Vegetation Resources Inventory – British Columbia

Appendices to Ground Sampling Procedures

Prepared by
Ministry of Forests, Lands and Natural Resource Operations
Forest Analysis and Inventory Branch

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https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-inventory/ground-sample-inventories/vri-audits/standards

Acknowledgments

The Government of British Columbia provides funding of the Resources Information Standards Committee work, including the preparation of this document. The Resources Information Standards Committee supports the effective, timely and integrated use of land and resource information for planning and decision making by developing and delivering focused, cost-effective, common provincial standards and procedures for information collection, management and analysis. Representatives to the Committee and its Task Forces are drawn from the ministries and agencies of the Canadian and the British Columbia governments, including academic, industry and First Nations involvement.

The Resources Information Standards Committee evolved from the Resources Inventory Committee which received funding from the Canada-British Columbia Partnership Agreement of Forest Resource Development (FRDA II), the Corporate Resource Inventory Initiative (CRII) and by Forest Renewal BC (FRBC), and addressed concerns of the 1991 Forest Resources Commission.

For further information about the Resources Information Standards Committee, please access the RISC website at:

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Major Amendments for 2018

1. Damage agent severities specified as ‘nominal’, ‘ordinal’, or ‘continuous’ in order to coordinate with the newly added QA standards for damage agent severities. (Appendix D)

Table of Contents

List of Figures

Appendix A: Completing the Field Cards

This appendix contains the following sample field cards:

