint fungus. A-32
Figure A.24 Pine root fungus. A-34
Figure A.25 Picture conk. A-36
Figure A.26 Conk fungus. A-38
Figure A.27 Red belt fungus. A-40
Figure A.28 Velvet-top fungus. A-42
Figure A.29 Sulphur fungus. A-44
Figure A.30 Spongy butt rot complex. A-46
Figure A.31 Bleeding conk. A-48
Figure A.32 False tinder fungus. A-52
Figure A.33 Poria obliqua. A-54
Figure A.34 This table converts the third of a tree into log number. A-72
Figure F.1 FS 693 - Provincial Cruise Plan (Page 1 of 2). F-2
Figure F.1 FS 693 - Provincial Cruise Plan (Page 2 of 2). F-3
Figure F.3 FS 694 - Provincial Cruise Plan and Map Check List. F-4
Figure F.4 FS 695 - Provincial Office Check of Field Cruise Data. F-5
Figure F.5 FS 696 - Provincial Field Check Cruise Summary. F-6
Figure F.6 FS 697 - Provincial Compilation Check Form. F-7

2. Number the trees consecutively starting with the first tree that has at least half of its stem to the right of true north. If two trees are exactly in line, count the tree closest to the plot centre first.

3. Measure and record odd number trees in the odd numbered plots and even number trees in even number plots.

4. Do not number the dead useless snags less than 3 m and the dead useless down trees.

3.4.1.7 "Boundary" or "Border" Plots (Plots Falling On Type or Block Boundaries)

Plot centres which fall on or adjacent to timber type lines or harvesting boundaries inside the sample area are split through the plot centre parallel to the type line. The trees inside the sample area are recorded and the plot noted as a B for border/half plot.

Plot centres which fall *outside* the sample area will be dropped.

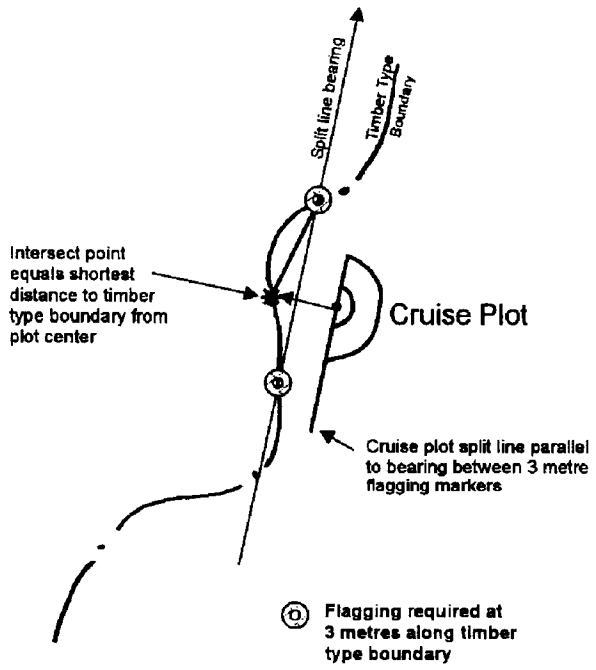


Figure 3.3 Border plot procedure.

3.5 Tree Measurements - Prism and Fixed-Area Plots

3.5.1 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 should be numbered; "out" trees should have an "X". In count plots, only the first tree must be numbered, with an arrow painted on that tree indicating whether the tree tally goes clockwise or counter clockwise. Live useless and dead useless stems are not tallied in count plots.

3.5.2 Species

All living and dead, standing and down trees which are listed in Section 6.3.2 (except dead and down useless) and which meet or exceed the utilization limit must be recorded when present in a plot. Section 6.3.2 gives a complete list of the commercial tree species and the proper use of genus and species codes.

3.5.3 Heights

The "One Hundred Percent method" must be used on all scale and cruise based tenures cruised after March 31, 1997. The Sample Height method is restricted to use in stump cruises or where severe damage due to windshear or freezing has occurred. Severely damaged stands must be identified on the cruise plan and submitted to the Regional Manager or their designate for sampling alternatives. Project the original height of trees with broken tops.

3.5.3.1 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 3.4). The angle A must be 90 degrees.

3.5.6.5 Tree Class 5 (Veteran)

A veteran is defined as a mature living tree (121 years or older for all species except deciduous greater than 40 years or Cottonwood and Aspen in FIZ K & L greater than 80 years) in a main stand which has been classified as immature (less than 121 years) (e.g., a former remnant of a mature Douglas fir stand in an immature stand of lodgepole pine).

A reasonable number of veteran ages should be sampled along with the age drilling of the main stand component.

3.5.6.6 Tree Class 6 (Live Useless)

Live Useless trees are trees that have only one or two live limbs. They are combined with TC 4 for the compilation of percent snags. This tree class must not be confused with a Tree Class 2 tree, which has 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.

3.5.6.7 Tree Class 7 (Veteran Dead Potential)

This class is a combination of Veteran and Dead Potential so that the correct loss factor tables are applied in the compilation. The guidelines for TC 3 and TC 5 apply.

3.5.6.8 Tree Class 8 (Immature)

An immature is defined as an immature tree (less than 121 years, etc.) within a mature stand. This classification enables the correct loss factor tables to be applied in the compilation.

3.5.6.9 Tree Class 9 (Immature Dead Potential)

This class is a combination of Immature and Dead Potential so that the correct loss factors are applied in the compilation. The guidelines for TC 3 and TC 8 apply.

3.5.7 Quality

Stem quality information forms the basis for a computerized grading system. Quality remarks are also used for the experimental interior Douglas Fir quality and the interior log grade algorithms (refer to Appendix 8). 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 class information will be collected on all commercial living and dead potential trees (refer to Chapter 6, Position 45-51, required on the coast for immature cutting authorities).

3.5.8 Damage Codes

Standard cruising methods as outlined in Chapter 6 and Appendix 7 of the *Cruising Manual* are to be followed.

Damage codes are to be used when damage is identifiable.

Code the trees as they appear at the time of the cruise with no attempt to guess what the future condition of the trees will be.

3.5.9 Ages

Measurements of age should concentrate on co-dominant trees as the purpose is to obtain average stand age. Two to three trees should be bored for age 1.3 m above high side on each plot when the type is near a loss factor age-change (younger immature/older immature, older immature/mature or mature/over mature) or individual species have a different age.

For 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 average age in 10's on the Cruise Tally Sheet is required for all measure and count plots. This age is used in each plot to assign the correct loss factor table, determine maturity and for stratification. It is important that height as well as age be taken on each age sample tree because the height is used to estimate the years to boring height to obtain total age.

In older immature stands with scattered veterans, however, age counts of the older portion of the stand are important in order to distinguish the veterans from the younger trees. Refer to the back of Table 17 for the correct application of the age in 10's and tree class combinations that must be recorded.

Plot centre reference	Plus or minus 1 percent of horizontal distance
Radius - fixed area plots	Plus or minus 1 percent of horizontal distance
Radius - prism plots	Plus or minus 1 percent of horizontal distance
Length and width: fixed rectangular plots	Plus or minus 1 percent of horizontal distance

Boundary Traverse	**Cruise-Based**	**Scale-Based**
Closure error	Plus or minus 0.7 percent	Plus or minus 1 percent
Area error	Plus or minus 1 percent	Plus or minus 1.5 percent
Inter-station distance	Plus or minus 1 percent	Plus or minus 2 percent

3.6.2.2 Quality - as they affect grade (Coast Immature Cutting Authorities)

1. Pathological indicators: Plus or minus 90 percent of these individual indicators which occur in the middle or lower 1/3 of the stem must be coded in the correct third on an individual plot.

2. Quality indicators:

   a. Individual Check Plots - Indicators: spiral grain:

   ≥ 90 percent of all quality indicators checked must be within plus or minus 1 code change.

   Log number of: 1st live limb and 1st stub (when they occur in first 10 m):

   Average variation of all part 2. quality indicators checked in an individual plot must be within plus or minus 1 code change.

Spiral grain greater than 4 doesn't require checking.

Knots and knot indicators: applies only to first and second 5 m logs, and trees less than 60 cm should not be included in statistics generated in 2. In the case of knots, to apply the above standard, there must be ≥ 2 quarters difference.

b. all check plots: ≥ 90 percent of the above quality indicators, on all stems in all plots must be coded correctly within the limits of Section 3.6.2.2, 2., a.

These standards are designed to reflect the areas where a change in grade would occur with incorrect coding.

3.6.2.3 Slopes

Slope:

1. Plots – ≥ 90 percent of the individual plots checked must be within plus or minus 5 slope percentage points of the slope measured by the check cruiser.

2. Block or Cutting Permit - The average variation of all slopes checked must be within plus or minus 5 slope percent.

3.6.3 Allowable Non-Sampling Errors - Original Versus Check Plots

Compile original and check plots as separate cruises on the most recent cruise compilation software.

3.6.3.1 Net Volume Standard

The following standards may be used to adjudicate marginal pass/fail check cruises.

	Allowable Error
1. Individual checked plot volumes	• ≥ 90 percent of the individual plot volumes must be within 7 percent of their true plot volume.
2. Total volume for all checked plots	• Average variation must be within 5 percent of true plot volume as determined by the check- cruiser. Minimum of 5 plots.
3. LRF's (Interior only)	• LRF must be plus or minus 1 percent of true LRF for all plots checked.

Any one of the foregoing items which are outside the permissible measurement standard are grounds for redoing the work.

3.6.4 Cruise Plans

It is *mandatory* for licensees (both Industry and Forest Service) to submit plans to the Ministry of Forests district office 30 days prior to commencement of a cruise.

This includes submission of cruise plans for all cut block(s), including amendments to existing cutting permits. The 30 days will commence on the date the plan is received (date stamped) at the district office (see the attached *sample* Cruise Plan format in the Forms Chapter).

Cruise plans must be submitted to the appropriate district manager on either the prescribed Ministry of Forests format or on a format designed by the licensee or consultant, but containing all the information requested by the Ministry of Forests.

Response to cruise plans will be either in writing, e-mail or by phone within 10 working days.

3.6.5 Standards for Some Basic Cruise Functions

- Sample location must be sufficiently accurate to enable relocation of the samples at a future date. Fixed-area plots are subject to the standards in Section 3.3,
- adequate records must be kept of all data so that they may be traced to their specific sources for evaluation in their primary or later applications,
- the sampling design should meet the standards of Chapter 2,
- inadequate identification of plot centres, sample trees and strip lines in the field may also lead to rejection of the cruise, and
- forest typing must meet the criteria listed in Section 2.7.3.1 to ensure consistency of forest typing within cut blocks and among multiple cut blocks.

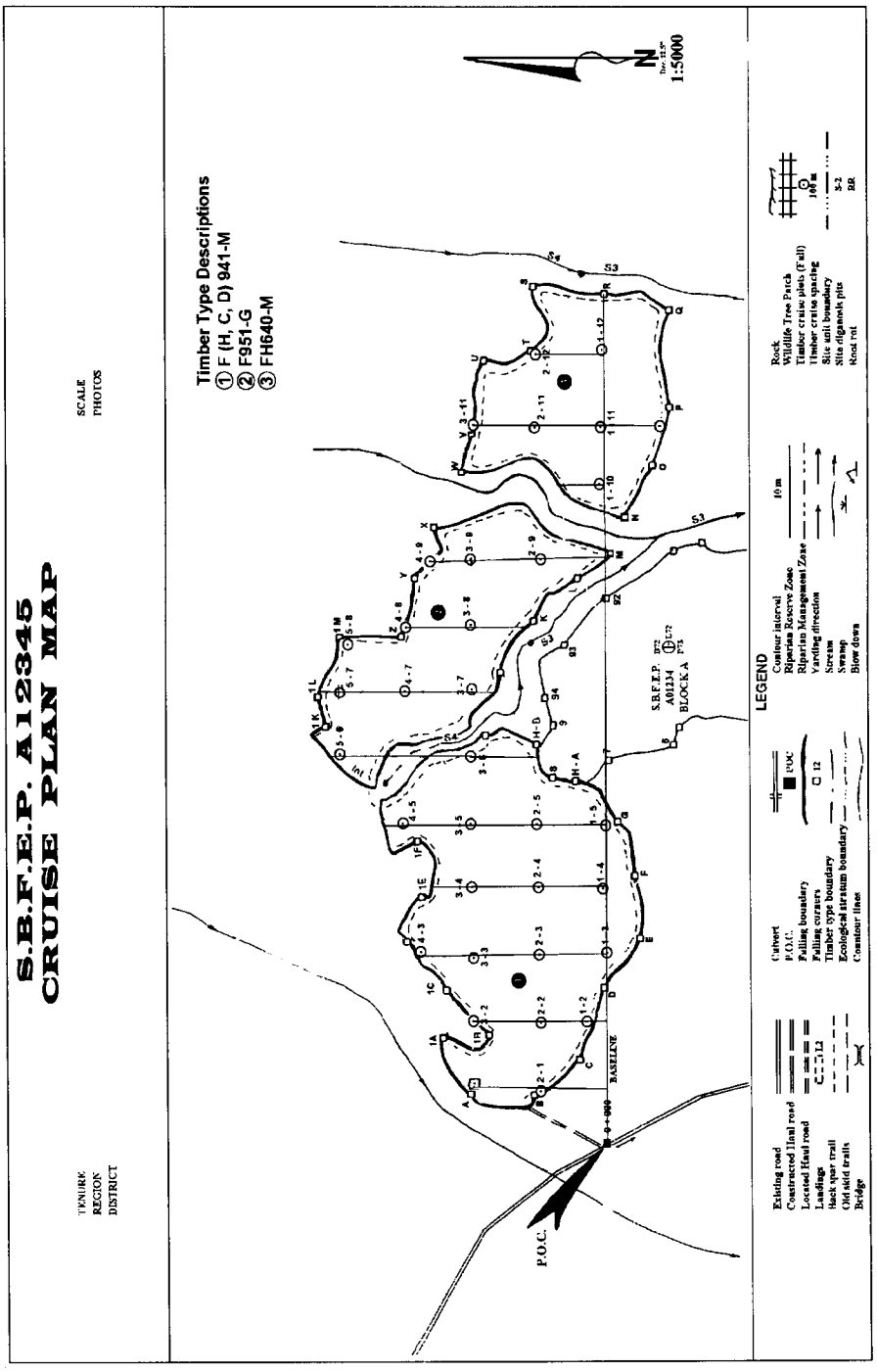


Figure 3.7 Cruise Plan Map.

The programme selects for the particular set of height sample trees under consideration, the equation which provides the lowest standard error of the estimate for volume. At this point the user has the option to override the computer selection and insert one of the other equations if the equation selected does not on inspection meet the requirements of fit over the range of DBH's.

If the curve with the lowest standard error generates a negative height at 10 cm DBH, the next best curve shall be selected.

