TFL 35
Growth & Yield Monitoring
Pilot Project:
Year End Report

Prepared for

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Weyerhaeuser Company Ltd.
Kamloops, BC

Project: WCK-081-061

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Table of Contents

1. INTRODUCTION 1
1.1 PROJECT OVERVIEW 1
1.2 REPORT OBJECTIVES 1
1.3 TERMS OF REFERENCE 1
2. BUSINESS NEEDS 1
2.1 THE PROCESS 1
2.2 PRIMARY BUSINESS NEED 1
2.3 SECONDARY BUSINESS NEEDS 2
2.4 MONITORING OBJECTIVE 2
3. SAMPLE DESIGN 2
3.1 OVERVIEW 2
3.2 PURPOSE 3
3.3 TARGET POPULATION 3
3.4 SAMPLE PLOT LOCATIONS 3
3.5 PLOT NUMBERING 3
4. PLOT MEASUREMENTS 4
4.1 THE SAMPLE PLOT 4
4.2 ADDITIONS TO CMI STANDARDS 4
4.3 TREE TAGS 5
4.4 TALLY CARDS 5
5. FIELDWORK 5
5.1 FIELD CREWS 5
5.2 TRAINING 5
5.3 SAMPLE PACKAGES 5
5.4 PLOT SAMPLING 5
5.5 QUALITY ASSURANCE 6
6. DATA MANAGEMENT 6
APPENDIX I – SUMMARY OF ACTIVITIES TO DATE 7
APPENDIX II – INTERNAL PROJECT UPDATES AND FORECASTS 8
APPENDIX III – VRI PLOT CARDS USED IN FIELD SAMPLING 12
APPENDIX IV – EXAMPLE OF COMPLETED CARDS FOR PLOT 820-600 14

List of Tables

Table 1. Plots sampled in the 2000 field season. 6

List of Figures

Figure 1. TFL 35 growth and yield monitoring sample plot. 4
Figure 2. Tree tags used on the TFL 35 growth and yield monitoring sample plots (actual size). 5

1. INTRODUCTION

1.1 PROJECT OVERVIEW

Weyerhaeuser Company Ltd. (Weyco) initiated discussions to complete a growth and yield (G&Y) monitoring project in the late fall of 1999. The primary objective was to design and implement a sampling program to monitor the volume growth in post-harvest regenerated (PHR) stands on TFL 35. The project began in the spring of 2000 with confirmation of business needs and design of the program. The first set of plots were installed in the late summer and early fall of 2000. Additional plots to complete the full monitoring sample will be installed in the summer of 2001. The data will then be analyzed and a final report prepared for the spring of 2002.

1.2 REPORT OBJECTIVES

This year-end report describes the activities completed under this project from its inception in Nov. 1999 to the end of this fiscal year (Mar. 31, 2001). This report does not summarize any the data collected under this project – this will be done in the final report that will be submitted in the spring of 2002.

1.3 TERMS OF REFERENCE

This project is being completed by J.S. Thrower and Associates Ltd. (JST) for Don Brimacombe, *RPF* of Weyco, Kamloops Division. The main JST project team includes Jim Thrower *PhD, RPF*, (Project Leader), Eleanor McWilliams, *MF, RPF* (Analyst) and Mike Ciccotelli, *ForTech* (Field Operations Manager). The Ministry of Forests (MOF) contacts are Bob Macdonald, *RPF* (Kamloops Forest Region) and Jon Vivian, *RPF* (Resources Inventory Branch, Victoria).

2. BUSINESS NEEDS

2.1 THE PROCESS

Business needs for monitoring on TFL 35 were identified and confirmed through several internal Weyco meetings and discussions over a six-month period. These needs were also discussed with MOF Regional and Branch staff during this time. Many needs for a monitoring program on the TFL were considered including monitoring all stands and all areas, only PHR stands, subsets of PHR stands (e.g., treated and non-treated). And timber and non-timber attributes. The many potential uses and needs for information that could come from a monitoring program were evaluated considering costs, benefits, uncertainty in management processes, and potential future changes. The agreed-on business needs (presented below) were discussed with MOF staff[1] at a meeting at the Kamloops Region office on May 3, 2000.

2.2 PRIMARY BUSINESS NEED

The primary business need for G&Y monitoring on TFL 35 is to periodically measure actual G&Y of PHR stands to check projections used in timber supply analysis. The volume of many PHR stands on the TFL is projected to be higher than natural stands. This higher volume has a large impact on timber supply

[1] Attending this meeting were Bob Macdonald, Brian Russell (MOF, Kamloops District), Jon Vivian (via phone from Victoria), Don Brimacombe, and Jim Thrower.

forecasts, and thus Weyco wants to have an ongoing high level-of-comfort that these forecasts are accurate. Furthermore, Weyco wants to consider immediate corrective action if significant differences are observed in actual G&Y when compared to projected G&Y.

2.3 SECONDARY BUSINESS NEEDS

The most important secondary business need identified was to provide monitoring data and information to support market certification (e.g., for the Forest Stewardship Council (FSC)). The specific requirements for certification are unknown at this time, but will likely require monitoring the entire TFL landbase. This potential future need was considered in the program design.

Another possible future business need is to monitor the G&Y and stand dynamics in mature stands (primarily spruce (Sx) leading). The ability to meet this need in the future was also addressed in the proposed design.

2.4 MONITORING OBJECTIVE

The primary objective of the G&Y monitoring program on TFL 35 was defined as to:

> *Monitor the change in volume, species composition, top height, and site index in PHR stands.*

The secondary objective of the program is to:

> *Use a sample design that can be modified in the future to provide information to support market certification or other monitoring needs.*

The intent is that data from the monitoring program will be compared with predicted values of the same attributes used in timber supply analysis. The goal is to develop a high level-of-confidence in the accuracy and precision of projections used in timber supply analysis. This program is not designed to provide data to develop yield curves or estimate the response of trees and stands to silviculture treatments.

For this program, we consider G&Y monitoring as *the process of comparing the actual G&Y of a forest or stand to the predicted or expected G&Y for that forest or stand.* This program is designed to check existing G&Y predictions for PHR stands – not to develop new G&Y predictions; however, these data may be used to develop other models and for other uses.

3. SAMPLE DESIGN

3.1 OVERVIEW

The key features of the sample design are:

1) Potential sample points were located on a 1 km grid across the TFL.
2) Samples are 400 m^2 circular plots centered at these grid points.
3) Measurements are taken for tree attributes only.
4) Plots are installed only in PHR stands greater than 15 and initially less than 40 years of age.
5) All sample plots in the target population will be installed over two years.

6) Sample plots will be remeasured every five years (funding permitting) to correspond with preparation of management plans.

3.2 PURPOSE

The purpose of the proposed sample design is to provide tree-level data for a representative sample of PHR stands on the TFL. This design is intended to provide data to address Weyco's primary business needs, be compatible with the MOF preliminary protocol for monitoring, and to provide this information in a cost-effective manner.

This design gives estimates of net change and allows the components of net change (survivor growth, mortality, and ingrowth) to be calculated if required. However the primary focus is on obtaining accurate estimates of yield and net change and comparing this to predicted values.

This sample design provides enough data to compare G&Y estimates for all PHR stands in aggregate and for Pl leading stands (the most prominent). The sample size is not large enough to separately check G&Y estimates for stands with other leading species.

3.3 TARGET POPULATION

The target population were all PHR stands that are 15 years of age and older. The initial definition of the target population also included a maximum age of 40 years. This maximum age was chosen to reflect the start of clearcutting on the TFL in the late 1950's. The target population will expand over time as more stands are harvested and subsequently regenerated.

3.4 SAMPLE PLOT LOCATIONS

The sample plots are located on a 1 km square grid created using NAD 83 UTM coordinates. This grid resulted in approximately 59 sample points in the target population in the year 2000. A new forest-cover for the TFL was received in the spring of 2001. The 1 km sample grid was overlaid with the new forest cover to prepare the 2001 sample. This resulted in some changes in the definition of the sample population, and two more plots were added to the 2000 sample list.

3.5 PLOT NUMBERING

We developed a unique plot numbering system for this project. The intent was to have a simple numbering system that could incorporate the addition of any new samples on the existing 1 km grid or on a refined grid.

Each monitoring sample plot number contains two numbers separated by a dash (e.g., 850-430). These numbers are based on the UTM Easting and Northing coordinates of each plot. The first three-digit number is the sample plot UTM Easting with the first digit and the last two digits removed. The first Easting digit is always 6 and the last two are always 00 because all plots are on the UTM grid on 1,000 m intervals. Thus, these digits are not needed to describe a unique location on the TFL as they are all the same.