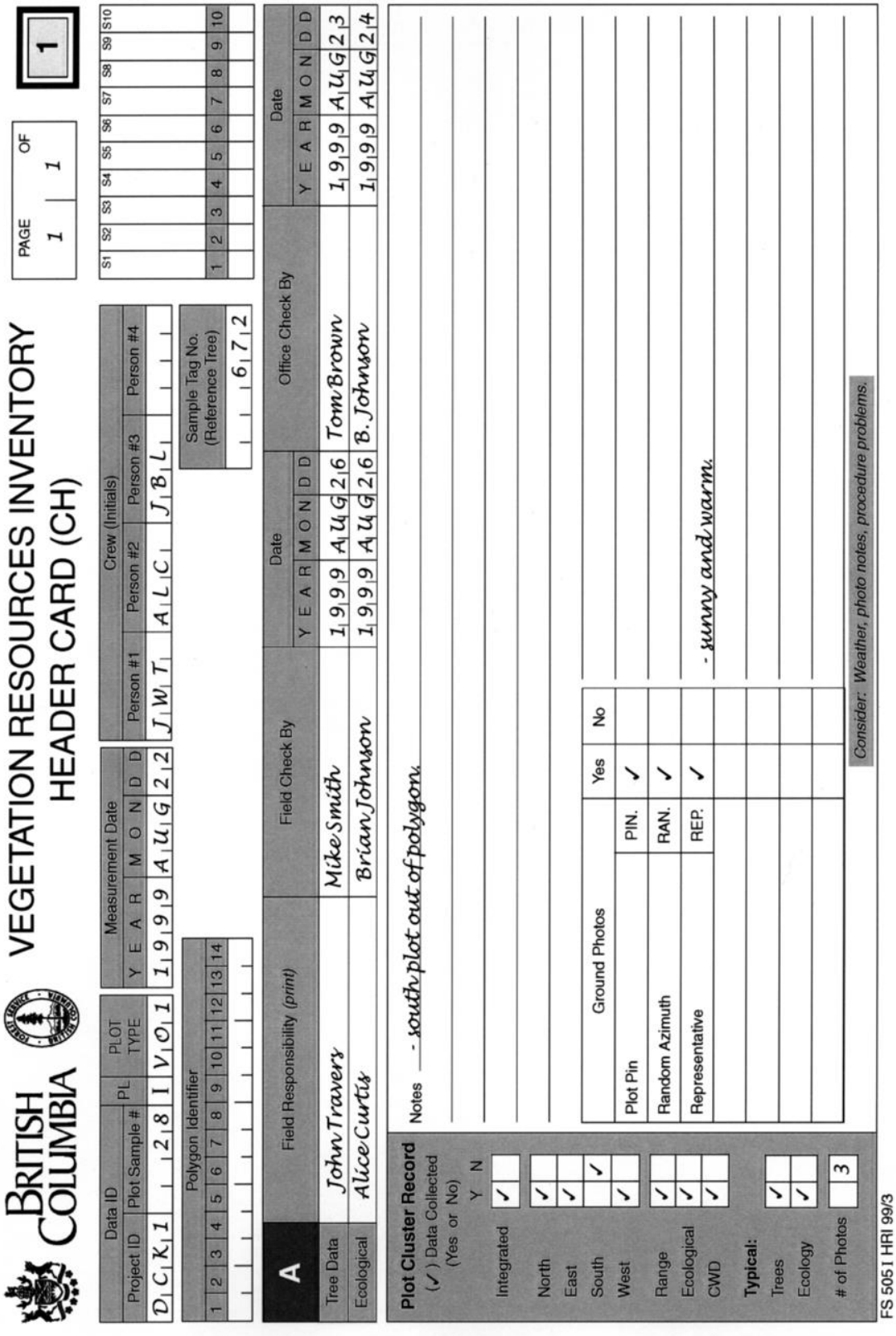


Figure A.1 — Sample field card 1: Header Card (CH) (front)

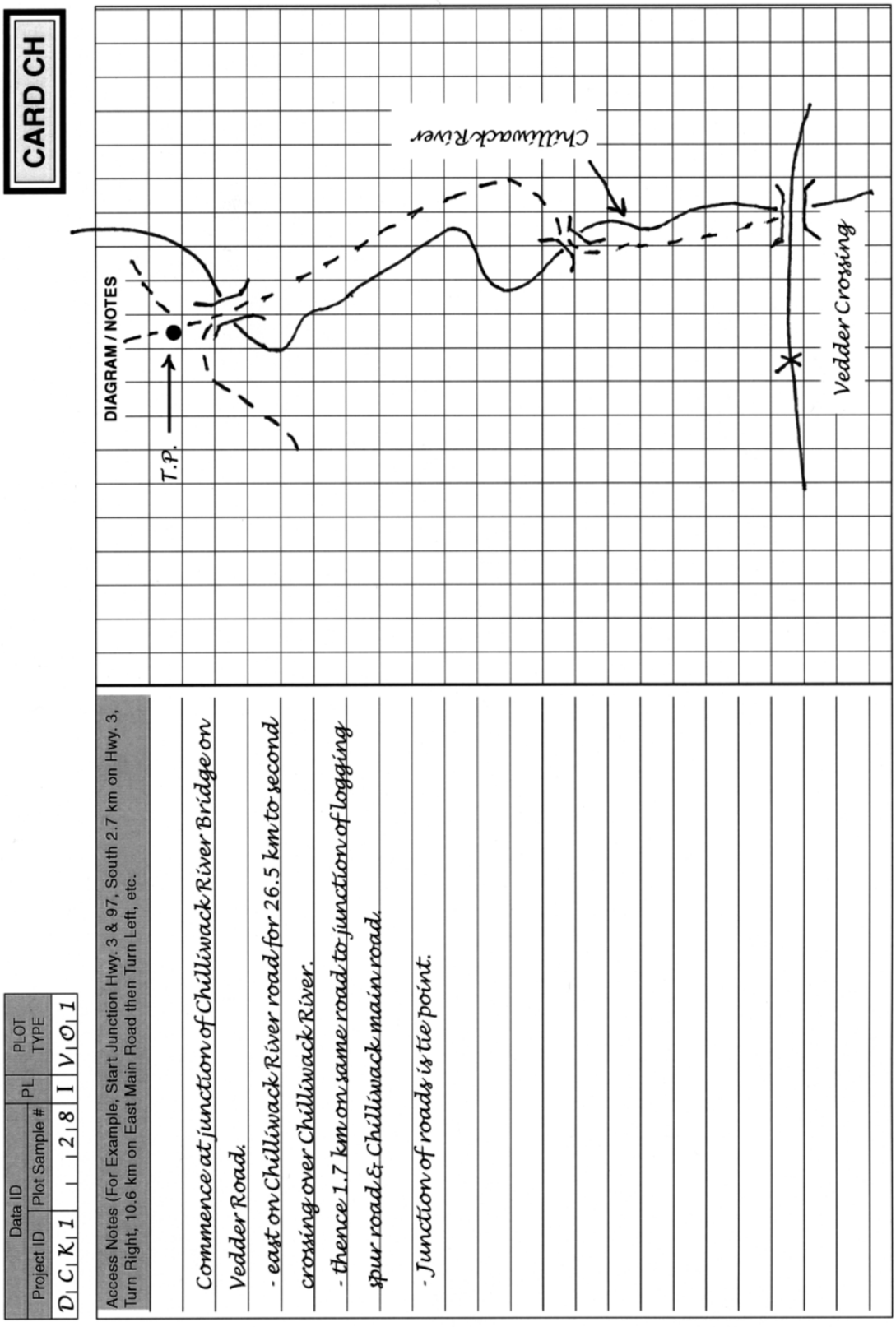


Figure A.2 — Sample field card 1: Header Card (CH) (reverse)