Limitations:

1. There must be twenty height sample trees before the constants can be calculated for an equation.

2. The programme will only automatically calculate the height sample trees for a particular type. It will not group height sample trees into one equation for like species on the same site from another forest type unless Card Type E is coded with those instructions (see Section 7.5).

4.2.2 Volume and Taper Equations

The 1994 Kozak taper equations Version 4.1 are used to predict log diameters within each tree. These equations are a subroutine in the cruise compilation program.

The information necessary in this subroutine:

1. Species Code

1	=	F
2	=	C
3	=	H
4	=	B
5	=	S
6	=	Y
7	=	Pw
8	=	Pl
9	=	Py

10	=	L
11	=	Ac
12	=	D
13	=	Mb
14	=	E
15	=	At
16	=	Pa

2. Forest Inventory Zone.

Zone	Code
A, B, C	1
D, E, F, G, H, I, J	2
K, L	3

3. DBH - diameter at breast height (high side) outside bark (nearest 0.1 cm).

4. HT - Total height (nearest 0.1 m).

5. SH - Stump height for utilization (nearest 0.1 m).

6. TD - Top diameter for utilization (nearest 0.1 cm).

7. GOL - Log length for log breakdown. In the interior of BC the lumber recovery factors are based on 5 m logs.

Information provided by this subroutine:

1. Number of GOL metre long logs plus one short from the top of the tree.

2. Volume for each log (1, 2, etc.).

3. Top diameter inside bark for each log.

4.5.3 Compilation Methods - Using One Prism With Full And Half-Sweeps

If full sweeps are used, the stem count at each sampling point is converted to basal area per hectare. When half-sweeps are used the stem count at each sampling point is doubled by the computer and then converted to basal area per hectare. Therefore in calculating volume per hectare for trees included by a half-sweep the following procedure is required:

Calculate the plot radius for each tree by multiplying tree DBH by the prism plot radius factor (prf). The area of the plot calculated from this plot radius is divided into the area of one hectare. This resulting value is the number of trees per hectare that a given tree represents for a full sweep plot (360°). However, when a half-sweep (180°) is used, the number of trees represented by each counted tree are on a half hectare basis and so the resulting number of trees represented by each counted tree must be doubled by the compilation program to bring the answer up to a per hectare basis.

It is important to note that in calculating volume for the trees counted on the half-sweep, the compilation program multiplies the prism BAF used by two, since the prism basal area factor is for one hectare. For example, consider a 30 cm DBH tree counted using a prism with a basal area factor of 4. The plot radius for this tree is 7.5 m and the plot area is 0.01767 ha. However, if the tree is included in a half-sweep the plot area is only 0.00883 ha or the same plot area as for a 30 cm DBH tree included in a full sweep using a prism with a basal area factor of 8.

> The computer compilation programme makes the appropriate adjustment.

4.5.4 Compilation Methods - Using Count-Plots

Where count plots are recorded in addition to measured plots, volumes calculated from measured tree data by species are modified by multiplying each species volume by the total species stem count of the measured and count-plots and the number of measured plots and dividing by the species stem count of the measured plots and by the total number of measured and count plots. Where sample plots have been stratified by timber type, the calculations are made for each type using only the data of measured and count-plots which are located within the type area.

A double sampling ratio (DSR) is calculated to prorate species volumes by timber type when count plots are included in a prism cruise.

Assume a timber type includes two full measure and two count plots using a BAF 10 prism in the following example:

Full meaure plot	#1 - 4 Fir	Total = 9 Fir
Full measure plot	#2 - 5 Fir	
Count plot	#1 - 6 Fir	Total = 8 Fir
Count plot	#2 - 2 Fir	
Total	17 Fir	

$$DSR_{(fir)} = \frac{\text{Number measure plots}}{\text{Total number plots}} \times \frac{\text{Total \# trees for species x Average Basal Area Factor}}{\text{\# measure trees for species x Average Basal Area Factor}}$$

$$= \frac{2}{4} \times \frac{17 \times 10}{9 \times 10}$$

$$DSR_{(fir)} = 0.9444$$

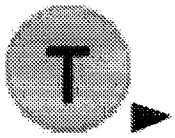
4.6 Computer Compilation Output

The cruise compilation shall accurately represent the area and volume to be appraised and shall be compiled on the most recent version of the cruise compilation program approved by the Revenue Branch.

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

For cruises compiled by electronic data processing methods, the following basic data will be submitted with the volume compilation for either/or both Coast and Interior timber sales or cutting permits.

4.6.1 Summary of Required/Optional Reports



001a	Edit report (data listing) of cruise data or 3.5 diskette	Required - electronic
001b	Scattergram of Card Type 2's and Card Type 3's	Required if ht/dia curves used - electronic
003a	Scattergram of Sample Trees - Regression Coefficients	Required if ht/dia curves used - electronic
003b	Original scattergram and regression coefficients if suggested curve is overridden. Provide a written explanation and computer report of actual keyed values	Required if ht/dia curves used - electronic
004a	Edit checks if calculating heights from height curves	Required if ht/dia curves used - electronic
004b	Double Sampling Ratios	Required - electronic
005a	Percent Reduction input values	Required - electronic
005b	Cruise Statistics	Required – hard copy
006	Extended Forest Type Stand and Stock Tables	Clearcut - optional – electronic Partial cut - required – electronic or hard copy upon request
006	Partial Cut Damage Reports	Required – hard copy upon request
007	Stand and Stock Tables	Clearcut – optional – electronic Partial - required – electronic or hard copy upon request
007	Partial Cut Damage Reports	Required – hard copy upon request
008	Volume and Lumber Recovery Information (Interior compilations)	Required – hard copy
009	Volume Summary	Required - hard copy & electronic
009	Partial Cut Damage Reports	Required – hard copy upon request
011	Plot Summary	Required – hard copy & electronic
012	Plot Summary by Maturity (Coast compilations only)	Required - electronic
015a	Harvesting Method and Appraisal Summary	Required - hard copy & electronic
015b	Second and Old Growth Summary (Coast compilations only)	Required - hard copy & electronic

Figure 4.2 Required/optional reports.

If percent reduction is being applied, two sets of reports will be required. The original reports before percent reduction applied and the reports after percent reduction has been applied. Also required are the keyed input values for the percent reduction.

* Electronic = 3.5 diskette

5.3 Calculation of Sampling Error - Fixed Area Plots

$N = \frac{\text{timber type area}}{\text{plot size}}$ n = # of plots

y = plot volumes $\bar{y}$ = mean plot volume

5.3.1 Non-Stratified Sampling

1. Variance (Var) = $\frac{\left(\Sigma(y_i - \bar{y})^2\right)}{n-1}$

2. Multiply by finite population correction (fpc) = $\frac{N-n}{N}$

3. Standard deviation (SD) = $\sqrt{(\text{Var} \times \text{fpc})}$

4. Standard error (SE) = $\frac{SD}{\sqrt{n}}$

5. 1 Sampling Error (1SE) = $\frac{SE}{\bar{y}}$

6. Sampling Error at the 95% Probability Level = 1SE x (students "t" value @ n - 1 degrees of freedom).

5.3.2 Stratified Sampling

1SE (all types) = (1 SE Type 1 x Proportional Area Type 1) + (1 SE Type 2 x Proportional Area Type 2) + ...

Sampling Error at the 95% Probability Level = 1SE x ["t" @ (n-1 for type 1) + (n-1 for type 2) + . . .]

5.4 Interpretation of Sampling Error

The introduction of statistical methods cannot change the element of chance or improve on the results of individual cruises. It does however provide a measure of confidence in results, known as sampling error. For the odds quoted (19 times out of 20), for the type of timber measured, for the size of sale and for the kind and intensity of sampling employed. The sampling error is a limiting difference that will only be exceeded 1 time in 20 because of chance effects of sampling which are beyond the control of the cruiser.

It should be noted that the estimate for sampling error from a cruise does not tell how much the timber sale volume estimate of that cruise would vary from a 100 percent cruise volume. The actual result of a cruise is not claimed as any more reliable an estimate of the volume than any other number between the limits quoted, but for administrative purposes is assumed to be the correct volume.

Ministry of Forests Cruise Tally Sheet (FS 205) 6

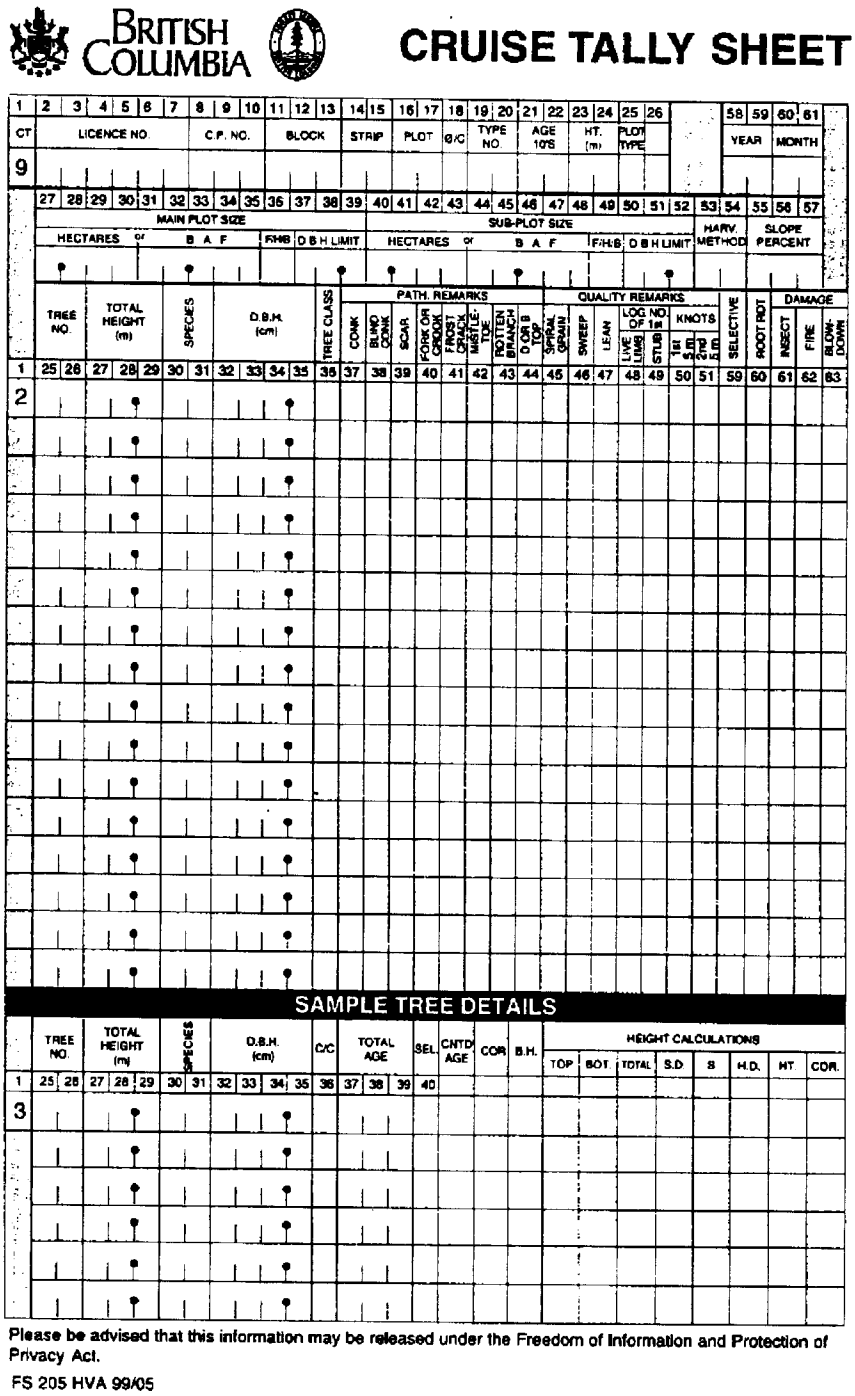
6.1 Form Design - General

Measurements taken on samples established in timber sales, cutting permits, etc. will be recorded on a Cruise Tally Sheet that provides the information in this chapter. The front side of the form identifies the plot, records the plot sizes and individual tree measurements while the reverse side provides the sample tree height information.

6.2 Entry of Data in Divided Spaces or Numbered Columns

Alphabetic fields are left justified as in the species code whereas numeric fields are right justified. It is not absolutely necessary that zeros be entered in spaces not required but their use helps avoid errors in placing the digit in its correct column and it is extremely important that this error is not made. For example, if columns for an item are 8, 9 and 10 and the magnitude of the item ranges from 0 to 999, then column 10 will be used for the units digit, column 9 for the tens digit and column 8 for the hundreds digits. For example:

	8	9	10
4 entered as	0	0	4
54 entered as	0	5	4
954 entered as	9	5	4



BRITISH COLUMBIA

CRUISE TALLY SHEET

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26			58	59	60	61
CT	LICENCE NO.						C.P. NO.			BLOCK			STRIP		PLOT		Ø/C	TYPE NO.		AGE 10'S		HT. (m)		PLOT TYPE			YEAR		MONTH		
9																															

27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
MAIN PLOT SIZE													SUB-PLOT SIZE													HARV. METHOD		SLOPE PERCENT		
HECTARES		or	B A F				F/H/B	D B H LIMIT					HECTARES			or	B A F				F/H/B	D B H LIMIT								

TREE NO.	TOTAL HEIGHT (m)	SPECIES	D.B.H. (cm)	TREE CLASS	PATH. REMARKS									QUALITY REMARKS							SELECTIVE	DAMAGE			
					CONK	BLIND CONK	SCAR	FORK OR CROOK	KNOT OR CRACK	MISTLE-TOE	ROTTEN BRANCH	D OR B TOP	SPIRAL GRAIN	SWEEP	LEAN	LOG NO. OF 1st LIVE LIMB	KNOTS 1st STUB	KNOTS 2nd & 3rd STUB	SELECTIVE	ROOT ROT	INSECT	FIRE	BLOW-DOWN
1	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	59	60	61	62	63
2																															

SAMPLE TREE DETAILS

TREE NO.	TOTAL HEIGHT (m)	SPECIES	D.B.H. (cm)	C/C	TOTAL AGE	SEL	CNTD AGE	COR	B.H.	HEIGHT CALCULATIONS							
										TOP	BOT	TOTAL	S.D	S	H.D.	HT	COR.
1	25 26	27 28 29	30 31	32 33 34 35	36	37 38 39	40										
3																	

Please be advised that this information may be released under the Freedom of Information and Protection of Privacy Act.

FS 205 HVA 99/05

Figure 6.1 Front Side of Cruise Tally Sheet (FS 205 HVA 99/05).

Positions 32 to 35 DBH

Enter the diameter in centimetres and decimal centimetres at breast height (1.3 m above the high side) of each tree equal to or above the contract specification. Whole numbers are recorded as decimals (e.g., 12.0 not 12).