The second three-digit sequence in the plot number is the UTM Northing coordinate of the plot with the first two digits and the last two digits removed. Again, the first two digits are always the same on the TFL

(i.e., 56) and the last two are 00. Therefore, a plot located at 684,000 Easting and 5,656,000 Northing would have a plot number of 840-560.

4. PLOT MEASUREMENTS

4.1 THE SAMPLE PLOT

The monitoring plots are 400 m^2 circular plots with two smaller nested subplots (Figure 1).

Main plot – all trees 4.0 cm and greater in diameter at breast height (DBH) are measured and tagged.

Small tree plot – trees larger than 4.0 cm in diameter and taller than 1.3 m are measured.

Regen plot – trees less than 1.3 m in height are tallied and stumps measured.

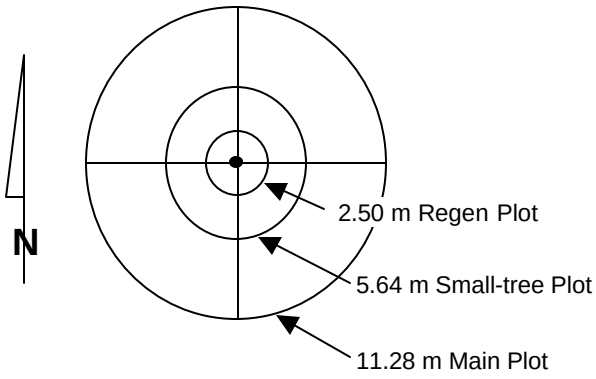


Figure 1. TFL 35 growth and yield monitoring sample plot.

4.2 ADDITIONS TO CMI STANDARDS

These plots located on TFL 35 included measurements that exceed the CMI standards. These additional measurements were needed to address Weyco's business needs, largely to address information needs for small trees and to better track site productivity than would be possible with the standards CMI methods. The additional measurement included:

1) *Tagging Limits* – the CMI standards suggest measuring all trees with a 9.0 cm diameter limit in the main plot and to a 4.0 cm limit in the small tree plot (CMI Manual Section 4.2, page 34). We tagged and measured all trees to a 4.0 cm tagging limit in the main plot and all trees (i.e., no tagging limit) in the small tree plot.
2) *Tree Heights* – the CMI standards suggest measuring the height and age of the first and second leading species (by basal area in the plot) in each 100 m^2 quadrant. The CMI standards restrict measurements to the largest diameter tree of the respective species. We measured the height and age of the largest diameter tree in each quadrant, regardless of suitability for estimating site index. Where this largest tree was suitable for height and age measurements, it was recorded with and asterisk (*) on the plot card. Where this largest diameter tree was not suitable, the height and age of the next largest diameter tree that was suitable was measured and recorded as an "other" (o) tree on the plot card.
3) *Branch Measurements* – we recorded branch information on all trees in the first quadrant (i.e., sector 1 and 2) of each sample plot. This was done to address Weyco's business needs to monitor some components of tree and log quality for PHR stands. The measurements included the diameter and live/dead status of the largest branch in the first whorl above breast height (1.3 m). The diameter and live/dead status was also recorded for the largest branch in the first 3.0 m above ground. These measurements were recorded in the log grade section of the VRI Tree Detail Card.

4.3 TREE TAGS

We had special plastic tree tags made for this project (3.8 cm in diameter (1.5 in)). The tags were chocolate brown in color instead of the usual blue. This color was selected to help keep the tags as hidden as possible. The tags were numbered from 001 to 999 (Figure 2). These tags were made by T.B. Vets, Vancouver, BC.

Figure 2. Tree tags used on the TFL 35 growth and yield monitoring sample plots (actual size).

4.4 TALLY CARDS

All measurements were recorded on VRI plot cards numbered 1, 2, 3, 8, 9, 10, 12, 14, 15, and 16 (Appendix III). The VRI cards did not have designated columns to accommodate notes for plot sector and residual status, therefore, the S1 and S2 columns on Card 8 were used for sector and residual, respectively.

5. FIELDWORK

5.1 FIELD CREWS

The field crews for the sampling in 2000 included Scott MacKinnon (Crew Leader), Jody Medinski (Crew Assistant and Leader), Graham Wills (Assistant), and Kendra Wood (Assistant). Mike Ciccotelli completed training and Jean Roach (Skyline Forestry Consultants Ltd.) completed third party quality assurance (QA) checks of plot measurements.

5.2 TRAINING

Office training of crews occurred Aug. 8 and 9, 2000. This was to review procedures and standards in the office prior to fieldwork. Field training occurred Aug. 10 and 11, 2000. Field staff met with Don Brimacombe to review Weyco safety standards prior to fieldwork. In addition, field staff reviewed our internal safety program with Mike Ciccotelli prior to starting work on the TFL. Don Brimacombe met with Scott MacKinnon and Mike Ciccotelli in the field on Aug. 12, 2000 to conduct an on site safety inspection.

5.3 SAMPLE PACKAGES

Sample packages were prepared for each plot which included aerial photographs of sample location (1996 1:10,000 color), original plot cards, plot location map, orthophoto, TEM map, and plot photos according to VRI standards. All maps were at 1:10,000 scale.

5.4 PLOT SAMPLING

Field sampling of the first 19 plots occurred from Aug. 9 to Sept. 21, 2000 with the last plot installed Oct. 13, 2000 (Table 1). These plots were randomly selected from the 59 plots to provide a statistically-valid sample for this first phase. The first 19 plots were sampled by Scott MacKinnon (SM), Jody Medinski (JM), Graham Wills (GW), and Kendra Wood (KW). Barry Elliot (BE) and Andrei Spazier (AS) assisted in completing the 20th plot (Table 1).

5.5 QUALITY ASSURANCE

Third party QA audits were contracted to Jean Roach (Skyline Forestry Consultants Ltd.). Jean conducted two field audits and the MOF completed six field audits. All corrections as reported in the audit were made to the plot cards and database (Table 1).

Table 1. Plots sampled in the 2000 field season.

Plot Number	Date Sample Completed	Field Crew	Quality Assurance Check by:
850-430	Aug 10, 2000	SM, JM	Skyline
830-450	Aug 15, 2000	SM, JM	MOF
850-490	Aug 17, 2000	SM, JM	
860-580	Aug 18, 2000	SM, JM, GW	MOF
860-630	Aug 21, 2000	SM, JM, GW	MOF
850-660	Aug 22, 2000	SM, JM, GW	Skyline
850-710	Aug 23, 2000	SM, JM, GW	MOF
880-660	Aug 24, 2000	SM, JM, GW	
820-600	Aug 25, 2000	SM, JM, GW	
880-600	Aug 28, 2000	SM, JM, GW	
810-450	Aug 29, 2000	JM, KW	
860-560	Aug 30, 2000	SM, GW	MOF
900-550	Aug 31, 2000	SM, GW	MOF
840-630	Sept 1, 2000	JM, KW	
840-600	Sept 7, 2000	JM, KW	
910-700	Sept 11, 2000	JM, KW	
910-640	Sept 13, 2000	JM, KW	
890-510	Sept 14, 2000	JM, KW	
880-690	Sept 19, 2000	JM, KW	
850-610	Oct 18, 2000	KW, BE, AS	

6. DATA MANAGEMENT

Field data were loaded using the MOF VRI data entry software VIDE (Ver. 1.2.01). This data entry program was not designed to facilitate the differences between the CMI and VRI plots. We were successful in entering the data, however, the error checking component of VIDE did not recognize many of our special notes, and thus reported many errors. We therefore exported the data without OCX registration. The MOF assisted us by modifying their compilation project to accommodate our special data format.

APPENDIX I – SUMMARY OF ACTIVITIES TO DATE

The chronology of activities for this project to date are:

Nov 1999	• Submitted project prospectus to Don Brimacombe for review and approval.
Jan 2000	• Submitted proposal to Don Brimacombe for the TFL 35 monitoring pilot project.
Feb 2000	• Meeting at Kamloops Regional office to discuss project. Attending were Don Brimacombe, Jim Thrower, Bob Macdonald, and Jon Vivian (by phone). • FRBC services agreement made between Weyco and JST (signed Mar. 10, 2000) to cover period Jan. 1, 2000 to Mar. 31, 2001. Original intent was to have three phases: i) design system; ii) install about 25 plots in the TFL; and iii) report and make recommendations by March 31, 2001.
Mar 2000	• Start designing sample matrix and compare to inventory.
April 2000	• Continued program design.
May 2000	• Completed computer simulation to compare different grid sizes and how sample size may change over time. • Developed and distributed to Weyco staff a discussion paper on business needs and general approach of the monitoring program. • Jim Thrower gave presentation to Weyco staff at Kamloops office to review project. Attending were Don Brimacombe, Rod Wilis, Les Laithwaite, Bob Helfrich, Pat Salm, Ed Collen, Dan Batistella, and Sean Curry. • Confirmed Weyco business needs for monitoring.
June 2000	• Completed sample plan and submitted to Don Brimacombe for review.
July 2000	• Eleanor McWilliams and GIS department prepared sample packages and maps for field sampling.
Aug 2000	• Field work started. • Technical and safety training completed. • Initial QA checks completed.
Sept 2000	• Field work and QA continued.
Oct 2000	• Last plot installed. • Data cards copied and stored.
Nov 2000	• Received new standards agreement from Bob Macdonald. Changes were made to allow Weyco to extend the project over one more year to install more plots on the TFL. This delayed delivery of the final report to March 31, 2002.
Dec 2000	• Completed key punching data.
Jan 2001	• Delivered plot cards to Bob Macdonald.
Feb 2001	• Continued data analysis and problems with MOF program. • Re-selected samples for next years program with new forest cover for the TFL.
Mar 2001	• Planning for upcoming field season. • Completed year-end report.