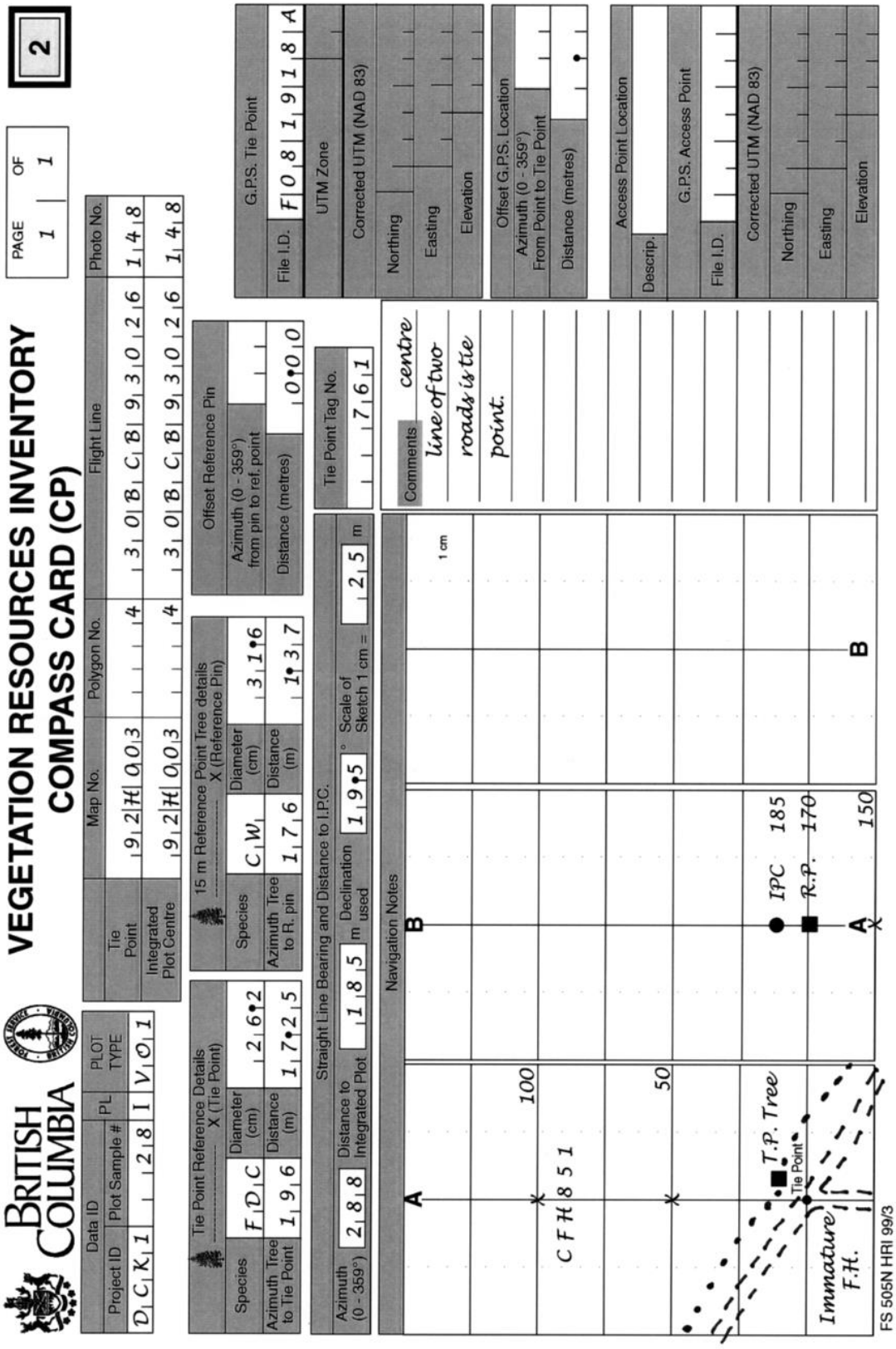


Figure A.3 — Sample field card 2: Compass Card (front) (CP)