Position 36 Tree Class (see Section 3.5.6 for Detailed Descriptions)

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

Positions 37 to 44 Pathological Remarks

Refer to the box entitled "Path Code". This indicates the numerical coding to be used in this section. The tree is schematically divided into thirds, with the left-hand block representing the bottom third, and middle block the middle third, and the right-hand block the top third. The shading indicates in which third or thirds the defects occur. The applicable numerical code is shown to the left of the blocks. Thus, if the defects occur in the lower third only, "1" is entered under the class of defect; if they occur in both the middle and upper thirds, "5" is entered; etc.

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

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 suspect characters listed must be noted where they occur.

Refer to the Cruise Compilation Loss Factor Table for pathological occurrence by species and forest inventory zones.

Examples:

1. A suspect tree has conks on the middle and upper thirds of the trunk and an open basal scar on the lower third. Under "Conk" enter "5" and under "Scar" enter "1".

2. A suspect tree has a fork on the middle third, blind conks on the upper third and a broken top. Under "Fork" enter "2", under "Blind Conk" enter "3" and under "D. or B. Top" enter "3".

3. A suspect 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".

Positions 45 to 51 Quality Remarks 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.

Quality remarks must include information on all items indicated under this heading. Codes are indicated in the "Quality Code" box on the back of the plot sheet.

Position 45 Spiral Grain

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 provide the next best evidence of the characteristic.

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

- Determine 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 DBH as a guide for estimation.

Log Number

"Logs" are individual 5 m lengths and are numbered starting at the top of a 30 cm "stump".

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 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 utilization top of the tree, record live limb as a one (1).

The grades on trees smaller than 60 cm DBH are not affected by the live limb code. On deciduous trees, live limb is recorded as the 5 m log where the natural forking starts. Record live limb for the dead potential tree classes.

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 Crown or at some point below.

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

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 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. 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 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.

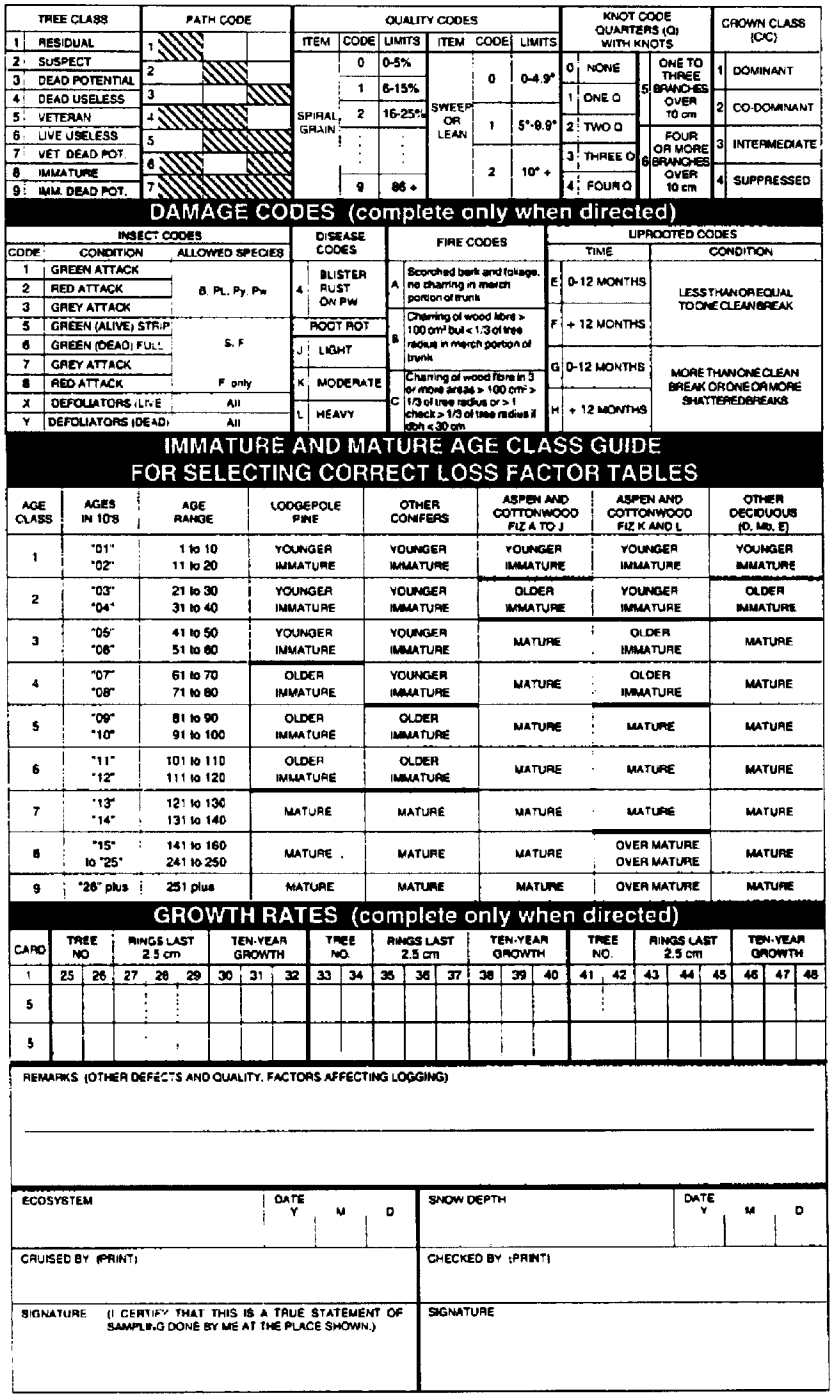
Positions 52 to 56

These columns are not in use.

Position 59 Partial Cutting

L = leave tree

Blank or C = cut tree



TREE CLASS	
1	RESIDUAL
2	SUSPECT
3	DEAD POTENTIAL
4	DEAD USELESS
5	VETERAN
6	LIVE USELESS
7	VET DEAD POT.
8	IMMATURE
9	IMM. DEAD POT.

PATH CODE: 1 2 3 4 5 6 7

QUALITY CODES					
ITEM	CODE	LIMITS	ITEM	CODE	LIMITS
SPIRAL GRAIN	0	0-5%	SWEEP OR LEAN	0	0-4.9°
	1	6-15%		1	5°-9.9°
	2	16-25%		2	10° +
	9	26 +			

KNOT CODE QUARTERS (Q) WITH KNOTS			
0	NONE	5	ONE TO THREE BRANCHES OVER 10 cm
1	ONE Q		
2	TWO Q	6	FOUR OR MORE BRANCHES OVER 10 cm
3	THREE Q		
4	FOUR Q		

CROWN CLASS (CC)	
1	DOMINANT
2	CO-DOMINANT
3	INTERMEDIATE
4	SUPPRESSED

DAMAGE CODES (complete only when directed)

INSECT CODES

CODE	CONDITION	ALLOWED SPECIES
1	GREEN ATTACK	B, PL, Py, Pw
2	RED ATTACK	
3	GREY ATTACK	
5	GREEN (ALIVE) STRIP	S, F
6	GREEN (DEAD) FULL	
7	GREY ATTACK	
8	RED ATTACK	F only
X	DEFOLIATORS (LIVE	All
Y	DEFOLIATORS (DEAD)	All

DISEASE CODES

4	BLISTER RUST ON Pw
	ROOT ROT
J	LIGHT
K	MODERATE
L	HEAVY

FIRE CODES

A	Scorched bark and foliage, no charring in merch portion of trunk
B	Charring of wood fibre > 100 cm² but < 1/3 of tree radius in merch portion of trunk
C	Charring of wood fibre in 3 or more areas > 100 cm² > 1/3 of tree radius or > 1 check > 1/3 of tree radius if dbh ≤ 30 cm

UPROOTED CODES

	TIME	CONDITION
E	0-12 MONTHS	LESS THAN OR EQUAL TO ONE CLEAN BREAK
F	+ 12 MONTHS	
G	0-12 MONTHS	MORE THAN ONE CLEAN BREAK OR ONE OR MORE SHATTERED BREAKS
H	+ 12 MONTHS	

IMMATURE AND MATURE AGE CLASS GUIDE FOR SELECTING CORRECT LOSS FACTOR TABLES

AGE CLASS	AGES IN 10'S	AGE RANGE	LODGEPOLE PINE	OTHER CONIFERS	ASPEN AND COTTONWOOD FIZ A TO J	ASPEN AND COTTONWOOD FIZ K AND L	OTHER DECIDUOUS (D, Mb, E)
1	"01" "02"	1 to 10 11 to 20	YOUNGER IMMATURE	YOUNGER IMMATURE	YOUNGER IMMATURE	YOUNGER IMMATURE	YOUNGER IMMATURE
2	"03" "04"	21 to 30 31 to 40	YOUNGER IMMATURE	YOUNGER IMMATURE	OLDER IMMATURE	YOUNGER IMMATURE	OLDER IMMATURE
3	"05" "06"	41 to 50 51 to 60	YOUNGER IMMATURE	YOUNGER IMMATURE	MATURE	OLDER IMMATURE	MATURE
4	"07" "08"	61 to 70 71 to 80	OLDER IMMATURE	YOUNGER IMMATURE	MATURE	OLDER IMMATURE	MATURE
5	"09" "10"	81 to 90 91 to 100	OLDER IMMATURE	OLDER IMMATURE	MATURE	MATURE	MATURE
6	"11" "12"	101 to 110 111 to 120	OLDER IMMATURE	OLDER IMMATURE	MATURE	MATURE	MATURE
7	"13" "14"	121 to 130 131 to 140	MATURE	MATURE	MATURE	MATURE	MATURE
8	"15" to "25"	141 to 160 241 to 250	MATURE	MATURE	MATURE	OVER MATURE OVER MATURE	MATURE
9	"26" plus	251 plus	MATURE	MATURE	MATURE	OVER MATURE	MATURE

GROWTH RATES (complete only when directed)

CARD	TREE NO.	RINGS LAST 2.5 cm	TEN-YEAR GROWTH	TREE NO.	RINGS LAST 2.5 cm	TEN-YEAR GROWTH	TREE NO.	RINGS LAST 2.5 cm	TEN-YEAR GROWTH
1	25 26 27 28 29		30 31 32	33 34	35 36 37	38 39 40	41 42	43 44 45	46 47 48
5									
5									

REMARKS (OTHER DEFECTS AND QUALITY FACTORS AFFECTING LOGGING)

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

Figure 6.3 Reverse Side of Cruise Tally Sheet (FS 205 HVA 99/05).

6.4 Reverse Side of Cruise Tally Sheet (FS 205 HVA 96/8)

6.4.1 Card Type 5

Position 1 Growth Rates

Growth Rates for increment Tables (complete only when directed).

Positions 2 to 24

Common to card types 1, 2, 3 and 4.

Positions 25 to 26

Use the same tree number as recorded under Card Type 2 and 3.

Positions 27 to 29 Rings Last 2.5 cm

Count from cambium towards the pith.

Position 30 to 32 Ten Year Growth (last 10 years)

Measure from the cambium towards the pith to the nearest 0.1 cm.

Position 33 to 40

Repeat 25 to 32.

Positions 41 to 48

Repeat 25 to 32.

6.4.2 Miscellaneous

Snow Depth

Note average depth of snow in centimetres at time of cruise for a given cruise plot along with the date on which the cruise plot was completed.

Signature

All Cruise Tally Sheets (FS 205 and industry versions) must be signed and dated by the cruiser in charge and in so doing, accepts responsibility for the information contained on the card.

Position 14 Special Compilation

WET AND DRY BELT DOUGLAS FIR ZONES		
	Biogeoclimatic Zone	**Biogeoclimatic Subzone and Variant**
Wet Belt	ICH (Interior Cedar Hemlock)	dw, dk, mw, mm, mk, mc, wk, vk, vc
Code = 1	SBS (Sub-Boreal Spruce)	dh, dw, dk, mh, mw, mm, mk, mc, wk, vk
	IDF (Interior Douglas Fir)	mw, ww
	ESSF (Englemann Spruce - Subalpine Fir)	dc, dk, dv, mw, mv, mm, mk, mc, wv, wm, wk, wc, vc, vv
	SBPS (Sub-Boreal Pine - Spruce)	mk, dc, mc
Dry Belt	ICH (Interior Cedar Hemlock)	xw
Code = 2	IDF (Interior Douglas Fir)	undifferentiated, dk1, dk2, dm2, xh, xw, xm, dm1
	ESSF (Englemann Spruce - Subalpine Fir)	xc
	MS (Montane Spruce)	xk, dc, dk, dm, xv
	SBPS (Sub-Boreal Pine - Spruce)	xc
	PP (Ponderosa Pine)	xh, dh

If subzones are missing from the above listing, the general rule to apply is: very dry and dry subzones are Dry Belt; and moist, wet and very wet are Wet Belt.

Enter:

(blank)	if Coast compilation
0	if Interior compilation is required by the three quality classes. *This option has been disabled.*
1	if interior fir is present and sale is in the Wet Belt.
2	if interior fir is present and sale is in the Dry Belt.

If the cutting permit occupies both Wet and Dry Belt BEC zones, subzones or variants, compile using the zone with the highest Douglas fir total net volume based on the cruise data.

Position 15 Tree Class Combinations

This column states which tree classes will be included in the final volume.

Blank or 0	useless volumes excluded - if only residual, suspect and dead potential tree volumes are required,
1	useless volumes included - if residual, suspect, dead potential plus live and dead useless volumes are required. Do Not use for appraisal purposes. Reports will be titled "Not for Appraisal Purposes".

Position 16 Species Compilation

This column indicates whether all the species on the sale are to be compiled in the same manner or whether an exception is required. For example:

1. Cedar poles or veneer for only Douglas Fir (not programmed as yet).

2. The stump height, top dib, DBH limit or log length could be altered for one species on the sale (i.e., in the Interior, lodgepole pine is compiled to 12.5 cm plus, while all other species are compiled to a 17.5 cm DBH).◀

Enter:

0	if all species are to be compiled in the same manner.
1	if all species are to be compiled the same with an exception.

Positions 17 to 18 Type of Compilation (majority of species)

The code for the appropriate end product or combination of products is entered. Present appraisals require option *3 for the interior and option *32 (because of log grading) for the coast.

*3.	Lumber including all logs
*32.	Coast Integrated Company - with Peeler segregation

Compilation Standard

Specify the utilization level required. This will be for the majority of the species.

Positions 19 to 21 DBH Lower Limit

Specify to the nearest 0.1 cm the minimum DBH to be compiled.

Coast:	Mature (121 yrs +) = 17.5 cm Immature (< 121 yrs) = 12.0 cm	Interior	Lodgepole Pine = 12.5 cm Other Species = 17.5 cm

Positions 22 to 24 Stump Height

Specify Stump Height required to the nearest cm (e.g., standard utilization = 30 cm).