APPENDIX II – INTERNAL PROJECT UPDATES AND FORECASTS

This appendix presents our internal monthly project updates and forecasts for this project to the end of this fiscal year (March 31, 2001).

Update for October 1999

There was little activity this month. Jim spent some time planning the project for presentation to Don.

Forecast for November 1999

The forecast for November is to complete the project plan, present to Don, and begin the project according to the schedule in the plan.

Update for November 1999

Activity in November was for Jim and Celine to start planning for the project. A prospectus, plan, and budget was developed and sent to Don.

Forecast for December 1999

The forecast for December is to proceed with this project after Don has reviewed this with the TFL steering committee.

Update for December 1999

The little activity this month was for misc planning by Jim.

Forecast for January 2000

The forecast for January is for Jim to meet with Don early in the month to update objectives following the TFL steering committee meeting in December.

Update for January 2000

Activity in January was planning by Jim to update the project plan for submitting to the MOF and meetings with Don Brimacombe.

Forecast for February 2000

The forecast is to get MOF approval in early February, get a standards agreement signed, and begin the work. This project is starting late which may result in fewer deliverables than originally planned.

Update for February 2000

Activity in February was for Jim to work with Don on standards agreements and planning. Eleanor worked with Louisje to generate a sampling grid to start analysis. The deliverables for the end of the March are unsure as there is not much time left and we still do not have a standards agreement from the MOF, even though Don has given us approval to proceed. This may require reducing the deliverables and budget for this fiscal year.

Forecast for March 2000

The forecast for March is to continue with developing sampling options. Jim will work with Don to complete the standards agreement and to complete a description of business needs for monitoring on the TFL.

Update for May 2000

Activity in May was for Jim and Eleanor to continue developing the G&Y monitoring program for the TFL. Jim met with the Weyerhaeuser's TFL strategy committee to review the monitoring protocol.

Forecast for June 2000

The forecast for June is to complete the sample plan report early in the month and submit to Don for review and submitting to the MOF. We will then wait for review comments, revise accordingly, and continue to refine the field methods to prepare for field testing that is planned to occur later this summer.

Update for June 2000

Activity in June was for completing the sample plan and submitting to Don for review. Work continued in developing the sampling protocol and for time to support MOF queries etc. Some time was also for Jim to go the TFL with Don and Sean to review ideas etc.

Forecast for July 2000

The forecast for July is to continue developing the sampling methods and prepare for field sampling. We anticipate some difficulty getting field crews this summer and this will be discussed with Don.

Update for July 2000

Activity in July was for preparation for field sampling. This included sample packages, GIS maps, and misc field supplies. This project is on time and on budget and we do not anticipate any problems.

Forecast for August 2000

The forecast is to begin fieldwork in early August and continue into early September. We have rescheduled some of our field crews and do not anticipate any problems with crew availability.

Update for August 2000

Fieldwork started in August. Office training was completed Aug. 8-9 and field training Aug. 10-11. Production was slower than anticipated at first, but increased as the crews became more familiar with the MOF Change Monitoring procedures. A two-person crew can complete a plot in one day if conditions are good. MOF tests in other areas are getting the same productivity with less onerous plots.

A third person was added to the crew near the end of the month to help increase production to one plot/day. Two crews were used at the end of the month to take advantage of the availability of some trained people to help out. Auditing was completed by Jean Mather on batches of the first 2 plots, the next 5 plots, and again on the next 10 plots.

Forecast for September 2000

The forecast is to continue fieldwork to September 21. The data will then be loaded and analysis can proceed thereafter.

Update for September 2000

Fieldwork was completed in September by Jody and Kendra. The total is now 19 completed plots. Production is better now that crews are more familiar with procedures. Jean Mather completed here second independent audit of crew measurements and all is fine. She was impressed with the precision

and accuracy of the field crews to visually estimate tree heights. Karen Gelowitz requested that Jean submit here audit reports to Bob MacDonald. This project is on time and on budget.

Forecast for October 2000

The forecast is to finish up the small details of field sampling in October. This will include completing one more plot to bring the total to 20 and to revisit all plots to get better GPS coordinates (should take only two days).

Update for October 2000

Activity in October was to complete the last sample plot to bring the total to 20 and to GPS all plots. Kendra spent some time organizing field data and Karen investigated using the MOF data entry program. Jim spend considerable time working on developing a standards agreement with Glenn Thiem for the MOF.

Forecast for November 2000

The forecast for November is to begin data entry and continue organizing and archiving field data.

Update for November 2000

Most activity in November was working with the MOF on their keypunching program and for admin activities for Jim. The post-processed GPS data were received for the sample plots. We will use the MOF VRI keypunching program. There are some problems using this program for Change Monitoring Inventory (CMI) data, however, we have developed some fixes. We are saving time now by using their program, but are risking have to re-enter some data later if their program fails.

Project Forecast for December 2000

The forecast is to complete data entry in December and begin analysis early in the new year.

Project Update for December 2000

Activity for December was to complete keypunching the plot data, project management, and misc support.

Project Forecast for January 2001

The forecast for January is to review the data and start summaries and the interim report.

Project Update for January 2001

Jim and Don met Jan. 17 to discuss the remainder of the project for this year and into next fiscal year. The year-end report will document what we did this year and the plans for next year. An appendix showing example analyses will not be done as the MOF compilation program will not be available until next summer.

Mike delivered the plot cards and database to Bob Macdonald at the MOF. This completes a deliverable in the contract. We do not expect any issues as the cards and data were collected carefully, lots of QA has been completed, and Bob is up-to-date on what we are doing.

Project Forecast for February 2001

The forecast for February is to begin the year-end report, which will be completed for the end of March.

Mike will get the new data recorder program for VRI plots from the MOF for testing for possible use in our field work next year. Eleanor will redo the sample plan for next year to reflect Weyco's updated forest cover layer in the GIS. The plan is to install an additional 40 plots for next summer with final report due March 31, 2002.

Project Update for February 2001

Most activity in February was to continue with data analysis and to prepare for sampling next year. We continue to have problems with the MOF data entry and compilation programs; however, Karen and Eleanor have been working with the MOF in Victoria to resolve these issues. This project will be under budget as some reporting and analysis in the original budget will be done next year. Jim will discuss with Don if this money can be carried into the next fiscal year.

Project Forecast for March 2001

The forecast for March is to complete data summaries, the year-end report, and continue preparing for next year.

Project Update for March 2001

This project is being pre-billed to meet FRBC reporting requirements. A full update will be completed at the end of March.

Project Forecast for April 2001

NO FORECAST

APPENDIX III – VRI PLOT CARDS USED IN FIELD SAMPLING

VRI Card Number and Name	Notes
1. Header Card (CH) (version 99/3)	• Completed. • UTM coordinates not taken. To be entered in the database from post-processed GPS data. • Plot sample and polygon identifier not recorded. This will be obtained from the MOF later to be consistent with their codes. Plot is uniquely identified by the Sample Tree Tag Number (which is our plot number).
2. Compass Card (CP) (version 99/3)	• Completed. • No special notes.
3. Cluster Layout (CL) (version 99/3)	• Completed. • No special notes.
4. Range Sampling (RS) Shrub Transect #1	• Not used.
5. Range Sampling (RS) Shrub Transect #2	• Not used.
6. Coarse Woody Debris (EW) Transect 1	• Not used.
7. Coarse Woody Debris (EW) Transect 2	• Not used.
8. Tree Details (TD) (version 99/3)	• Completed. • Height to live crown recorded to nearest 0.1 m, therefore is added to the field. • Information not recorded includes log grades, wildlife codes, and broken tops. • Branch measurements recorded in log grade columns. Measurements for first branch whorl above breast height (1.3 m) recorded in columns for Log 1 (23-26) and measurements for largest branch in first 3 m of stem recorded in columns for Log 2 (28-31). Grade (column 23 and 28) = live/dead status. Length (column 24-25 and 29-30) = branch diameter (cm). % Sound (column 26 and 31) = measured (M) or estimated (E) measurements. • Column 55 used to record sector number of plot (1-8). • Column 56 used to record if a tree was veteran (Y/N). • Diameter of small trees (<2 cm) measured with a 15 cm ruler.
9. Tree Loss Indicators (TL) (version 99/3)	• Completed. • Stem map not recorded.
10. Small Tree, Stump, and Site	• Completed.