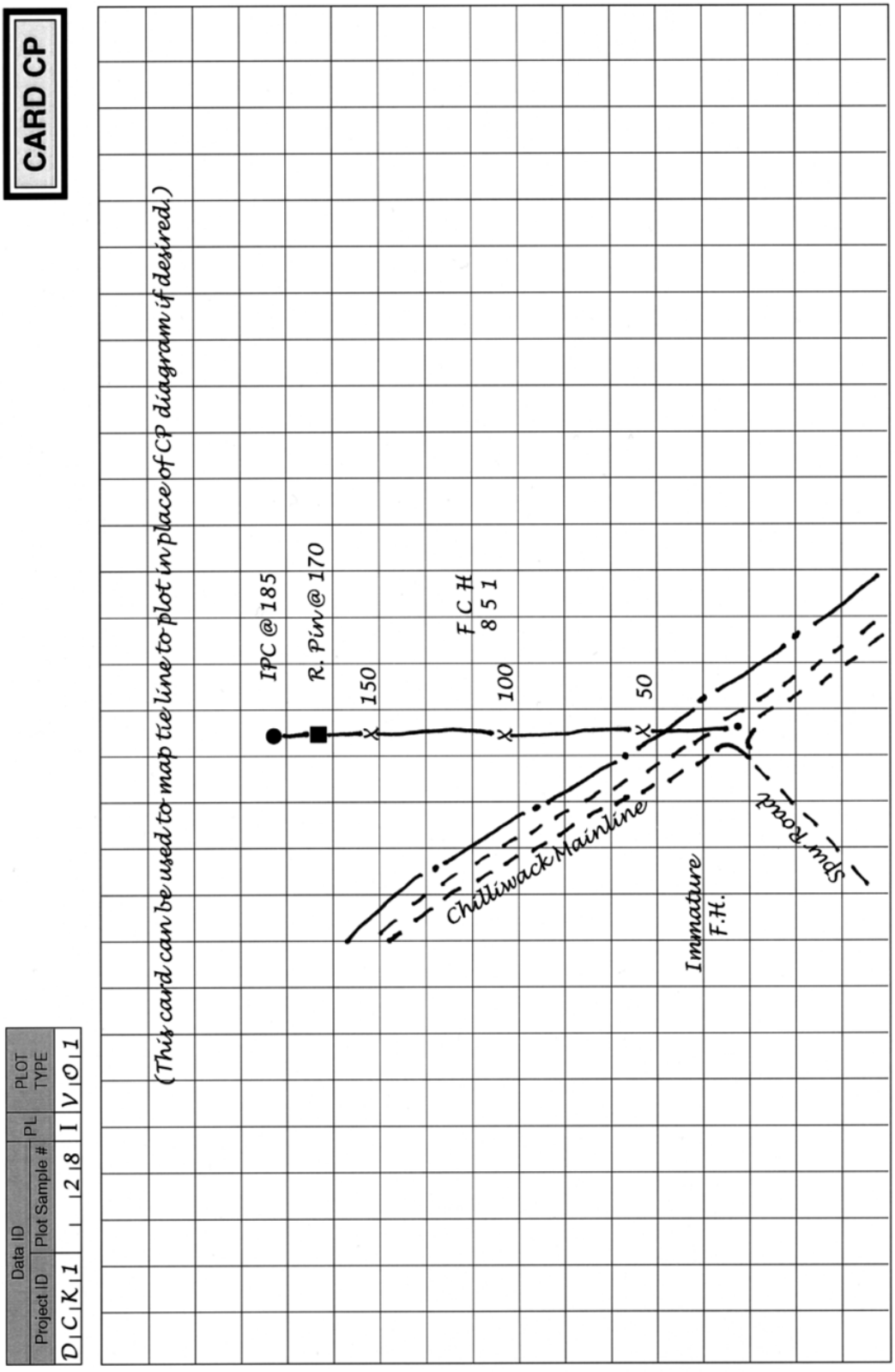


Figure A.4 — Sample field card 2: Compass Card (CP) (reverse)