Positions 25 to 27 Top Diameter

Specify top dib for the tree to the nearest 0.1 cm

Coast	Mature (121 yrs +) = 15 cm Immature (<121 yrs) = 10 cm
Interior	10 cm

Red cedar (Interior only):

- if age is < 141 years, compile to a 10 cm top, and
- if age is = > 141 years, compile to 15 cm top.

Positions 28 to 29 Log Lengths (to the nearest metre)

Log Lengths for product analysis. At present we only have lrf's for 5 m logs. Coast grading requires 10 m log length. If not equal to 5 m for Interior or 10 m for Coast, reports are titled "Not for Appraisal Purposes".

Log Lengths for other purposes can be 1 to 99 m.

(Zero) 0 = total tree length between stump height and top dib.

Positions 30 to 44

Exception Number 1.

Compilation for a species may require a different type of compilation; Lower DBH Limit (i.e., PL = 12.5 cm DBH). Stump height, top dib, and log length.

Positions 45 to 59

Exception Number 2 (i.e., Cedar 160 years = 15 cm top) Stump height, top dib, and log length.

Positions 60 to 74

Exception Number 3.

> Positions 30 to 74 on second line allows three more exceptions for one compilation.

Position 75 Block or Average Line Method (Type Average) of Compilation

A	average line (type average) method.
B	block method.

The average line (type average) method of compilation uses all plots from the timber type that is common to all blocks of cruise.

The block method uses only the plots in the timber type within the block or the plots in the timber type within the harvest method. Only one method must be used for an appraisal cruise.

The average line method is the default method.

The block method must be used for the following types of compilations:

1. Percent reduction by block.
2. Cutting permit compilations where immature and mature block combinations occur.
3. Other compilations approved by the Regional Manager in the cruise plan.

Position 78 Stump Diameter Measurement Type

Code "C" for centimeters.

Code "R" for rads.

Stump height must be in centimeters.

Stump Cruising 8

8.1 Introduction

The following methods are prioritised by safety considerations and the most accurate answer obtainable:

- all species, including deciduous, must be tallied,
- all stumps and/or felled trees, including non-merchantable (species and size) must be tallied,
- utilization standards will be based on whether the unauthorised timber harvesting (UTH) occurred in Coastal or Interior administrative areas. Refer to the most recent *Timber Utilization Policy – Coast and Interior*,
- if the volume can be isolated through the official scale, then utilize the scale volume plus a residue and waste volume for the area, and
- if there are situations that arise and the following methods do not apply, contact the Regional Cruising Coordinator in the respective forest region.

8.2 Boundaries

- Locate legal survey posts and confirm the boundary location. Re-establish cut block boundaries from original traverse notes if necessary,
- closed traverse the UTH area to the tolerances set out in Section 3.6.2.1 of the *Cruising Manual* (CM) under cruise based allowable errors, and
- if the unauthorised harvest will result in an administrative penalty under Section 117 of the *Forest Practices Code*, then a closed traverse of the area will be required since the penalty levied is in dollars per hectare.

8.3 Measurement Methods

The following methods are listed in order of preference. If stumps are lower than 30 cm height at high side, record the actual height as the additional volume removed will be included with the UTH volume in the compilation.

8.3.1 Method 1: Areas Less than 10 ha

Conduct a 100 percent cruise of the trees if the trees are still full length. If the trees have been bucked into log lengths, scale them as per scaling procedures outlined in the *Scaling Manual*.

If the UTH area is within a homogeneous pine or pine and spruce timber type of a density of 1 000 stems per hectare or more and greater than 3 ha, method 2 may be used.

8.3.2 Method 2: Areas Greater than or Equal to 10 ha

The sampling intensity must be sufficient that a sampling error of plus or minus 8 percent is achieved at the 95 percent confidence interval.

If the sampling error cannot be achieved, establish 400 m^2 (.04 ha) plots at an intensity to cover at least 10 percent of the area. A grid spacing of 60 m should be sufficient to ensure a plot coverage of 10 percent of the area.

Establish 400 m^2 (11.28 m radius) fixed area plots on a systematic grid. Record all of the necessary information for each tree represented by an "in the plot stump"(i.e., pith of stump is within 11.28 m of plot centre).



	Mature						OI.	MAT.	
PSYU/ SSA / TSA /TFL	**#**	**F**	**C**	**H**	**B**	**S**	**PL**	**PL**	**FIZ**
Public Sustained Yield Units									
Cranbrook	20								F
Creston	21								E
Crooked River	22				91	97			I
Dean	23								A
Dease - Proposed	25								K
Dewdney: Chilliwack Portion Yale Portion Harrison Portion	26 - 1 - 2 - 3			99 95 99	99 98 99				 C D C C
Eagle	27		94	85					G
Edgewood	28								E G
Fernie	29								F
Finlay	30					96			I K
Fontas - Proposed	31								L
Fort Nelson - Proposed	32								L
Granby	33								E
Hecate	34								A J
Kamloops	35	98							D
Ketchika - Proposed	36								K
Kettle	37					95		97	E
Kinbasket	38		92	86					G

	Mature						OI.	MAT.	
PSYU/ SSA / TSA /TFL	**#**	**F**	**C**	**H**	**B**	**S**	**PL**	**PL**	**FIZ**
Public Sustained Yield Units - cont'd									
Kingcome	39		99	98					A B
Klappan - Proposed	40								K
Kluskus	41								H
Kotcho - Proposed	42								L
Lac La Hache	43	99	98						D G H
Lardeau	44		91	84					G
Liard - Proposed	45								L
Longworth	46		96	90	92	98			G
Moberly	47								L
Monkman	48		96	90	92	98			I
Morice	49		13	12	93	99			H J
Nakusp	50		91	84					G
Narcosli - P.H.A. #5	51								H
Naver	52			90	92	98			H I
Nechako - P.H.A #1	53								H I
Nehalliston - P.H.A. #2	54								G
Nicola	55	98							D
Niskonlith - P.H.A. #2	56								G
Nootka	57			96					B
North Thompson	58		97	88					G
Okanagan	59	98	94	85					D E

	Mature						OI.	MAT.	
PSYU/ SSA / TSA /TFL	**#**	**F**	**C**	**H**	**B**	**S**	**PL**	**PL**	**FIZ**
Public Sustained Yield Units - cont'd									
Ootsa	60								H
Parsnip	61				91	97			I
Peace - P.H.A. #7	62								L
Purden	63		96	90	92	98			I
Quadra	64								B
Queen Charlotte	65								A
Quesnel Lake	66		98	90	92	98			D G H
Raft	67		97	88					G
Rivers Inlet	68								A
Robson	69		96	90	92	98			G
Salmo	70								E G
Salmon Arm	71		94	85					G
Shuswap	72		95	87					G
Sikanni - Proposed	73								L
Similkameen	74	98							D
Skeena	75								
Terrace Portion	-1			94	96				A J
Kitwanga Portion	-2			93	95				J
Hazelton Portion	-3			92	94				J
Slocan	76		91	84					G
Smithers	77		13	12	93	99			I J

	Mature						Ol.	MAT.	
PSYU/ SSA / TSA /TFL	**#**	**F**	**C**	**H**	**B**	**S**	**PL**	**PL**	**FIZ**
Public Sustained Yield Units - cont'd									
Soo	78			97	97				C
Spallumcheen	79		94	85					G
Stikine	80			91					K
Stuart Lake	81				91	97			I
Stum	82	99					98		H
Takla	83				91	97			I
Taku – Proposed	84								K
Upper Kootenay	85								F
Vancouver	86			99	99				C
Wapiti	87								L
Westlake	88				92	98			H I
Williams Lake	89	99							D H
Willow River	90			90	92	98			I
Windermere	91								F
Yalakom	92	99							D
Special Sale Area									
Fort St James	S02				91	97			I
Prince George – Quesnel	S04	99			92	98			H I G
Tree Farm Licence									
TFL 1 - Terrace	01				96				A J
TFL 3	03		91	84					G

A.4 Pathological Classification of Trees

Within mature stands, or stands approaching maturity, (i.e., older immature stands) individual trees contain varying amounts of decay. Thus, in stands of this type the estimation of cull is subject to considerable error. Therefore, it would be advantageous to know which trees are likely to contain decay, particularly those which are likely to contain excessive amounts of decay. Recent pathological studies have shown that two broad classes of living trees are clearly recognizable in stands of this character. As the classification of trees is made on the basis of the presence or absence of external signs of decay, it is anticipated that each class of tree so defined will represent a different potential loss factor within the stand.

A.4.1 Class of Trees

All living trees measured on each sample plot will be classed as:

- residual, or
- suspect.

A.4.1.1 Suspect Trees

Suspect trees are living trees which bear one or more of the following external indications of decay, on or immediately adjacent to the trunk of the tree within the limits specified.

1. Conks.
2. Blind conks (swollen knots).
3. Scars.
4. Fork or pronounced crook.
5. Frost crack.
6. Trunk infections or mistletoe.
7. Rotten branches.
8. Dead or broken top.

"Suspect" classifications will be made on the basis of the above signs of decay only; no other abnormalities are to be used.

See Table 18 for Pathological Occurrence by Species and Forest Inventory Zones.

A.4.1.2 Residual Trees

Residual trees are living trees which bear none of the external indications of decay listed above.

It must be pointed out that these signs and defects are expressive of decay in the stand, rather than in individual trees. The amount of decay indicated by signs will be subject to considerable variation within species and individual trees. For example, frost cracks may be highly significant as indicators of decay on a particular species in the stand as a whole, but not as significant on individual trees.

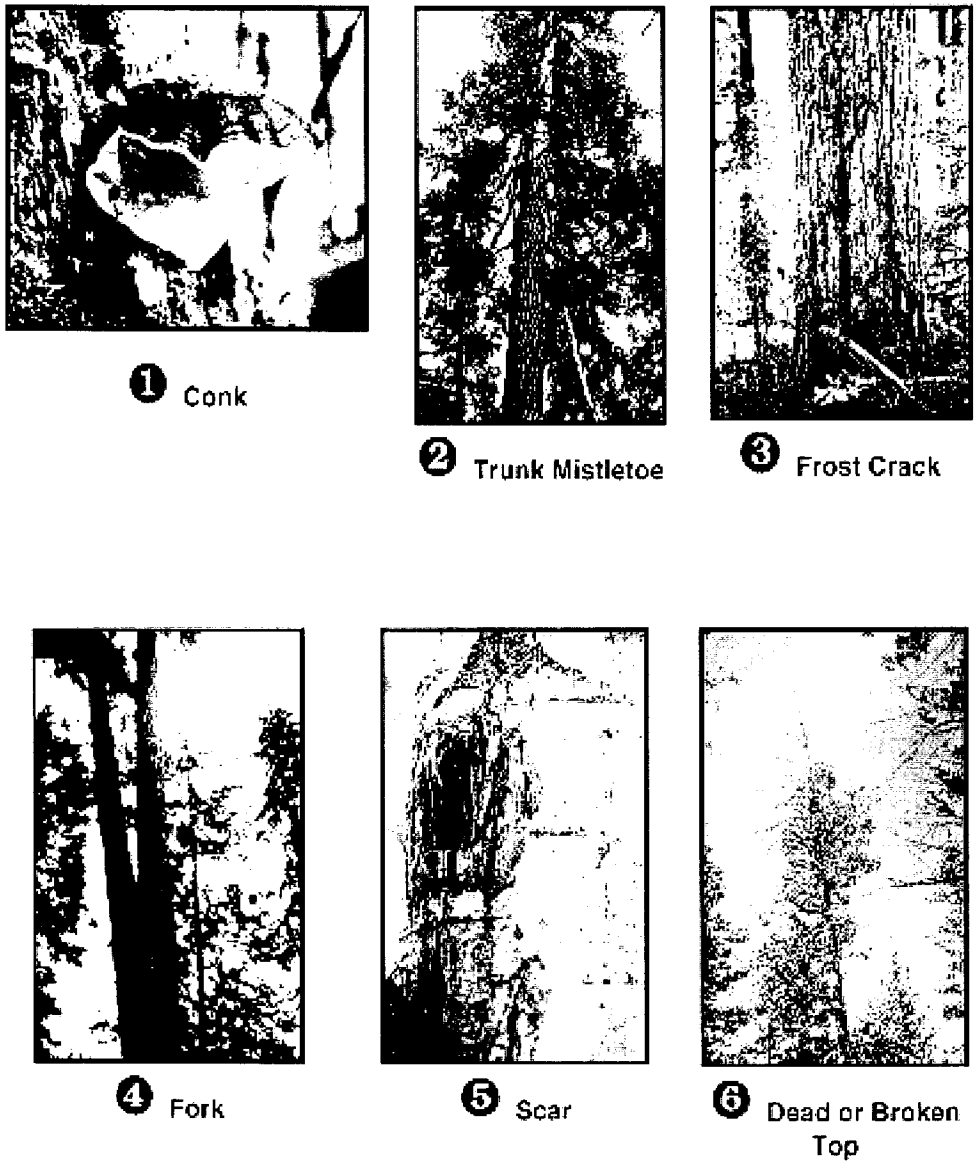


Figure A.2 Residual trees.

A.4.2 Signs and Defects Indicative of Decay in Standing Trees

The following is a brief description and explanation of the external indications of decay listed in Section A.4.1.1. These indicators are to be called on all live and dead potential (except dead potential in the Interior) trees from the base of the tree to the **utilization top** including secondary leaders which contain a merchantable log (3 m long to a 15 cm top - except 10 cm top for the interior and for coastal immature). Do not record pathological indicators above utilization top diameter. Not shown are large rotten branches and blind conks.

Residual and Suspect Trees – Secondary Leaders

All live trees except cedar and cypress – record all pathological indicators on secondary leaders if the leader is alive and of merchantable size. Conks of an identifiable heart rot fungi may be called on non-merchantable live secondary leaders. Do not record any pathological indicators on dead secondary leaders.

Cedar and cypress – record all pathological indicators on live or dead secondary leaders of merchantable size.

Dead Trees

Record all pathological indicators on dead trees and their merchantable secondary leaders except do not record sap rot fungi as conk.

A.4.2.1 Conks

Conks are the fruiting bodies (sporophores) of decay fungi and are definite and reliable indicators of decay. Conks occur anywhere on the main stem, branches and exposed roots of the tree but appear most frequently around knots and on the underside of both dead branch stubs and live branches. For current cruising purposes, only specific root, butt and heart rot conks are suspect indicators. Slash conks are not suspect indicators (see Figure A.3 for a list of host species for selected decay fungi).

It is important to be able to differentiate between the fruiting of slash fungi that occur on dead branches and wounds of living trees and those that occur on the roots, live branches and trunks of living trees. It is necessary to be able to recognize the conks of the major heart rotting fungi found on living conifers and hardwoods. On conifers, the main conks to recognize are, *Echinodontium tinctorium, Phellinus (Fomes) pini, Phaeolus (Polyporous) schweinitzii and Fomitopsis (Fomes) pinicolii.* On hardwoods, the main conks are Phellinus igniarius and Phellinus tremulae. See the following host list for major and some minor heartwood decay species.