Tree Data (TS) (version 99/3)	• Tree tagged at breast height. • Diameter measured above tag nail. • Plot top height tree measured as per VRI standards (coded "T"). • Site tree information was recorded differently than VRI standards. All trees measured for height and age selected independently from each quadrant (see Section 4.2). Largest diameter tree in each quadrant coded with an asterisk (*). All other trees coded as "other" (o). • Wildlife codes (column 27-28) and wildlife use (column 29-30) for stumps not recorded. • Physiological age (column 49-51) not recorded. • Age count includes 2000 growing season.
11. Auxiliary Plot Card (TA)	• Not used.
12. Ecological Description 1 (EP) (version 97/1)	• Completed. • Reconnaissance standard to estimate field site series.
13. Ecological Description 1 (ED)	• Not used.
14. Tree and Shrub Layers (ET) (version 97/1)	• Completed. • Cover estimates from 11.28 m plot (instead of the 10.0 m plot in the VRI standard).
15. Herb and Moss Layers (EH) (version 97/1)	• Completed.
16. Succession Interpretations (EO) (version 97/3)	• Completed.

APPENDIX IV – EXAMPLE OF COMPLETED CARDS FOR PLOT 820-600

BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY
HEADER CARD (CH)

WCK-061
820-600
PAGE 1 OF 1
1

Data ID: Project ID	Plot Sample #	PL	PLOT TYPE	Measurement Date: YEAR	MON	DD	Crew (Initials): Person #1	Person #2	Person #3	Person #4
3321		1	M01	2000	AUG	25	SM	SM	GW	

Polygon Identifier: 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Sample Tag No. (Reference Tree): 820600

	Field Responsibility (print)	Field Check By	Date: YEAR MON DD	Office Check By	Date: YEAR MON DD
A					
Tree Data					
Ecological					

Plot Cluster Record
(✓) Data Collected (Yes or No)

	Y	N
Integrated	✓	
North		✓
East		✓
South		✓
West		✓
Flange		✓
Ecological	✓	
CWD		✓
Typical:		
Trees	✓	
Ecology	✓	
# of Photos	12	

Notes: PI 1100

Ground Photos		Yes	No
Plot Pin	PIN	✓	
Random Azimuth	RAN	✓	
Representative	REP	✓	

Consider: Weather, photo notes, procedure problems

FS 505 | HR 99/3

WCK-061
820-600
PAGE 1 OF 1
2

BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY
COMPASS CARD (CP)

Data ID: Project ID	Plot Sample #	PL	PLOT TYPE		Map No.	Polygon No.	Flight Line	Photo No.
3321		1	M01	Tie Point	W92P008	188	8-5655	202
				Integrated Plot Centre	W92P008	188	8-5655	202

Tie Point Reference Details → X (Tie Point)
Species: PI Diameter (cm): 037.6
Azimuth Tree to Tie Point: 315 Distance (m): 22.20

15 m Reference Point Tree details → X (Reference Pin)
Species: PI Diameter (cm): 008.9
Azimuth Tree to R. pin: 276 Distance (m): 01.75

Offset Reference Pin
Azimuth (0 - 359°) from pin to ref. point:
Distance (metres):

Straight Line Bearing and Distance to I.P.C.
Azimuth (0 - 359°): 310 Distance to Integrated Plot: 013.0 m Declination used: 19.5° Scale of Sketch 1 cm = 020.0 m

Tie Point Tag No.: 820600

Navigation Notes

Comments:

G.P.S. Tie Point
File I.D.: R1030206A
UTM Zone: 10
Corrected UTM (NAD 83)
Northing: 5659919
Easting: 682095
Elevation: 1551

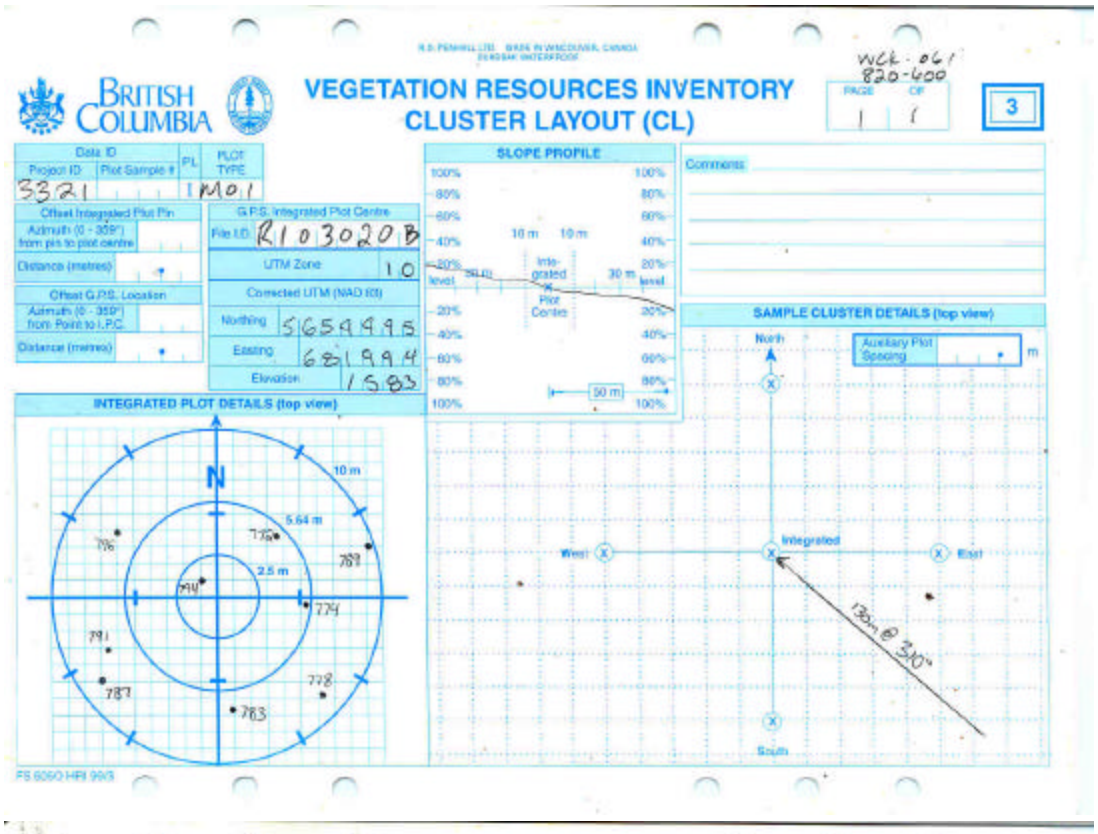
Offset G.P.S. Location
Azimuth (0 - 359°) From Point to Tie Point:
Distance (metres):

Access Point Location
Descrip.:

G.P.S. Access Point
File I.D.: R1030206B
Corrected UTM (NAD 83)
Northing:
Easting:
Elevation:

FS 505N HR 99/3

Reference tree



BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY
CLUSTER LAYOUT (CL)

WCK-061
820-600

PAGE 1 OF 1

3

Data ID: Project ID 3321 | Plot Sample # | PL | PLOT TYPE 1 MO1

Offset Integrated Plot Pin: Azimuth (0 - 359°) from pin to plot centre | Distance (metres)

Offset G.P.S. Location: Azimuth (0 - 359°) from Point to I.P.C. | Distance (metres)

G.P.S. Integrated Plot Centre: File I.D. R1030208 | UTM Zone 10 | Corrected UTM (NAD 83) | Northing 5659995 | Easting 681994 | Elevation 1583