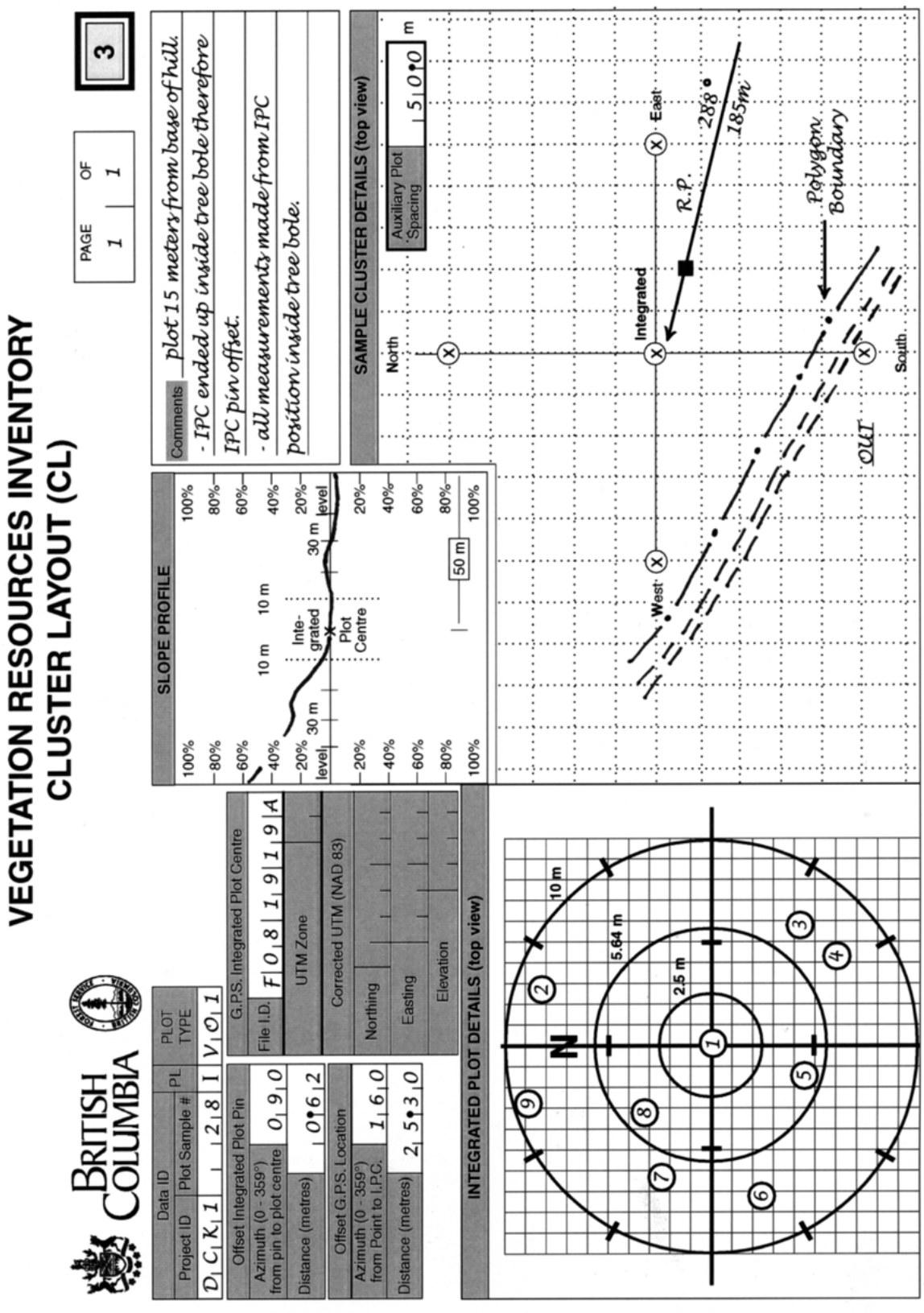


Figure A.5 — Sample field card 3: Cluster Layout (CL) (front)