The major heart rot conks are hard, thick, woody-like perennial structures and form singly at branch stubs or in small clusters on the underside of living branches. An exception is the mushroom-shaped to bracket-like sporophore of *P. schweinitzii* that is annual but may persist for more than two years. Before calling conks on living branches in the upper crown, there must be fruiting bodies of the heart rot fungus evident in the stand. Slash conks that occur on dead wood of living trees can be both annual (small, thin, leathery) and perennials, are often more numerous and occur anywhere on the tree. The slash conks

that occur on old exposed wounds are not allowed as suspect indicators. An exception is the conk of *F. pinicola*, which is common on dead trees but may also occur on large, old wounds as studies have found its occurrence indicates significant decay. However, *F. pinicola* that occurs on dead branches is not a suspect indicator.

Conks vary in size and shape and therefore are hard to spot, particularly when they are just developing or occur on the upper trunk. Conks of *E. tinctorium* and *Phellinus pini*, frequently appear as a small hoof-like or shelf-like structure on the underside of dead branch stubs on the middle and/or lower trunk of an infected tree. Moss-covered branch stubs and burls often resemble conks, particularly when viewed from directly below; it is important therefore to view the tree from the side before making a decision.

Conks of Phaeolus schweinitzii

P. schweinitzii is the cause of brown cubical root and butt rot of most conifers but Douglas-fir and spruce are the most susceptible. The fruiting bodies may occur:

- on the base of a tree,
- on the ground up to 2 m from the tree where no exposed roots are evident, or
- on the exposed roots.

If a conk is mid-way between:

1. Two living susceptible trees only one tree is considered to be infected.
2. A highly susceptible species (e.g., Douglas-fir) and a less susceptible species (e.g., red cedar), the most susceptible species is considered to be infected.
3. A living tree and a stump showing brown cubical rot, and it is not on a root of the live tree, it is assumed to be associated with the stump.

A.4.2.2 Blind Conks

Blind conks are pronounced swellings or depressions around knots caused mainly by *P. pini* on conifers and *P. tremulae* on aspen and if identified correctly, are definite indicators of decay (see Figure A.3). The swelling or depression results from the tree attempting to heal over an abortive conk; a newly developing conk; or a point from which an old conk has dropped. Non-typical forms may appear as small branch holes or branch stubs at the base of trees. This form is often found in over-mature Douglas-fir and balsam species in the coast-interior transition zone (e.g., Boston Bar). Therefore over-mature trees with basal branch stubs should be examined for blind conk.

All blind conks must be verified by cutting with an axe. This will reveal a bright yellow or buff-colour of the conk. Inaccessible blind conks must not be called indicators unless they are similar to ones that have been previously identified in the stand or on adjacent cutting permits.

Large holes left by fallen large rotten branches may not be blind conk suspect indicators

Age of scar:

- a scar shall be not recent in origin. This is interpreted as the injury having not occurred within approximately the past five years,
- the scar or catface should show greyed or weathered wood. Weathered wood shall be described as:
  - dried and some "sun checking" evident,
  - usually associated with change of wood colour to a greyish tone,
  - callous growth should also be evident where the tree is attempting to grow over the scar, and
  - decay does not have to be evident.

Location of scar:

- a scar should be called if the damage occurs on any portion of the trunk of the main stem or on the secondary leader (only if the secondary leader contains a merch log),
- a scar which extends from the first or second third of the tree into the upper 1/3 of the tree on which the top is dead will be classified as a scar "4" by convention. The objective is not to double call the pathological indicators in the upper 1/3 of the tree,
- scars occurring completely below the point of germination, either on the trunk or an exposed root adjacent to the trunk, will be classified as a scar, and
- do not record scars above utilization top diameter.

Abnormalities similar to scars but not classified as scars:

Black knots:

- black knots frequently develop around unhealed knots and wounds. A superficial saprophytic fungus, which feeds on the exuded sap, causes the blackness. Black knots are quite sound and when cut into with an axe do not signify decay.

Burls and galls:

- burls and galls develop from abnormal cell growth in trees and are not associated with scarring, however scars occurring on burls and galls will be called.

Dry side:

- dry side results from the death of the cambium through bruising by other trees or by other physiological causes. Dry side may appear as a narrow to wide strip or as a localized area on the side of a tree. The bark remains over the affected area and provides protection against wood rotting fungi. Dry side is not a scar unless the bark has sloughed (is missing).

Sap sucker holes:

- sap sucker holes are superficial in extent and have no established significance for causing decay.

Insect borings:

- borings by bark beetles or other insects are generally recent in origin and they are not pathological indicators.

A.4.2.4 Fork or Pronounced Crook

A fork or crook is the result of damage to the main leader of the tree where one or more lateral limbs take over as the main stem. Fork or crook is called if severe enough to indicate that the original injury exposed the wood and provided an entrance point for decay fungi. Fork or crook are to be called between the root collar and the minimum top diameter specified in the cutting authority document.

Forks are called for any of the following conditions:

1. The main stem is markedly forked to indicate that 2 or more leaders have resulted from serious damage to the original leader (see Figure A.9, Example A and B).

2. The diameter of the main stem changes excessively from its normal taper to indicate that a serious injury has occurred. For cruising purposes, the diameter change must be at least 10 percent (see Figure A.9, Example C and D).

Crooks are called if:

1. A stub is visible at the offset, with a 10 percent diameter change of the bole at the base of the stub (see Figure A.9, Example F).

2. The offset is severe enough to indicate that damage occurred to the main stem. For cruising purposes, the offset must be at least 50 percent of the diameter of the tree at the crook (see Figure A.9, Example E). Offsets less than 50 percent must be sharply crooked over a short length of the bole.

Some forks and crooks are not called (see Figure A.22). Forks and Crooks may be a growth characteristic of the tree species (for example deciduous species) or may have developed from malformation of the terminal leader due to insect or mistletoe attack. In addition, a fork may be confused with a branch. Forks or crooks which are not called are as follows:

1. Crooks with a minor offset (for cruising purposes, an offset less than 50 percent of the diameter of the tree at the crook).

2. Small sharply angled branches or spikes (for cruising purposes, less than a 10 percent change in the diameter of the main stem).

3. Natural forking in deciduous tree species.

4. If the damage is less than 5 years old and/or occurs above the minimum top diameter specified in the Timber Utilization Policy (Coast or Interior).

5. Flattening of the top of the tree caused by wind or natural outgrowth.

6. Candelabra branches in coniferous species.



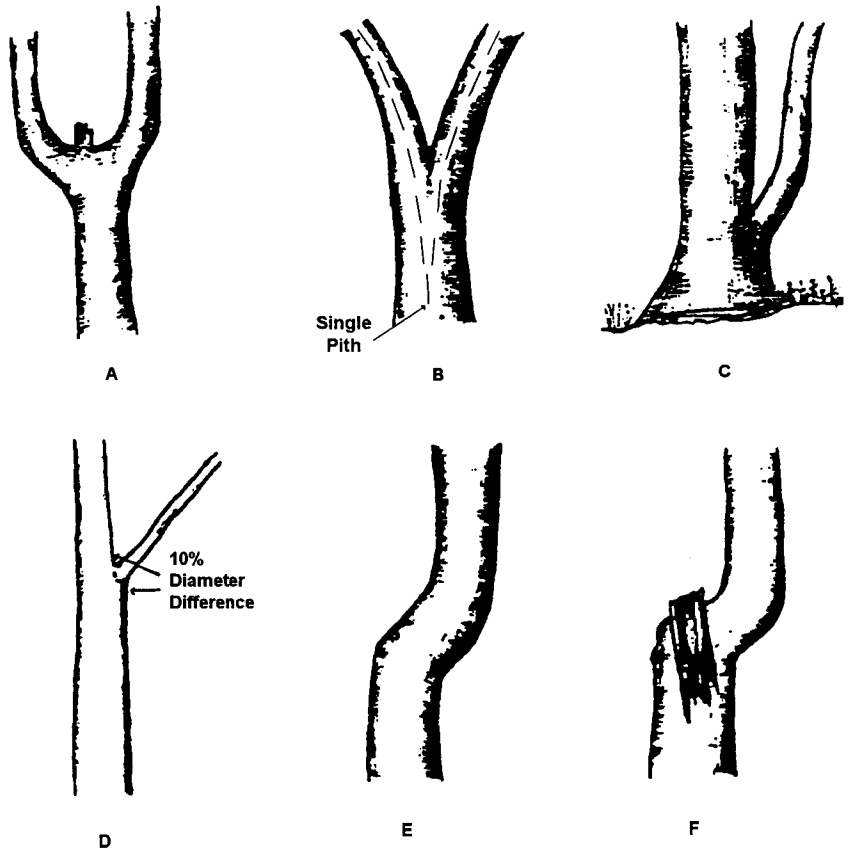


Figure A.9 Types of forks and crooks which are recorded.

Examples A and B illustrate forks which occur in the merchantable portion of the trunk. Example C illustrates forks which occur on the basal portion of trees. Examples E and F illustrate pronounced crook.

A.4.2.5 Frost Cracks

- frost cracks result from deep radial splitting of the trunk caused by uneven expansion of the wood after sudden and pronounced drops in temperature,
- the cracks usually originate at the base of the trunk and extend up the tree following the longitudinal grain of the tree (see Figure A.10),

A.4.2.7 Large Rotten Branches

Large rotten branches are dead branches that are large (over 10 cm DIB) and are clearly decayed. These branches are usually broken off within a couple of metres of the trunk. Decayed heartwood close to or at the branch base should be obvious. The branches may be found at any position on the tree, but are generally confined to a position below the base of the live crown. This indicator is typically found on overmature trees (see Figure A.13).

Large rotten branches should not be confused with the normal decay of dead branches. It should be associated with large branches that have broken off, exposing a large heartwood surface to decay producing fungi, thereby potentially infecting the adjacent trunk.

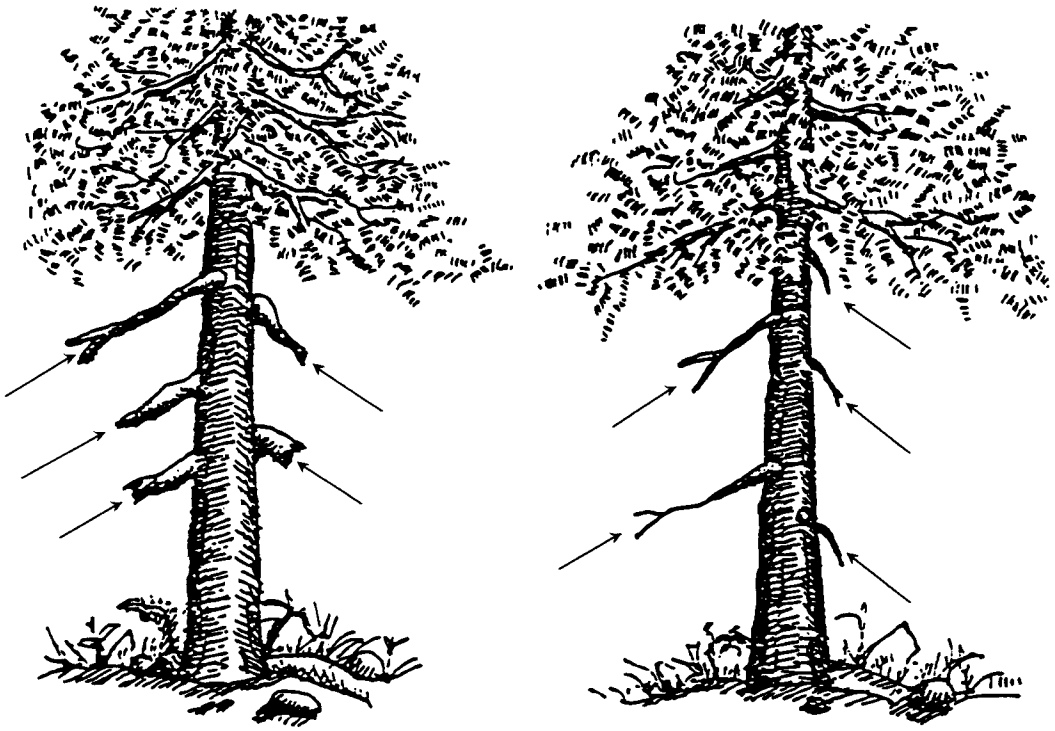


Figure A.13 Rotten branches.

A.4.2.8 Dead or Broken Top

Definition:

- where the tree top or complete stem has died due to various physiological causes.

Causes of dead tops

Dead tops may be caused by several factors such as:

- insect attack,
- drought conditions,
- sun scald, and
- physiological death.

The calling of dead tops:

- a dead top must be obviously weathered, indicating that death occurred at least five (5) years ago and below utilization top before it will be called as a pathological indicator, and

Broken tops:

- broken tops can be caused by various causes:
  - wind breakage,
  - snow damage,
  - damage from falling trees, etc.
- broken tops must be obviously weathered (see scar criteria) before being called as a pathological indicator,
- standing trees that have windsheared and are broken in the bottom third will have a windthrow damage code assigned (do not record a dead or broken top in 1),
- if a fork is present at a broken top position, record the fork if a merchantable log (3 m and 10 or 15 cm top) can be recovered from the fork. If the fork is not of merchantable size, record the d or b top(do not call both indicators),
- where there is not any evidence of a broken top in the stem at the fork/crook position and neither of the leaders are merchantable, record fork/crook,
- if a candelabra, record d or b top.

A.7.1.3 Attack codes for balsam, white pine, yellow pine and lodgepole pine

Code	Description
1	Green Attack
2	Red Attack
3	Grey Attack

These attack codes (based on crown and bole symptoms) are applicable to the mountain pine beetle (PL, PY, PW), the western pine beetle (PY) and western balsam bark beetle (B).

In large, active infestations of these beetles, trees which have strip attacks and unsuccessful full attacks due to tree resistance will generally be low in numbers. Therefore, additional codes are not necessary to identify them for the purpose of normal timber sale or inventory cruising.

Any evidence of bark beetle attack in a green tree must be tallied as a green attack bark beetle code.

Green Attack Code 1 (Risk Group 2, Balsam and the Pines)

Since the mountain pine beetle and the western pine beetle normally complete their life cycles in one year, the Green Attack code will represent trees that have been infested ten to twelve months or less. The crown is green but pitch tubes are evident on the lower bole and the inner bark will contain characteristic gallery patterns and immature stages of the beetles. Successfully attacked trees usually die within a few weeks following initial attack even though their crowns may stay green up to twelve months. How long the crown of an infested tree stays green depends on climate, soil, topography and tree species. For lodgepole pine, green attacked trees are common from late July to late May in most areas. White pine and yellow pine infested by mountain pine beetle often start discolouring by fall or mid-spring.