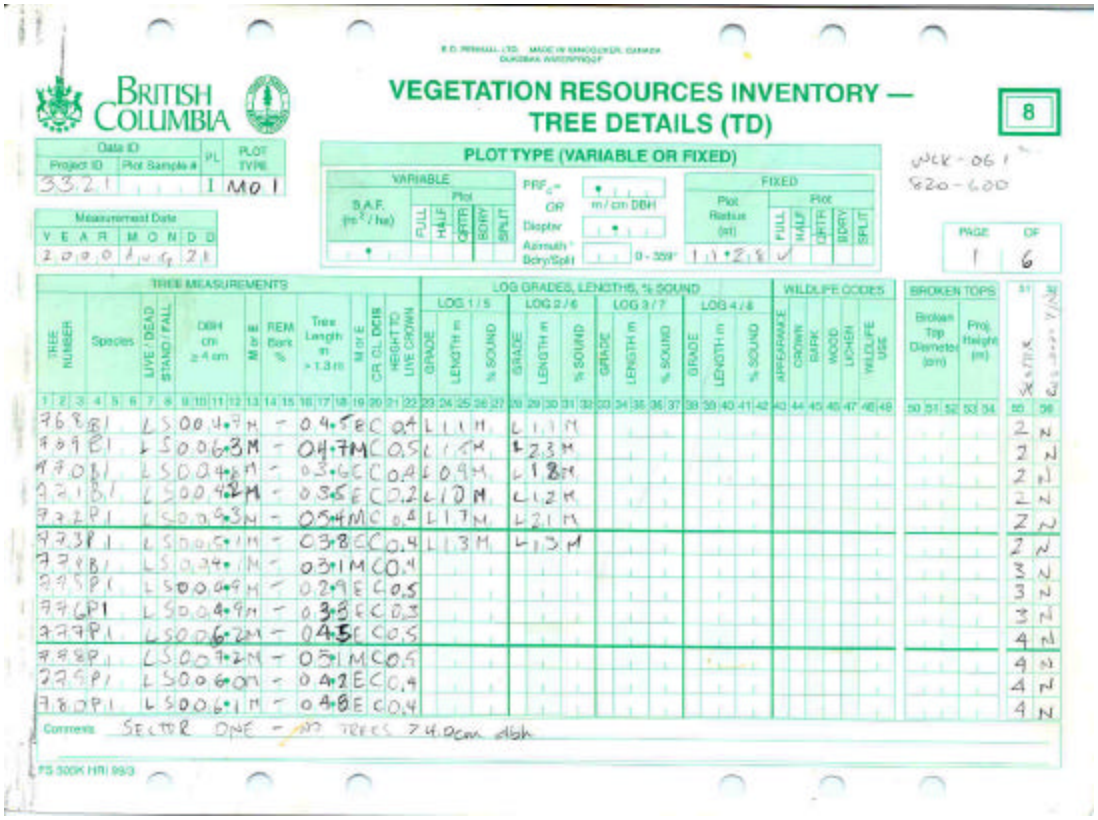
SLOPE PROFILE

Comments

INTEGRATED PLOT DETAILS (top view)

SAMPLE CLUSTER DETAILS (top view)

FS 6060 HRI 99/3



BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY —
TREE DETAILS (TD)

8

WCK-061
820-600

PAGE 1 OF 6

Data ID: Project ID 3321 | PL | PLOT TYPE 1 MO1

Measurement Date: YEAR 2000 MON Aug DD 28

PLOT TYPE (VARIABLE OR FIXED)

VARIABLE: S.A.F. (m^2/ha) | Plot: FULL, HALF, QRTR, BDRY, SPLIT | PRF_4= OR m/cm DBH | Diopter | Azimuth Bdry/Split 0 - 359°

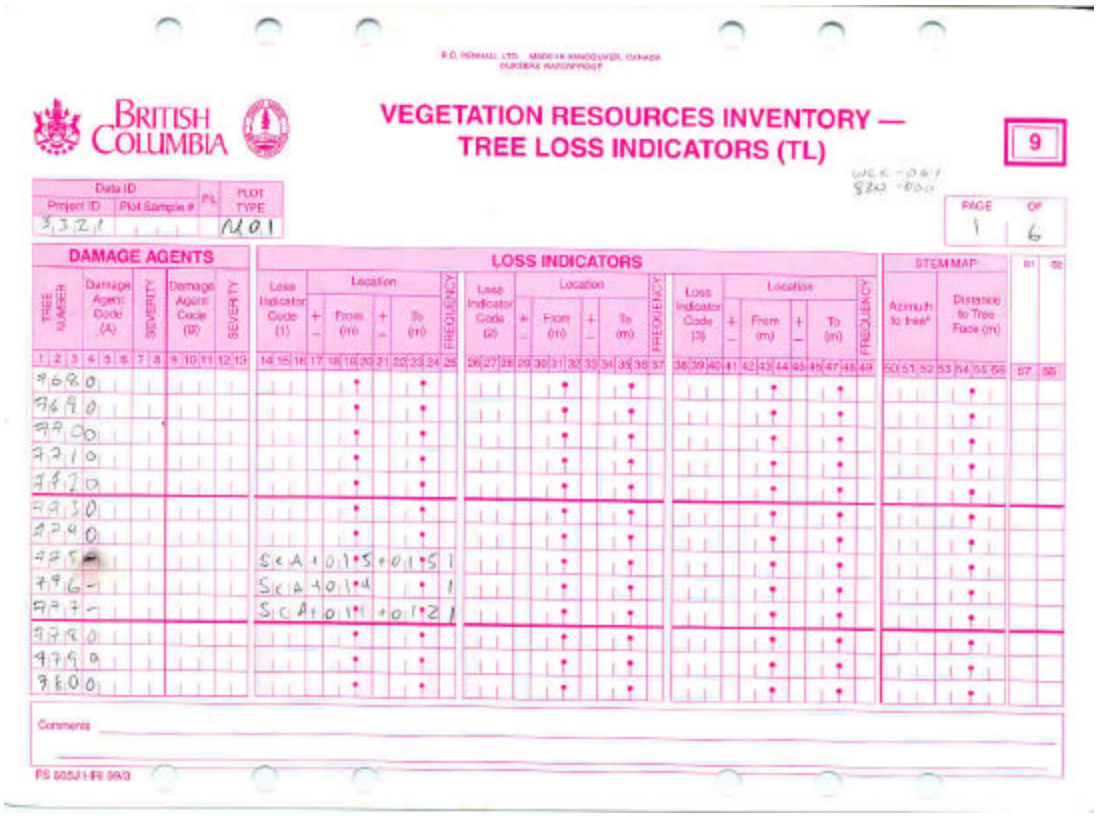
FIXED: Plot Radius (m) 11.28 | Plot: FULL ✓, HALF, QRTR, BDRY, SPLIT

TREE MEASUREMENTS | LOG GRADES, LENGTHS, % SOUND (LOG 1/5, LOG 2/6, LOG 3/7, LOG 4/8) | WILDLIFE CODES | BROKEN TOPS

TREE NUMBER	Species	LIVE / DEAD STAND / FALL	DBH cm ≥ 4 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR SL DEB	HEIGHT TO LIVE CROWN	LOG 1/5 GRADE	LOG 1/5 LENGTH m	LOG 1/5 % SOUND	LOG 2/6 GRADE	LOG 2/6 LENGTH m	LOG 2/6 % SOUND	LOG 3/7 GRADE	LOG 3/7 LENGTH m	LOG 3/7 % SOUND	LOG 4/8 GRADE	LOG 4/8 LENGTH m	LOG 4/8 % SOUND	WILDLIFE CODES: APPEARANCE	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE	BROKEN TOPS: Broken Top Diameter (cm)	Proj. Height (m)	SAMPLE	YES/NO
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	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
768	B1	L	S	00	4	9	H	-	04	5	E	C	0.4	L	1	1	M	L	1	1	M																															2	N
769	B1	L	S	00	6	3	M	-	04	7	M	C	0.5	L	1	5	M	L	2	3	M																															2	N
770	B1	L	S	00	4	8	M	-	03	6	C	C	0.4	L	0	9	M	L	1	8	M																															2	N
771	B1	L	S	00	4	2	M	-	03	5	E	C	0.2	L	1	0	M	L	1	2	M																															2	N
772	P1	L	S	00	0	3	M	-	05	4	M	C	0.4	L	1	7	M	L	2	1	M																															2	N
773	P1	L	S	00	0	5	M	-	03	8	E	C	0.4	L	1	3	M	L	1	3	M																															2	N
774	B1	L	S	00	3	9	M	-	03	1	M	C	0.4																																							3	N
775	P1	L	S	00	0	9	M	-	02	9	E	C	0.5																																							3	N
776	P1	L	S	00	4	9	M	-	03	5	E	C	0.3																																							3	N
777	P1	L	S	00	6	2	M	-	04	5	E	C	0.5																																							4	N
778	P1	L	S	00	7	2	M	-	05	1	M	C	0.5																																							4	N
779	P1	L	S	00	6	0	M	-	04	2	E	C	0.4																																							4	N
780	P1	L	S	00	6	1	M	-	04	8	E	C	0.4																																							4	N

Comments: SECTOR ONE - 20 TREES 24.0cm dbh

FS 500K HRI 99/3



BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — TREE LOSS INDICATORS (TL) 9