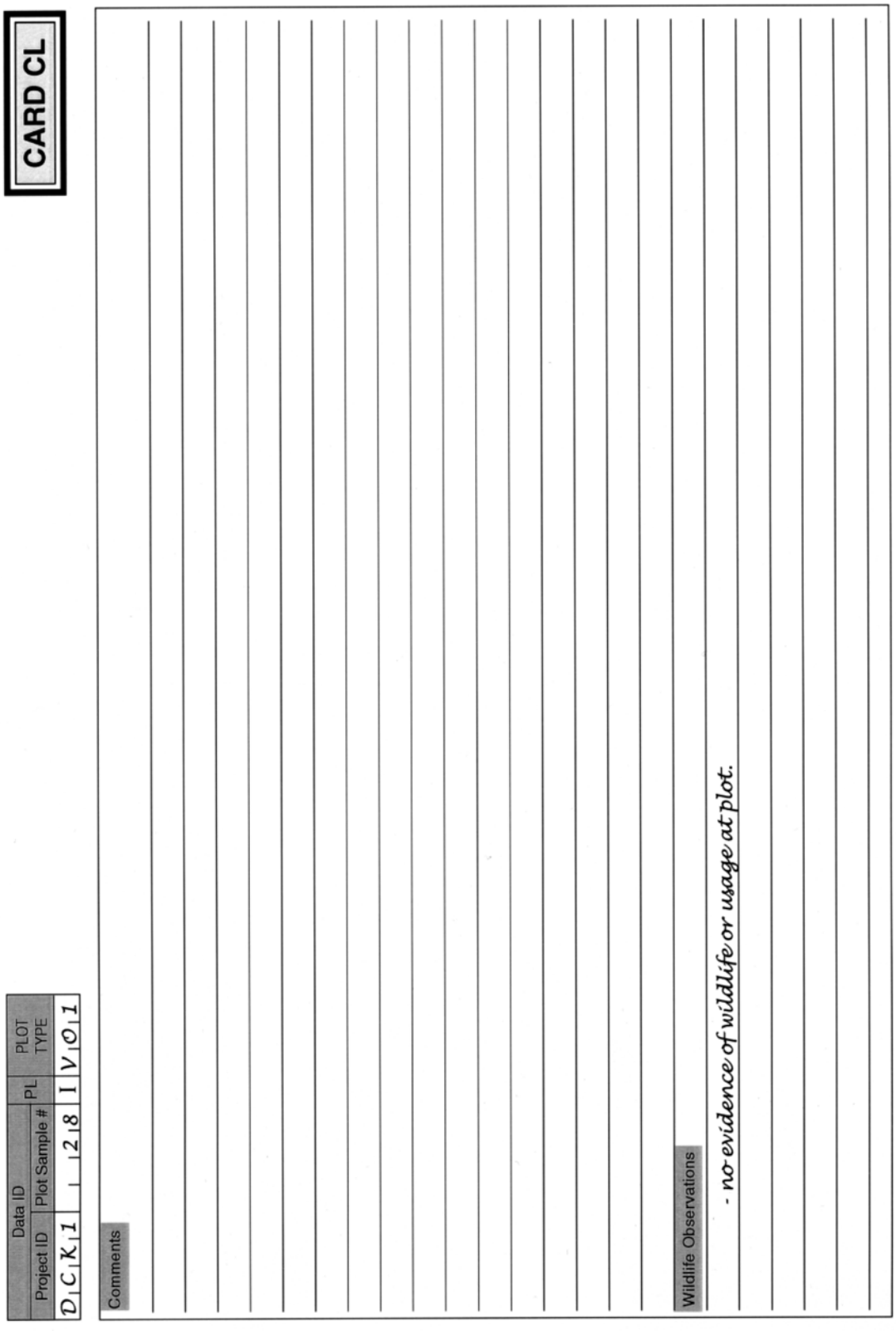


Figure A.6 — Sample field card 3: Cluster Layout (CL) (reverse)