Red Attack Code 2 (Risk Group 2, Balsam and the Pines)

This code represents trees that, on average, had been attacked during the previous two seasons. The crowns first fade to straw colour, then to red and finally to rust colour before the needles fall off the tree. By the time the foliage is rust coloured, the beetles have usually left these trees to infest green trees. The boles of many trees in this category may be heavily worked by woodpeckers, making them susceptible to checking.

Grey Attack Code 3 (Has to be dead = Highest Risk Group, Balsam and the Pines)

This code will represent trees which are dead and have grey needles. The bole of the older kills will have much checking and loose bark. However, pitch tubes on the bark of the lower bole and/or bark beetle galleries under the bark will be readily discernible.

The western pine beetle has a different gallery pattern than the mountain pine beetle, but infested trees go through the same sequence of foliage changes after attacks by either beetle. Therefore, the same attack code is applicable.

The western balsam bark beetle usually completes its life cycle in two years. Therefore, both green and red attacked trees will contain brood. Also quite often there is no evidence of pitch tubes on the trunk of infected trees. Therefore, the boles of balsam fir need to be examined at close range for signs of boring dust in the crevices of the bark and/or small round holes in the bark that signify entry or emergence by this beetle. Thus, in the green infected stage, attacked trees are quite difficult to find.

A.7.1.4 Blister Rust Code 4 (Risk Group 2, White Pine)

Normally used in stands where white pine is a major species (more than 20 percent of the volume) which is seriously infected with blister rust. This code can be used in a normal old growth H-C type containing a few scattered PW veterans.

A.7.1.5 Attack Codes for Spruce, Douglas Fir

Code	Description
5	Green (Alive) Strip Attack – S and F
6	Green (Dead) Full Attack – S and F
7	Grey Attack – S and F
8	Red Attack – Fir only

The first three codes are applicable to the spruce and fir beetle. Spruce foliage turns yellowish for a brief period in the winter season following an attack before the needles drop off the tree. Therefore, the species was not included in the red attack. Infested trees with faded crowns should be included in the green (dead) full attack.

Green (Alive) Strip Attack Code 5 (Path/Tree Class = Risk Group, Fir and Spruce)

The trees in this code will be infested in a strip on the lower bole where broods either failed or succeeded in completing their development. In either case, the attacks did not kill the trees. These trees will live on, at least until subsequent attacks (which can happen quite often) completely girdle the bole. In the case of Douglas fir, strip attacked (green alive) in well established infestations are usually much less common than Green (dead) fully attacked trees. The loss factors are unaffected by this code.

Green (Dead) Fully Attacked Code 6 (Risk Group 2, Fir and Spruce)

The trees in this code still have green foliage but the attack by the bark beetles has completely girdled the tree. Some of these trees will have a considerable amount of their bark removed by woodpeckers lowering the value because of checks and splits.

In the case of Douglas fir, the beetle usually has a one year life cycle. The attack is usually in May and June. The crowns of infested trees stay green from a few months to a year after attack. Do not code as Tree Class 3. The compilation program will downgrade these trees to Risk Group 2.

Gray Attack Code 7 (Highest Risk Group and has to be dead, Fir and 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 these trees to the highest 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. For bole and crown symptoms of infestation, consult the publication on Douglas fir Beetle[3] under the headings Damage and Detection. The compilation program downgrades these trees to Risk Group 2. If they have conk or blind conk or are tree class 3, 7, or 9 they will be compiled as Risk Group 3.

A.7.1.6 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.

A.7.2 Fire Damage

The following section applies to situations where trees are damaged by fire.

Standard cruising methods as outlined in the *Cruising Manual* are to be followed in conjunction with the following classifications and their attack codes.

A.7.2.1 Light Damage - Code A

Damage consisting of scorched bark and foliage but no charring in the merchantable portion of the stem.

Classification: No change to the tree classification for light fire damage trees.

Trees with bark scorching that occurred greater than or equal to 5 years previously do not qualify for fire damage coding.

A.7.2.2 Moderate Damage - Code B

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

Classification: Assign the tree class and record the pathological indicators as normal. The compilation program will down grade risk group 1 trees to risk group 2.

A.7.2.3 Heavy Damage - Code C

Damage 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 also qualify for heavy damage.

Classification: Assign the tree class and record the pathological indicator as normal. The compilation program will down grade these trees to the highest risk group.

Trees are coded as they appear at the time of the cruise only and not at the anticipated time of harvesting.

Definitions:

Merchantable section	is the section of the stem between 30 cm stump and the 10 cm top diameter.
Charring	is the actual destruction of wood by fire. There must be identifiable damage to a surface area greater than100 cm^2.
Shallow charring	is charring which is greater than 100 cm^2 in surface area and less than one-third of the radius of the tree.
Extensive shallow charring	is charring in the bottom third of the tree that has 3 or more areas (each at least 100 cm^2) of exposed and charred wood fibre.
Deep charring	is where charring is deeper than one-third of the radius of the tree.
Multiple deep checks	is where more than 1 check is deeper than one-third of the radius of the tree.

1. Surface checking may occur as the result of fire damage but this does not affect tree classification.
2. Trees are coded as they appear at the time of the cruise and not at the anticipated time of harvesting.

A.7.3 Uprooted Stands (Windthrow, Flood Damaged)

A.7.3.1 Pre-Assessment of Fall-down

Falldown should be assessed and reported in the cruise plan. The report is to include the approximate proportion of the stand affected and the species, diameter range, orientation and pattern of the downed trees.

A.7.3.2 Sampling Fall-down

The following applies to situations where trees have been blown down or uprooted. Standard cruise methods as outlined in the *Cruising Manual* are to be followed in conjunction with the following criteria.

- fixed or variable plots can be used for both standing and falldown,
- trees will be coded as of the time of cruising,
- do not record uprooted tree class 4 and 6 trees,
- the allowable tree classes for all codes are 1, 2, 3, 5, 7, 8, and 9,
- all trees with red, green or brown needles are classified as living trees.

The following Damage Codes will be entered in column 63 of the Tally Sheet (FS 205).

Length of Time		Condition of Uprooted Trees
Code	**Time Since Damage**	**Description**
E	0 - 12 months	The tree may have one clean break in the merchantable portion of the stem. The compilation program will assign the risk group by tree class and pathological indicators.
F	+ 12 months	The tree may have one clean break in the merchantable portion of the stem. The compilation program will assign the risk group by tree class and pathological indicators.
G	0 – 12 months	The tree must have two or more clean breaks or one or more shattered breaks within the merchantable portion of the stem. The compilation program will down grade these trees to the highest risk group.
H	+ 12 months	The tree must have two or more clean breaks or one or more shattered breaks within the merchantable portion of the stem. The compilation program will down grade these trees to the highest risk group.

Definitions:

Clean break is a break in the merchantable portion of the stem which can be bucked out in a length equivalent to the diameter of the stem at the break.

Shattered break is a break more severe than a clean break.

Examples of Windshear/Snow Press and Uprooted Trees:

- if < 5 years since the damage and the tree is broken or shattered in the top third *do not* code blowdown or dead/broken top,
- if ≥ 5 years since the damage and the tree is broken or shattered in the top third larger than utilization diameter, code dead or broken top *only*. If broken above utilization diameter do not tally blowdown or dead or broken top,
- if < 5 years since the damage and the tree is broken or shattered in the middle third, code E or F only and do not record dead or broken top,
- if ≥ 5 years since the damage and the tree is broken or shattered in the middle third, code F only and tally dead or broken top in 2nd third, and

- if < 5 years since the damage and the tree is broken in the lower third, code E/F/G or H and do not tally a dead or broken top,
- if ≥ 5 years since the damage and the tree is broken in the lower third, code E/F/G or H and tally a dead or borken top.

Examples of Windfall (Downtrees):

- all uprooted trees, assign the appropriate blowdown code,
- if tree is partially uprooted and supported by another standing tree assign the appropriate blowdown code, and
- if tree is partially uprooted and self-supporting do not assign a blowdown code.

A.7.4 Extremely Damaged Stands (Windthrow, Flood Damaged, Fire, Insects or Disease)

Where damage conditions are such that a stand cruise procedure becomes too costly in terms of recoverable values from the salvageable material, the Regional Manager has the following options of estimating the volume and quality of both the damaged and undamaged wood left on the area:

1. Applying an estimated damage factor (derived either by aerial or ground reconnaissance) to an earlier cruise of the area when the stand was undamaged.
2. Applying an estimated damage factor to volumes derived from the inventory map and average lines for the area.

Appendix 8 Interior Log Grade Algorithm

The Interior Log Grade Algorithm is for the ministry compilation program. Industry compilers may also include it.

A.8.1 Assumption

Pathological and quality indicators on the tree can predict grade.

A.8.2 Procedures

1. The compilation program utilizes the table below for allocation of path in thirds to the logs.

2. Conk, blind conk, frost crack, rotten branch, D & B top and spiral grain, are collected as per the manual.

3. Saprot/checks are recorded (by thirds) in the rootrot column. Record these defects as listed in the *Scaling Manual*. The overall rule is that at least 50 percent of the log must be suitable for lumber. Sound cores must be at least 10 cm top diametre. Heart checks on logs 15 cm or less can have only one check 4 cm deep or more.

4. Four or more branches over 10 cm in bottom third of tree = knot code 6 in position 50 of the cruise tally card.

The body of the table contains the log number that is affected (e.g., a code of 3 (top third) in a 6 log tree affects 5 and 6). Knot Code 6 is the exception; it applies to the 5 metre log where the large knots occur.

Path Code	Number of Logs in the Tree							
by Third	1	2	3	4	5	6	7	8
1	1	1	1	1	1	1, 2	1, 2	1, 2, 3
2	1	1	2	2, 3	2, 3, 4	3, 4	3, 4, 5	4, 5
3	1	2	3	4	5	5, 6	6, 7	6, 7, 8
4	1	1	1, 2	1, 2	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1 to 5
5	1	2	2, 3	3, 4	2, 3, 4, 5	3, 4, 5, 6	3, 4, 5, 6	4 to 8
6	1	1, 2	1, 3	1, 4	1, 5	1, 2, 5, 6	1, 2, 6, 7	1, 2, 6, 7
7	1	1, 2	1, 2, 3	1, 2, 3, 4	1 to 5	1 to 6	1 to 7	1 to 8

The compilation program applies the following flow chart:

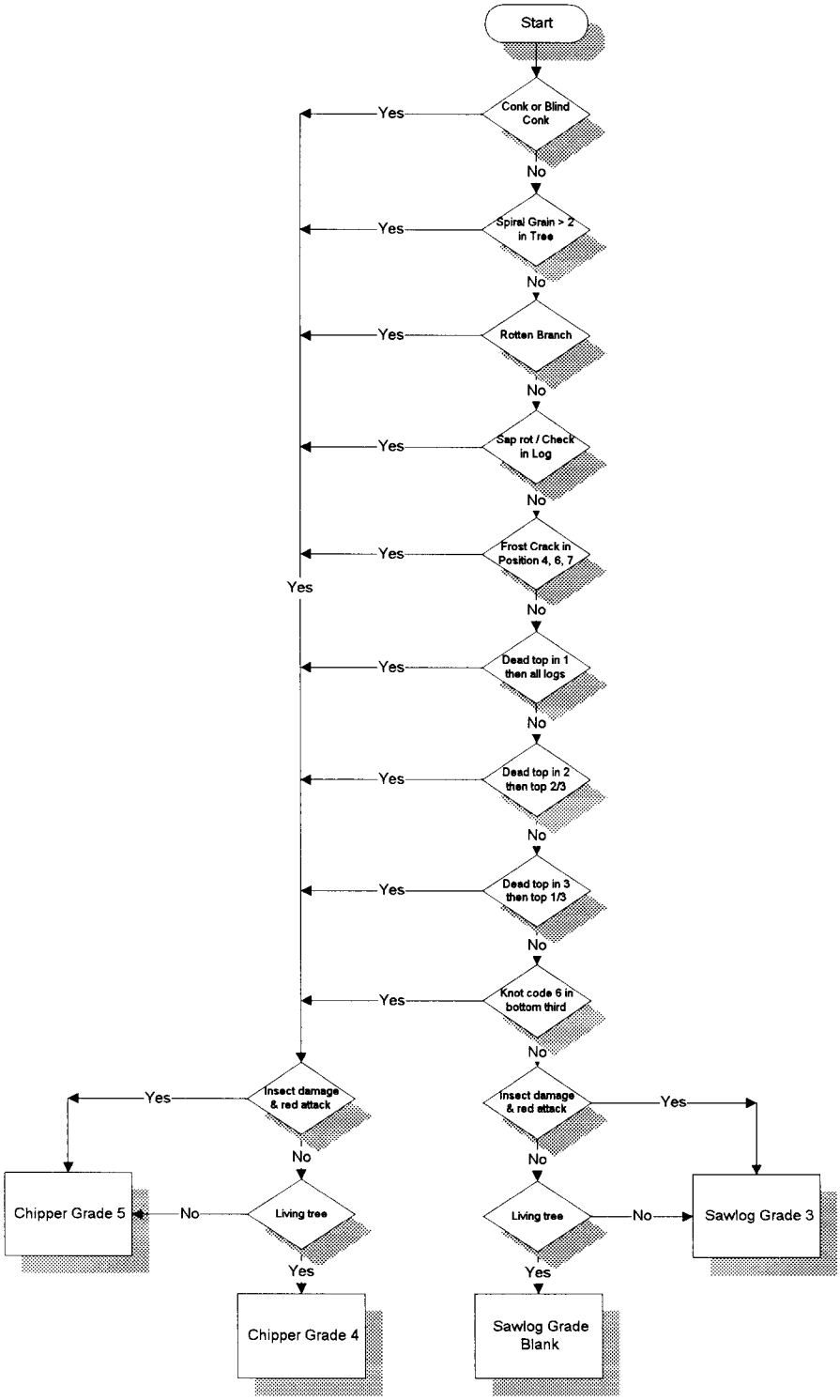


Figure A.34 This table converts the third of a tree into log number.