WCK-061 820-600

Data ID: Project ID 332 | Plot Sample # | PL | PLOT TYPE: 1 MO1

PAGE 1 OF 6

DAMAGE AGENTS

TREE NUMBER	Damage Agent Code (A)	SEVERITY	Damage Agent Code (B)	SEVERITY
968	0			
969	0			
970	0			
971	0			
972	0			
973	0			
974	0			
975	—			
976	—			
977	—			
978	0			
979	0			
980	0			

LOSS INDICATORS

Loss Indicator Code (1)	Location +/− From (m)	+/− To (m)	FREQUENCY	Loss Indicator Code (2)	Location +/− From (m)	+/− To (m)	FREQUENCY	Loss Indicator Code (3)	Location +/− From (m)	+/− To (m)	FREQUENCY
S	C	A	1	0.1	5	+	0.1	5	1		
S	C	A	+	0.1	4				1		
S	C	A	+	0.1	1	+	0.1	2	1		

STEMMAP: Azimuth to tree° | Distance to Tree Face (m)

Comments:

FS 505J1-PR 99/3

BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — SMALL TREE, STUMP AND SITE TREE DATA (TS) 10

WCK-061 820-600

Data ID: Project ID 332 | Plot Sample # | PL | PLOT TYPE: 1 MO1

Fixed Small Tree Plot: Plot Radius (m) 0.2 5.0 ✓ | Plot: FULL | HALF | QRTR | BORY | SPLIT

Fixed Stump Plot: Plot Radius (m) 0.2 5.0 ✓ | Plot: FULL | HALF | QRTR | BORY

PAGE 1 OF

SMALL LIVE TREE (< 4 cm @ DBH) - BY LENGTH CLASSES

Species	10 - 30 cm Tally	Total	31 cm - 1.3 m Tally	Total	Length > 1.3 m Tally	Total
B1	.	0.1	: .	0.3		
S.K	:	0.2	.	0.1		

STUMPS > 4 cm @ DIB AND LENGTH ≤ 1.3 m

Species	Freq.	DIB (cm)	Length (m)	% Sound	BARK	Soft/Rotten WOOD	Hard WOOD	Wildlife Use	Plot Plot Sp. DR*
P1	0.1	0.2 8.0	0.1	9.5					

HEIGHT AND AGE INFORMATION

* T = Top height tree. L = Leading species. S = Second species. R = Random tree

Plot Type	Tree No.	TYPE	Species	Cr. Cl.	Boring (OB) Diam. (cm)	Tree Length (m)	S / H	Bark Thickness (mm)	Stored Height (m)	Measure Code	Office Stored Height Age	Growth (mm) 5 Yr.	10 Yr.	20 Yr.	Female Data Length (cm)	Off. Count	Direct Age Corr.	Total Age	Phy Age	S / A
5.64 m	794	T	P1	C	00 9	7	0 0 5	8	Y	0 0 4	1	2		20	—	—		04	01 3		Y
5.64 m	792	*	P1	C	00 8	3	0 0 5	4	Y	0 0 4	1	2		18 4 5				04	01 4		Y
5.64 m	769	*	B1	C	00 6	5	0 0 4	7	Y	0 0 2	1	1		1.5	—	—		05	01 4		Y
5.64 m	783	*	P1	C	00 7	7	0 0 4	4	N	0 0 3	1	3		20	—	—		05	01 3		Y
5.64 m	778		P1	C	00 7	2	0 0 5	1	Y	0 0 2	1	4		20	—	—		04	01 2		Y

FIELD AGE COUNT

Tree No.	TYPE	BORED HEIGHT AGE
794	T	0009
792	*	0010
769	*	0009
783	*	0008
778	0	0008

Comments: Note: tree #794 is also * tree for quad 4

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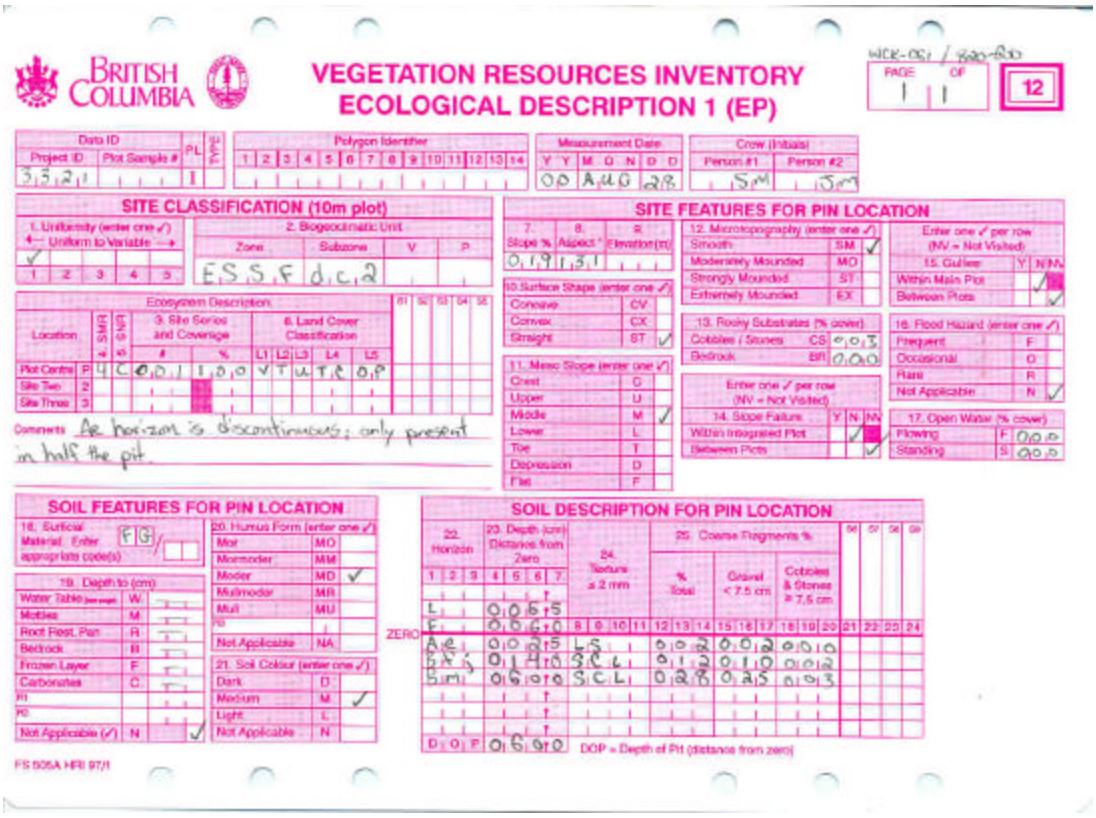

BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY
ECOLOGICAL DESCRIPTION 1 (EP)

12

Data ID: Project ID 3321 | Plot Sample # 1 | PL | TYPE
Polygon Identifier
Measurement Date: YY MO DA 98 AUG 28
Crew (Initials): Person #1 SM | Person #2 SM

SITE CLASSIFICATION (10m plot)
1. Uniformity (enter one ✓) ← Uniform to Variable → : 1 ✓ | 2 | 3 | 4 | 5
2. Biogeoclimatic Unit: Zone ESSF | Subzone dc | V 2 | P

Ecosystem Description

Location	S/M/R	3. Site Series #	3. Site Series %	6. Land Cover L1	L2	L3	L4	L5	S1	S2	S3	S4	S5
Plot Centre	P	4	10,0	1	0	0	V	T	U	T	R	0	P
Site Two	2												
Site Three	3												

Comments: Ae horizon is discontinuous; only present in half the pit.

SITE FEATURES FOR PIN LOCATION
7. Slope %: 19 | 8. Aspect °: 131 | 9. Elevation (m):
10. Surface Shape (enter one ✓): Concave CV | Convex CX | Straight ST ✓
11. Meso Slope (enter one ✓): Crest C | Upper U | Middle M ✓ | Lower L | Toe T | Depression D | Flat F
12. Microtopography (enter one ✓): Smooth SM ✓ | Moderately Mounded MO | Strongly Mounded ST | Extremely Mounded EX
13. Rocky Substrates (% cover): Cobbles / Stones CS 0,0,3 | Bedrock BR 0,0,0
14. Slope Failure (Enter one ✓ per row, NV = Not Visited): Within Integrated Plot Y | Between Plots NV ✓
15. Gullies (Enter one ✓ per row, NV = Not Visited): Within Main Plot Y | Between Plots N ✓
16. Flood Hazard (enter one ✓): Frequent F | Occasional O | Rare R | Not Applicable N ✓
17. Open Water (% cover): Flowing F 0,0,0 | Standing S 0,0,0

SOIL FEATURES FOR PIN LOCATION
18. Surficial Material: Enter appropriate code(s): F G
19. Depth to (cm): Water Table (per page) W | Mottles M | Root Rest. Pan R | Bedrock B | Frozen Layer F | Carbonates C | R1 | R2 | Not Applicable (✓) N ✓
20. Humus Form (enter one ✓): Mor MO | Mormoder MM | Moder MD ✓ | Multimoder MR | Mull MU | R1 | Not Applicable NA
21. Soil Colour (enter one ✓): Dark D | Medium M ✓ | Light L | Not Applicable N