Forest Region and District Boundaries

RCA · Cariboo Forest Region (Williams Lake)
DCH · Chilcotin Forest District (Alexis Creek)
DHO · Horsefly Forest District
DQU · Quesnel Forest District
DWL · Williams Lake Forest District
DMH · 100 Mile House Forest District

RPG · Prince George Forest Region
DDC · Dawson Creek Forest District
DFN · Fort Nelson Forest District
DJA · Fort St. James Forest District
DJO · Fort St. John Forest District
DMK · Mackenzie Forest District
DPG · Prince George Forest District
DRV · Robson Valley Forest District (McBride)
DVA · Vanderhoof Forest District

RKA · Kamloops Forest Region
DCL · Clearwater Forest District
DKA · Kamloops Forest District
DLI · Lillooet Forest District
DME · Merritt Forest District
DPE · Penticton Forest District
DSA · Salmon Arm Forest District
DVE · Vernon Forest District

RPR · Prince Rupert Forest Region (Smithers)
DBC · Bulkley/Cassiar Forest District (Smithers, Dease Lake)
DKM · Kalum Forest District (Terrace)
DKI · Kispiox Forest District (Hazelton)
DLA · Lakes Forest District (Burns Lake)
DMO · Morice Forest District (Houston)
DNC · North Coast Forest District (Prince Rupert)

RNE · Nelson Forest Region
DAR · Arrow Forest District (Castlegar)
DBO · Boundary Forest District (Grand Forks)
DCO · Columbia Forest District (Golden, Revelstoke)
DCB · Cranbrook Forest District
DIN · Invermere Forest District
DKL · Kootenay Lake Forest District (Nelson)

RVA · Vancouver Forest Region (Nanaimo)
DCR · Campbell River Forest District
DCK · Chilliwack Forest District (Rosedale)
DMC · Mid Coast Forest District (Hagensborg)
DPM · Port McNeill Forest District
DQC · Queen Charlotte Islands Forest District
DSI · South Island Forest District (Duncan, Port Alberni)
DSQ · Squamish Forest District
DSC · Sunshine Coast Forest District (Powell River)



This page is intentionally left blank.

Forms

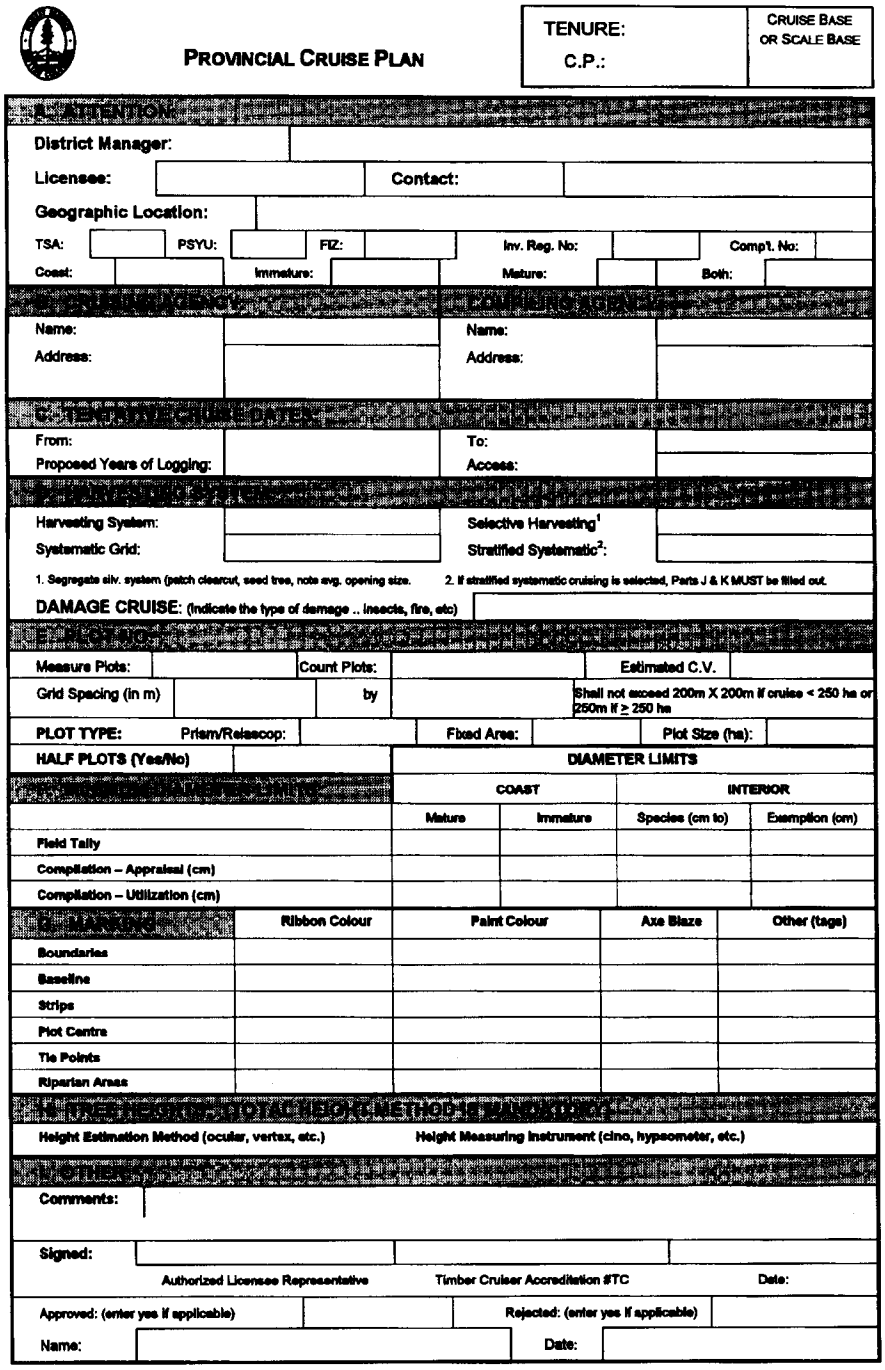
The following forms with FS numbers are provided in a fillable format that can be downloaded from the Internet. The FS 693 Provincial Cruise Plan is the only form that is available to the public. The FS 694 Cruise Plan and Map Check List, FS 695 Office Check of Field Cruise Data, FS 696 Field Check Cruise Summary and the FS 697 Compilation Check Forms are available for in service only.

The sites are located under:

Internal http://wwwinternal.for.gov.bc.ca/iscripts/ISB/FORMS/forms.asp

Internet http://www.for.gov.bc.ca/pscripts/ISB/FORMS/forms.asp

FS 693 Provincial Cruise Plan



PROVINCIAL CRUISE PLAN

TENURE: C.P.: | CRUISE BASE OR SCALE BASE

A. ATTENTION:

District Manager:

Licensee: Contact:

Geographic Location:

TSA: PSYU: FIZ: Inv. Reg. No: Compt. No:

Coast: Immature: Mature: Both:

B. PREPARED BY: **C. CRUISED BY:**

Name: Address: Name: Address:

D. PROPOSED LOGGING DATES:

From: To:

Proposed Years of Logging: Access:

E. SAMPLING SYSTEM:

Harvesting System: Selective Harvesting[1]

Systematic Grid: Stratified Systematic[2]:

1. Segregate silv. system (patch clearcut, seed tree, note avg. opening size. 2. If stratified systematic cruising is selected, Parts J & K MUST be filled out.

DAMAGE CRUISE: (Indicate the type of damage .. insects, fire, etc)

F. PLOT DESIGN:

Measure Plots: Count Plots: Estimated C.V.

Grid Spacing (in m): by Shall not exceed 200m X 200m if cruise < 250 ha or 250m if ≥ 250 ha

PLOT TYPE: Prism/Relascop: Fixed Area: Plot Size (ha):

HALF PLOTS (Yes/No)

G. DIAMETER LIMITS:

	COAST		INTERIOR	
	Mature	Immature	Species (cm to)	Exemption (cm)
Field Tally				
Compilation – Appraisal (cm)				
Compilation – Utilization (cm)				

H. MARKING:

	Ribbon Colour	Paint Colour	Axe Blaze	Other (tags)
Boundaries				
Baseline				
Strips				
Plot Centre				
Tie Points				
Riparian Areas				

I. TREE HEIGHTS: TOTAL HEIGHT METHOD IS MANDATORY

Height Estimation Method (ocular, vertex, etc.) Height Measuring Instrument (clino, hypsometer, etc.)

J. OTHER:

Comments:

Signed: Authorized Licensee Representative Timber Cruiser Accreditation #TC Date:

Approved: (enter yes if applicable) Rejected: (enter yes if applicable)

Name: Date:

Figure F.1 FS 693 - Provincial Cruise Plan (Page 1 of 2).

SECTIONS J, K, L (TO BE FILLED OUT WHEN REQUIRED)

J - STRATIFIED SYSTEMATIC SAMPLING (Calculate sampling requirements for each field type)

				A	B	C	D	E	F	G	H
Type No.	Type Description	BEC Subzone /Variant	Plot/Prism size	Type Area (ha)	Average m^3/ha	Estimated Vol/Type m^3	Type Vol. % of Total Vol.	Estimated Type CV	Weighted Type CV	Total Plots/CP	Planned Plots/Type
1										Refer to Sections 2.4, 2.5 Provincial Cruising Manual	
2											
3											
4											
5											
6											
7											
			Tot. Ha's		Tot. Vol.		Tot. Weigthed CV				

EXPLANATION OF FORMULA

C = A X B		$D = \frac{C}{\text{Sum C1..7}} \times 100$	E = cruising manual, section 2.62
Variable Plot F = D X E	Fixed Plot F = A X E	G = Cruising Manual, Section 2.4, 2.5	$H = \sqrt{\frac{\text{Total hectares} \times 10{,}000}{\text{G (number of plots)}}}$

K - SOURCE OF CV ESTIMATES

Type 1: _____
Type 2: _____
Type 3: _____
Type 4: _____
Type 5: _____
Type 6: _____
Type 7: _____

L - INSTRUCTIONS FOR SECTIONS

A Enter district and tenure information.
B Enter the name and address of the cruising and compiling agencies.
C Enter the tentative start and completion dates of the field work.
D Enter yes beside applicable headings.
E Enter the number of plots and the grid spacing.
F Enter the diameter limits measured and compiled to, and prism BAF.
G Enter the colour(s) of paint and flagging used, and the type of blazing and plot tags.
H Enter the appropriate height estimation method, and height measuring instrument used.
I Enter remarks if required. Signature and date are mandatory.
J OPTIONAL. Enter data ONLY if stratified systematic sampling is used. Type description – include: species/ age class/ height class/ site quality.
K OPTIONAL. Enter source of CV estimates.
ATTACH: CRUISE PLAN MAP. Drawn to 1:5,000 or 1:10,000 scale, topography, (streams and roads), air photo numbers, strips and baselines, plot locations, boundaries, area in the merch and total by cut block, label the cut block (mature or immature). MUST BE SUBMITTED WITH THIS FORM.
AERIAL PHOTOGRAPH: Submit a copy with timber typing.

FS 693 HVA 99/07

DISTRICT TO FORWARD COPY TO REGION

Figure F.2 FS 693 - Provincial Cruise Plan (Page 2 of 2).

FS 694 Provincial Cruise Plan and Map Check List

PROVINCIAL
CRUISE PLAN AND MAP CHECK LIST

TENURE:	___	___
C.P.:	___	___

A. TENURE and CRUISING AGENCY INFORMATION (Cruise Design – Parts A to C)	YES	NO	N/A
1. Licensee's name shown?			
2. Tenure and Cutting Permit numbers shown?			
3. TSA, PSYU, FIZ, Region and Compartment Numbers indicated.			
4. Cruising and Compiling Agencies indicated.			
E. [illegible] INFORMATION (Cruise Design – Parts D to G)			
11. Harvesting and sampling system acceptable? (Part D)			
12. Number of plots and plot type acceptable? (Part E)			
13. Diameter Limits acceptable? (Part F)			
14. Boundary marking acceptable? (Part G)			
C. [illegible]			
15. Tree height measuring instrument and estimation method indicated?			
D. [illegible] INFORMATION			
16. Tenure information adequate? (i.e. Licence, CP, FIZ zone, UTM Grid No's, Reg. and Compt. No's..etc..)			
17. Acceptable map scale? (1:5 000; 1:10 000; 1: 15 000; 1:20 000)			
18. Map area statement clearly shown? (Timber type descriptions and areas indicated?)			
19. Timber types colour coded on the cruise plan map?			
20. Minimum of 2 plots per type?			
21. Sufficient number of plots per type (as per type C.V.)?			
22. Consistent plot and/or strip spacing within each type? (Maximum grid - 200m if cruise < 250 ha or 250m if cruise ≥ 250 ha).			
23. Plots well distributed within each type?			
24. Prism and/or fixed area plot size consistent in each type?			
25. Cut block boundaries and forest types clearly delineated on map?			
26. Baseline established and tied to a well defined geographical feature or a legal survey mark if possible.			
27. P.O.C. established?			
28. Strips tied to cutblock boundaries?			
29. Plots and strips clearly marked?			

Note: There may be some exceptions to the above criteria. If in doubt check Chapters 2 and 3 of the Cruising Manual, or contact the Regional Cruising Coordinator.

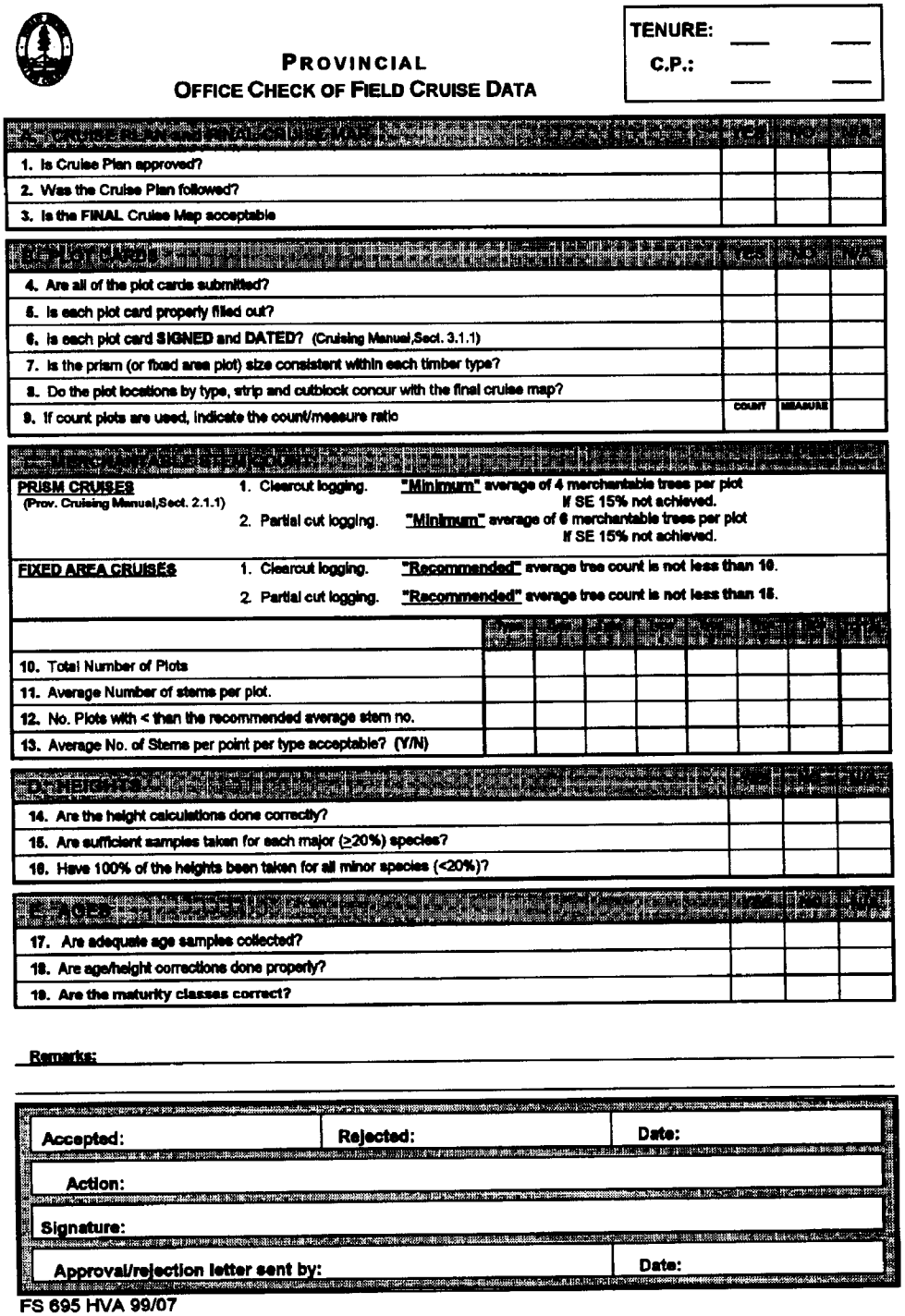
Remarks: _____

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

FS 694 HVA 99/07

Figure F.3 FS 694 - Provincial Cruise Plan and Map Check List.