SOIL DESCRIPTION FOR PIN LOCATION

22. Horizon	23. Depth (cm) Distance from Zero	24. Texture ≤ 2 mm	25. Coarse Fragments % Total	Gravel < 7.5 cm	Cobbles & Stones ≥ 7.5 cm	S1	S2	S3	S4
L	0 0 6 5								
F	0 0 6 7 0								
Ae	0 0 6 5	LS	0 0 2	0 0 2	0 0 0				
Bm1	0 1 0 0 6	SCL	0 1 2	0 1 0	0 0 2				
Bm2	0 6 0 0 9 0	SCL	0 2 5	0 2 5	0 0 3				
D O P	0 6 9 0								

ZERO
DOP = Depth of Pit (distance from zero)

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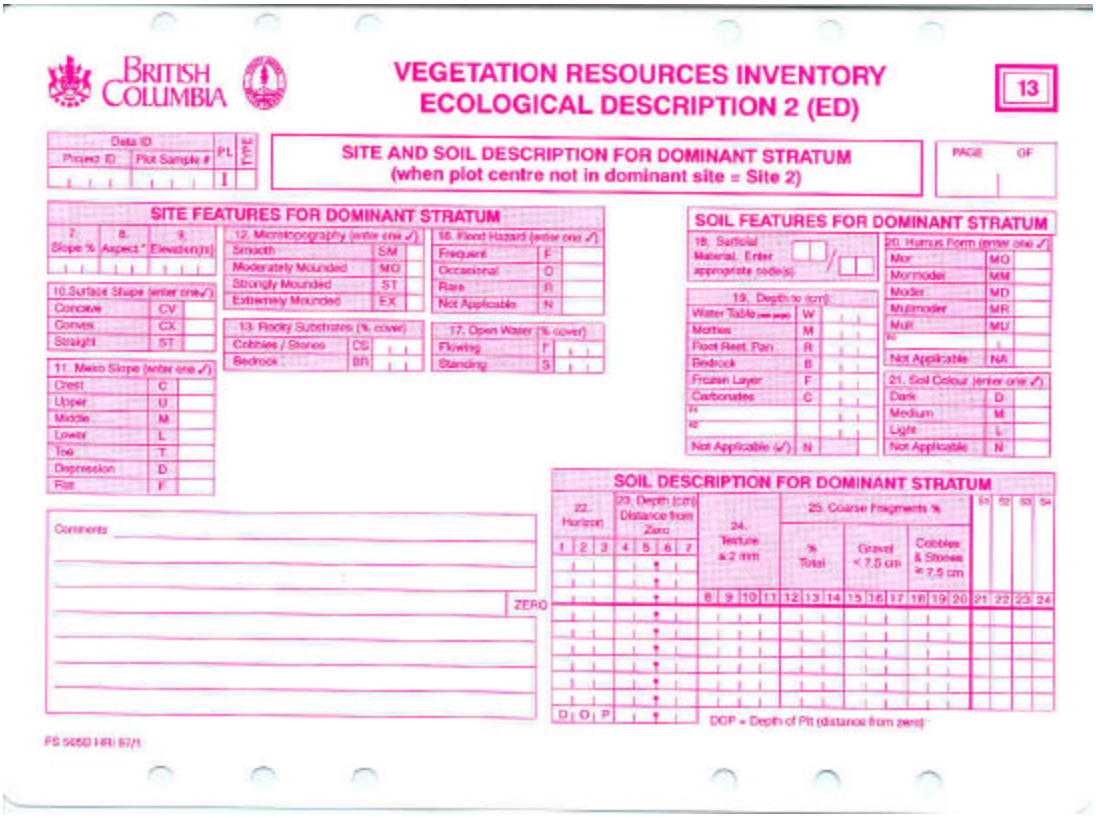


BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY
ECOLOGICAL DESCRIPTION 2 (ED)

13

Data ID: Project ID | Plot Sample # | PL | TYPE
SITE AND SOIL DESCRIPTION FOR DOMINANT STRATUM
(when plot centre not in dominant site = Site 2)
PAGE OF

SITE FEATURES FOR DOMINANT STRATUM
7. Slope % | 8. Aspect ° | 9. Elevation (m)
10. Surface Shape (enter one ✓): Concave CV | Convex CX | Straight ST
11. Meso Slope (enter one ✓): Crest C | Upper U | Middle M | Lower L | Toe T | Depression D | Flat F
12. Microtopography (enter one ✓): Smooth SM | Moderately Mounded MO | Strongly Mounded ST | Extremely Mounded EX
13. Rocky Substrates (% cover): Cobbles / Stones CS | Bedrock BR
16. Flood Hazard (enter one ✓): Frequent F | Occasional O | Rare R | Not Applicable N
17. Open Water (% cover): Flowing F | Standing S

SOIL FEATURES FOR DOMINANT STRATUM
18. Surficial Material: Enter appropriate code(s):
19. Depth to (cm): Water Table (per page) W | Mottles M | Root Rest. Pan R | Bedrock B | Frozen Layer F | Carbonates C | R1 | R2 | Not Applicable (✓) N
20. Humus Form (enter one ✓): Mor MO | Mormoder MM | Moder MD | Multimoder MR | Mull MU | R1 | Not Applicable NA
21. Soil Colour (enter one ✓): Dark D | Medium M | Light L | Not Applicable N

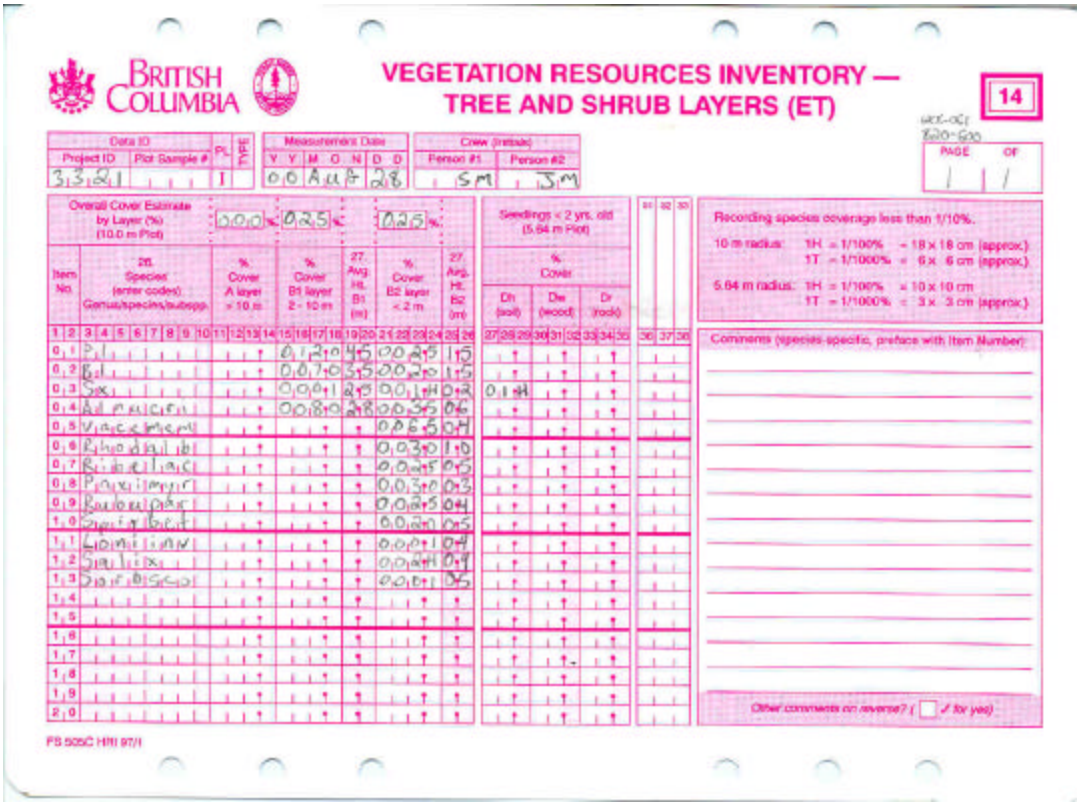
SOIL DESCRIPTION FOR DOMINANT STRATUM

22. Horizon	23. Depth (cm) Distance from Zero	24. Texture ≤ 2 mm	25. Coarse Fragments % Total	Gravel < 7.5 cm	Cobbles & Stones ≥ 7.5 cm	S1	S2	S3	S4
D O P									

ZERO
DOP = Depth of Pit (distance from zero)

Comments

FS 505D HRI 97/1

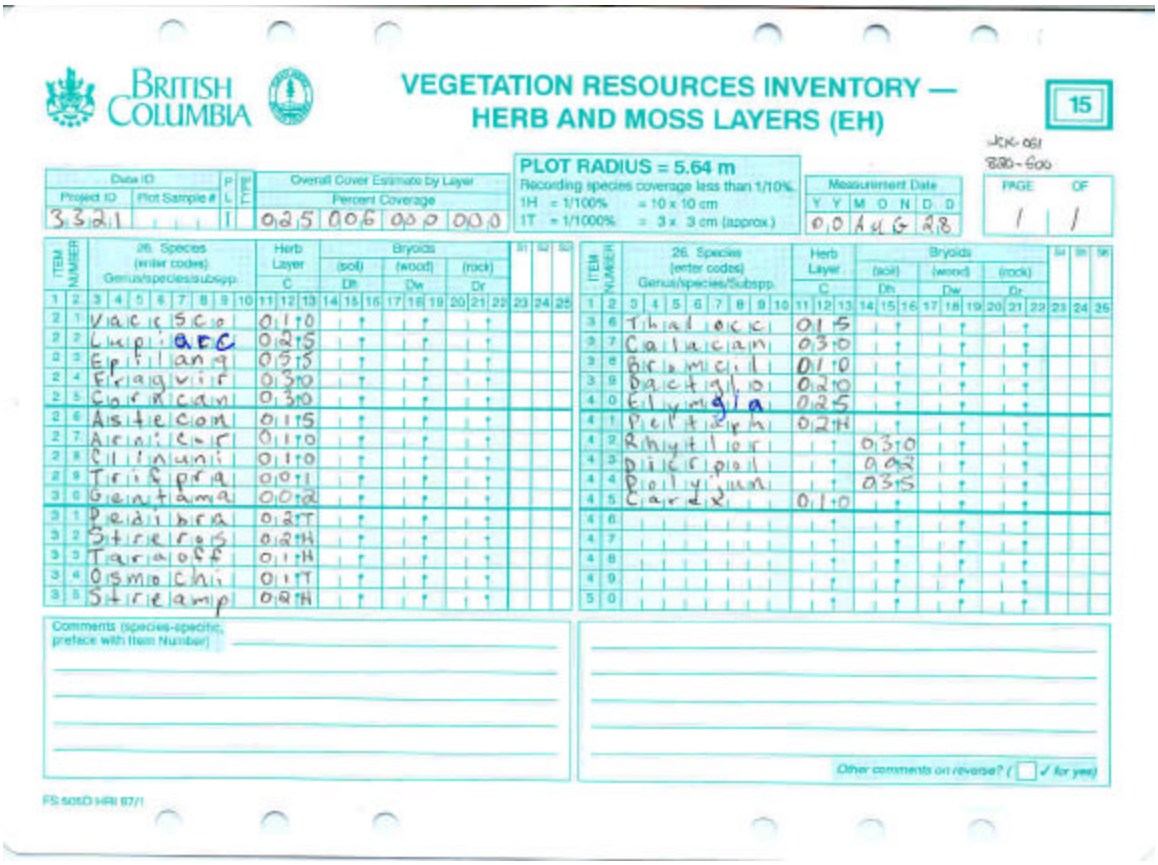


BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — TREE AND SHRUB LAYERS (ET)

14

FS 505C HRI 97/1



BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — HERB AND MOSS LAYERS (EH)

15

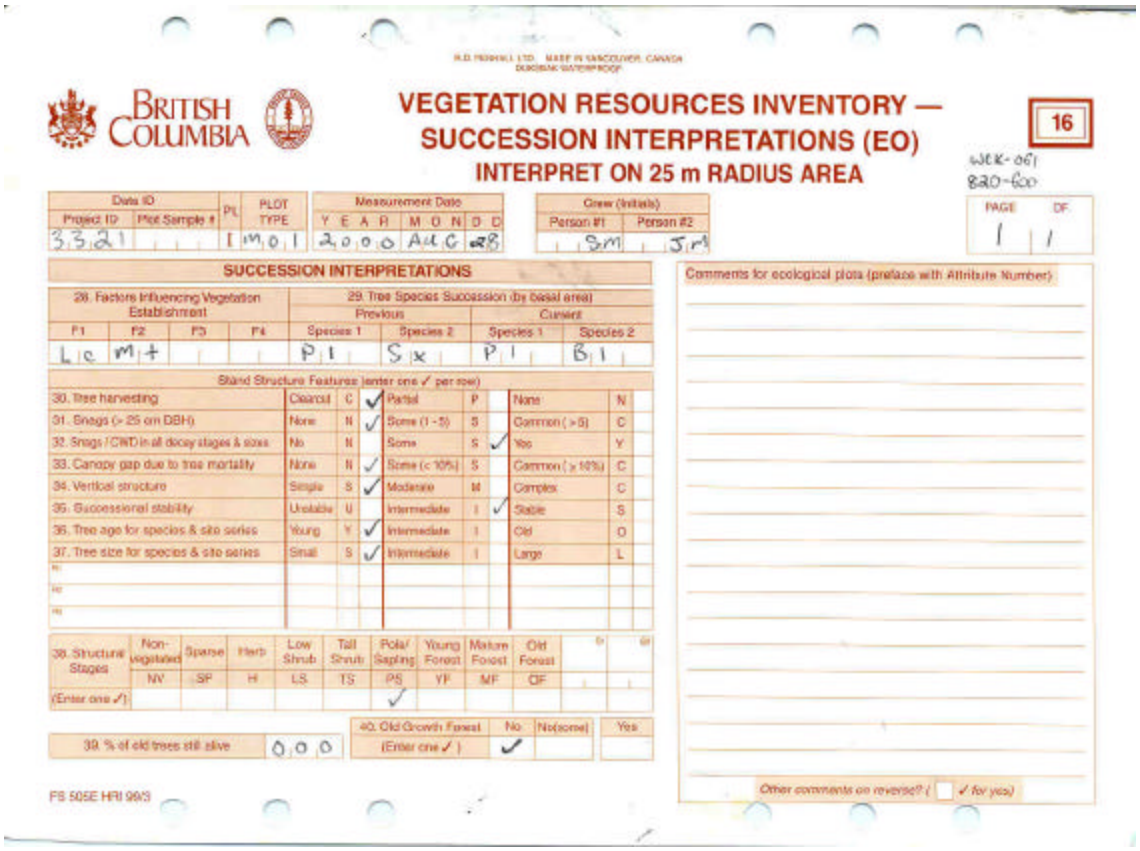
PLOT RADIUS = 5.64 m

Recording species coverage less than 1/10%.

1H = 1/100% = 10 x 10 cm

1T = 1/1000% = 3 x 3 cm (approx.)

FS 505D HRI 97/1



BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — SUCCESSION INTERPRETATIONS (EO)

INTERPRET ON 25 m RADIUS AREA

16

WEK-061
820-600

PAGE 1 OF 1

Data ID: Project ID	Plot Sample #	PL	PLOT TYPE	Measurement Date: YEAR	MON	DD	Crew (Initials): Person #1	Person #2
3321			M01	2000	AUG	28	SM	JM

SUCCESSION INTERPRETATIONS

28. Factors Influencing Vegetation Establishment				29. Tree Species Succession (by basal area)			
				Previous		Current	
F1	F2	F3	F4	Species 1	Species 2	Species 1	Species 2
Lc	M+			P 1	S x	P 1	B 1

Stand Structure Features (enter one ✓ per row)

30. Tree harvesting	Clearcut	C	✓	Partial	P		None	N
31. Snags (> 25 cm DBH)	None	N	✓	Some (1 - 5)	S		Common (> 5)	C
32. Snags / CWD in all decay stages & sizes	No	N		Some	S	✓	Yes	Y
33. Canopy gap due to tree mortality	None	N	✓	Some (< 10%)	S		Common (> 10%)	C
34. Vertical structure	Simple	S	✓	Moderate	M		Complex	C
35. Successional stability	Unstable	U		Intermediate	I	✓	Stable	S
36. Tree age for species & site series	Young	Y	✓	Intermediate	I		Old	O
37. Tree size for species & site series	Small	S	✓	Intermediate	I		Large	L

38. Structural Stages	Non-vegetated	Sparse	Herb	Low Shrub	Tall Shrub	Pole/ Sapling	Young Forest	Mature Forest	Old Forest		
	NV	SP	H	LS	TS	PS	YF	MF	OF		
(Enter one ✓)						✓					

39. % of old trees still alive	0 0 0

40. Old Growth Forest (Enter one ✓)	No	No(some)	Yes
	✓		

Comments for ecological plots (preface with Attribute Number)

Other comments on reverse? (✓ for yes)

FS 505E HPR 99/3