FS 695 Provincial Office Check of Field Cruise Data



PROVINCIAL
OFFICE CHECK OF FIELD CRUISE DATA

TENURE: ___ ___
C.P.: ___ ___

1. Is Cruise Plan approved?			
2. Was the Cruise Plan followed?			
3. Is the FINAL Cruise Map acceptable			

4. Are all of the plot cards submitted?			
5. Is each plot card properly filled out?			
6. Is each plot card SIGNED and DATED? (Cruising Manual,Sect. 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	

PRISM CRUISES (Prov. Cruising Manual,Sect. 2.1.1)	1. Clearcut logging.	"Minimum" average of 4 merchantable trees per plot If SE 15% not achieved.
	2. Partial cut logging.	"Minimum" average of 6 merchantable trees per plot If SE 15% not achieved.
FIXED AREA CRUISES	1. Clearcut logging.	"Recommended" average tree count is not less than 10.
	2. Partial cut logging.	"Recommended" average tree count is not less than 15.

10. Total Number of Plots								
11. Average Number of stems per plot.								
12. No. Plots with < than the recommended average stem no.								
13. Average No. of Stems per point per type acceptable? (Y/N)								

14. Are the height calculations done correctly?			
15. Are sufficient samples taken for each major (≥20%) species?			
16. Have 100% of the heights been taken for all minor species (<20%)?			

17. Are adequate age samples collected?			
18. Are age/height corrections done properly?			
19. Are the maturity classes correct?			

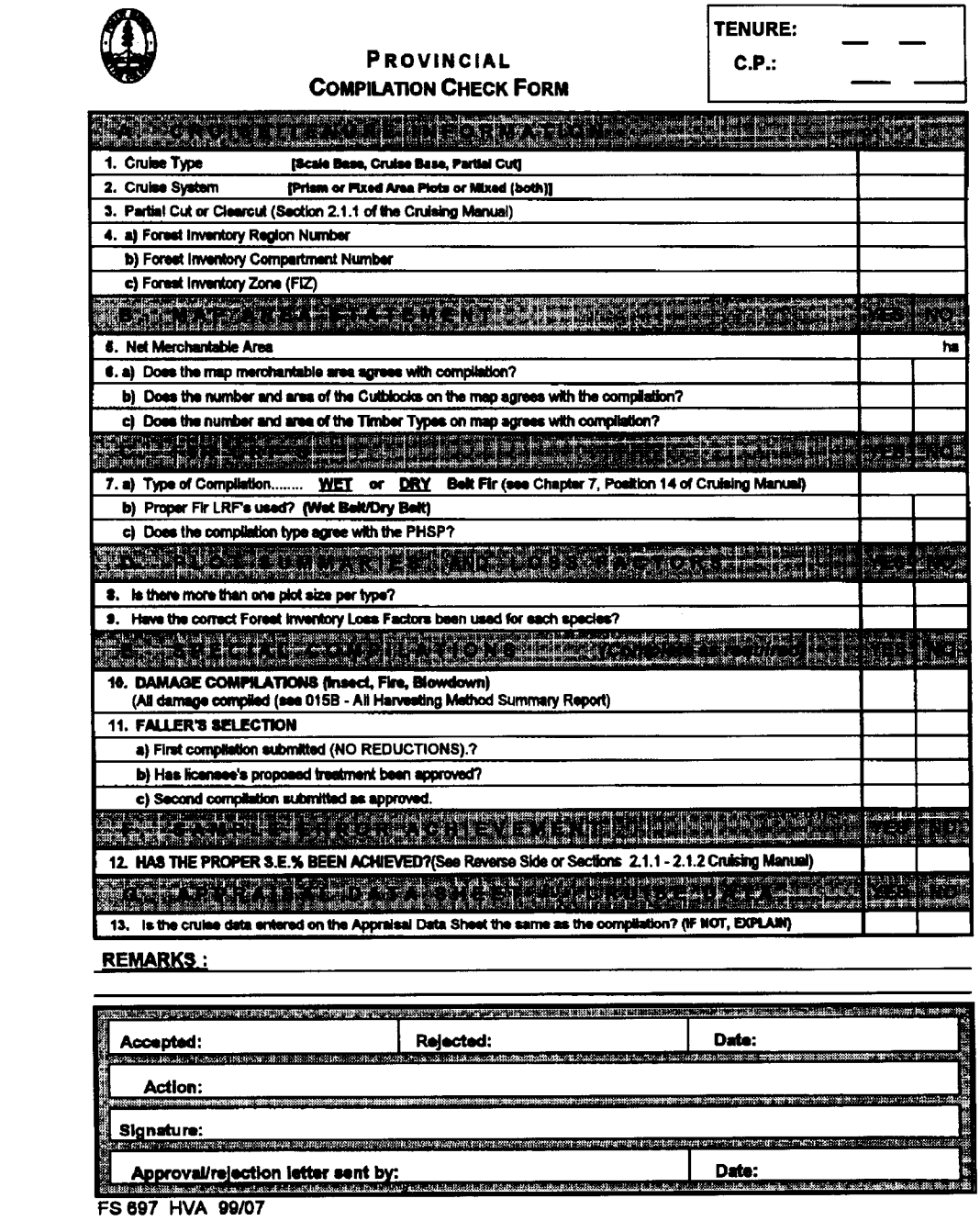
Remarks: _____

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

FS 695 HVA 99/07

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

FS 696 Provincial Field Check Cruise Summary



PROVINCIAL
COMPILATION CHECK FORM

TENURE: ___ ___
C.P.: ___ ___

1. Cruise Type [Scale Base, Cruise Base, Partial Cut]		
2. Cruise System [Prism or Fixed Area Plots or Mixed (both)]		
3. Partial Cut or Clearcut (Section 2.1.1 of the Cruising Manual)		
4. a) Forest Inventory Region Number		
b) Forest Inventory Compartment Number		
c) Forest Inventory Zone (FIZ)		
B. NET MERCHANTABLE AREA	**YES**	**NO**
5. Net Merchantable Area		ha
6. a) Does the map merchantable area agrees with compilation?		
b) Does the number and area of the Cutblocks on the map agrees with the compilation?		
c) Does the number and area of the Timber Types on map agrees with compilation?		
C. TYPE OF COMPILATION	**YES**	**NO**
7. a) Type of Compilation..... WET or DRY Belt Fir (see Chapter 7, Position 14 of Cruising Manual)		
b) Proper Fir LRF's used? (Wet Belt/Dry Belt)		
c) Does the compilation type agree with the PHSP?		
D. PLOT SIZE/MARKET AND LOSS FACTORS	**YES**	**NO**
8. Is there more than one plot size per type?		
9. Have the correct Forest Inventory Loss Factors been used for each species?		
E. SPECIAL COMPILATIONS	**YES**	**NO**
10. DAMAGE COMPILATIONS (Insect, Fire, Blowdown) (All damage compiled (see 015B - All Harvesting Method Summary Report)		
11. FALLER'S SELECTION		
a) First compilation submitted (NO REDUCTIONS).?		
b) Has licensee's proposed treatment been approved?		
c) Second compilation submitted as approved.		
F. FALLER S.E.% ACHIEVEMENT	**YES**	**NO**
12. HAS THE PROPER S.E.% BEEN ACHIEVED?(See Reverse Side or Sections 2.1.1 - 2.1.2 Cruising Manual)		
G. APPRAISAL DATA SHEET	**YES**	**NO**
13. Is the cruise data entered on the Appraisal Data Sheet the same as the compilation? (IF NOT, EXPLAIN)		

REMARKS :

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

FS 697 HVA 99/07

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		
1. Cruise Type [Scale Base, Cruise Base, Partial Cut]		
2. Cruise System [Prism or Fixed Area Plots or Mixed (both)]		
3. Partial Cut or Clearcut (Section 2.1.1 of the Cruising Manual)		
4. a) Forest Inventory Region Number		
b) Forest Inventory Compartment Number		
c) Forest Inventory Zone (FIZ)		
B. MAP AREA STATEMENT	YES	NO
5. Net Merchantable Area		ha
6. a) Does the map merchantable area agrees with compilation?		
b) Does the number and area of the Cutblocks on the map agrees with the compilation?		
c) Does the number and area of the Timber Types on map agrees with compilation?		
C. TYPE COMPILATION	YES	NO
7. a) Type of Compilation..... WET or DRY Belt Fir (see Chapter 7, Position 14 of Cruising Manual)		
b) Proper Fir LRF's used? (Wet Belt/Dry Belt)		
c) Does the compilation type agree with the PHSP?		
D. PLOT SUMMARY AND LOSS FACTORS	YES	NO
8. Is there more than one plot size per type?		
9. Have the correct Forest Inventory Loss Factors been used for each species?		
E. SPECIAL COMPILATIONS (Check if Applicable)	YES	NO
10. DAMAGE COMPILATIONS (Insect, Fire, Blowdown) (All damage compiled (see 015B - All Harvesting Method Summary Report)		
11. FALLER'S SELECTION		
a) First compilation submitted (NO REDUCTIONS).?		
b) Has licensee's proposed treatment been approved?		
c) Second compilation submitted as approved.		
F. SAMPLE CLEARCUT ACHIEVEMENT	YES	NO
12. HAS THE PROPER S.E.% BEEN ACHIEVED?(See Reverse Side or Sections 2.1.1 - 2.1.2 Cruising Manual)		
G. APPRAISAL DATA SHEET (ENTRIES DATA)	YES	NO
13. Is the cruise data entered on the Appraisal Data Sheet the same as the compilation? (IF NOT, EXPLAIN)		

REMARKS : _____

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

FS 697 HVA 99/07

DISTRICT TO FORWARD COPY TO REGION

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

This page is intentionally left blank.

Index

A

Age
- Classes, 6-5
- Codes, 7-18, 0-3
- Growth Rates, 6-24
- Measurements, 3-25, 6-21, A-3

Area, 3-4, 3-27
- Standard, 3-27
- Traversing, 3-3

B

Basal Area Factors (BAF), 3-10, 3-12, 6-7
Borderline Trees, 3-9, 3-11
Breakage, 3-21, 4-7

C

Check
- Compilation, 4-4, 4-9
- Field Work, 3-26

Coefficient of Variation, 2-12
Compilation Program, 4-4
Count Plots, 2-17
Crook, A-18
Crown Classes, 3-18, 6-20
Cruise Based Sales, 2-5

D

Damage Codes, 3-21, A-61
- Disease, 6-20, A-61
- Fire, 6-20, A-66
- Insects, 6-20, A-62
- Uprooted, 6-20, A-68

Dead or Broken Top, A-24
Decay, 3-21, 4-7
Deciduous, 7-8, 7-19
Deductions
- Breakage, 4-7
- Decay, 4-7
- Waste, 4-7

Diameters
- High side, 3-19

Diameters (DBH), 3-19, 3-30
Diopter, 6-7
Double Sampling, 4-12

F

FIZ Zones, A-6
Fork or Crook, A-18
Frost Crack, A-20
FS 121, 7-1
FS 205, 6-1, 6-24

G

Grading
- Computerized, 4-9
- Quality, 3-24

H

Heights, 7-17
- Measurements, 3-18
- One Hundred Percent, 3-14
- Sample Height, 3-16
- Sample Size, 3-16, 4-2

I

Isogonic/Isoporic Charts, A-5

L

Loss Factor Tables, 4-7

M

Mapping
- Field Work, 3-26
- Map Area Statement, 7-1
- Standards, 3-4, 3-27

Minimum Utilization Standards, 2-12, 3-14

O

Objectives, 2-1
One Hundred Percent Cruises, 3-7, 3-14
Optional in Interior, 6-14

P

Partial Cutting, 3-10, 6-18
Pathology, 3-20, 6-13
Percent Reduction, 4-16
Plans, 3-33
Plot
    Radius, 6-7
Plot Radius Factor (PRF), 3-11, 4-11
Plots
    Count, 2-1, 3-11, 3-13, 3-26, 4-13, 6-6
    Establishment, 3-2
    Fixed, 3-8
    Half-sweep, 4-13, 6-6
    Prism, 2-10, 3-9, 4-11
    Radius, 3-11
    Sample Size, 2-10
    Slope Correction, 3-3, 3-10
Plots sweep, 3-12

Q

Quality, 3-31, 6-14
    Knots, 6-17
    Lean, 6-16
    Live Limb, 6-17
    Spiral Grain, 6-14
    Stub, 6-17
    Sweep, 6-16

R

Reference Trees, 3-2
Reports
    Forest Service, 4-16
    Licensee, 4-16
Risk Groups, 3-21, 4-7

S

Safety, A-54
Sampling Error, 2-9
Slope, 3-2, 3-32, 6-9
Slope Correction
    Horizontal Distance, 3-3
    Plot Radius, 3-11
Species, 4-5
Standards
    Check Cruising, 3-26
    Compilation, 4-15
Statistics, 2-12
    Formulas, 2-12
Stratification, 2-14
Stump and Breast Height Diameter Tables, A-6
Stumpage Rates
    Cruise Based, 2-1
    Scale Based, 2-1
Stumps
    Diameters, 3-19
Stumps:, 3-17, 3-18, 3-24, 3-25

T

Traversing, 3-3
Tree Classes, 3-21
Trees per Hectare (TPH), 4-10
Typing, 2-15

V

Value, 2-12

W

Waste, 3-21, 4-7