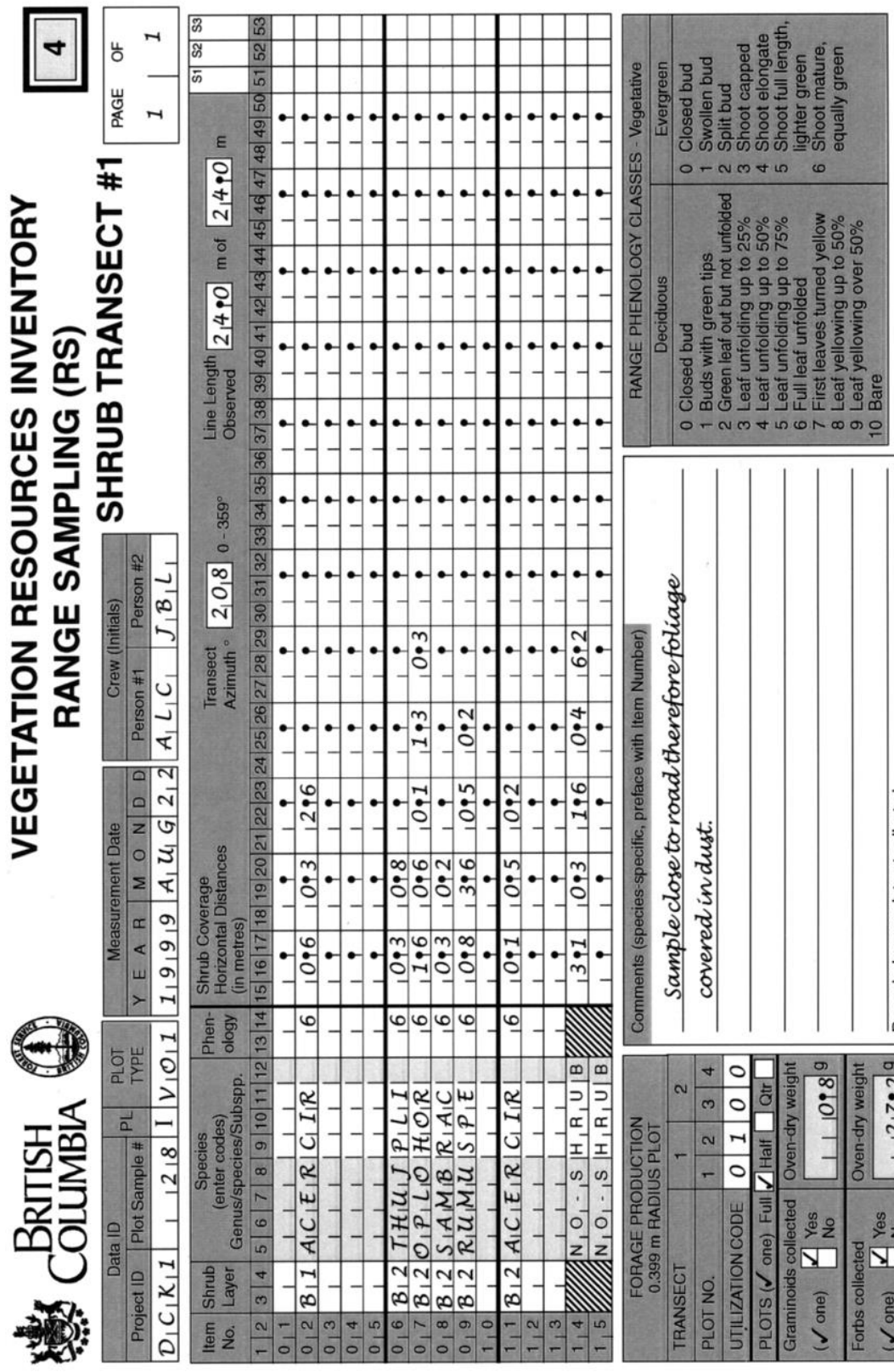


Figure A.7 — Sample field card 4: Range Sampling (RS) (shrub transect 1)

BRITISH COLUMBIA

5

VEGETATION RESOURCES INVENTORY
RANGE SAMPLING (RT)
SHRUB TRANSECT #2

Project ID	Plot Sample #	PL	PLOT TYPE	PAGE	OF
DCK1	28	I	VO1	1	1

Transect Azimuth ° 298 (0 - 359°) Line Length Observed 24•0 m of 24•0 m

Item No.	Shrub Layer	Species (enter codes) Genus/species/Subspp.	Phenology	Shrub Coverage Horizontal Distances (in metres)									S1	S2	S3
01	B2	THUJPLI	6	0•1	•	•	•	•	•	•	•	•			
02	B2	OPLOHOR	6	1•6	2•3	1•0	0•3	0•4	•	•	•	•			
03	B2	RUBUSPE	6	2•6	0•3	0•2	•	•	•	•	•	•			
04	B2	ACERMAC	6	1•3	•	•	•	•	•	•	•	•			
05	B2	RIBELAC	7	0•3	0•6	•	•	•	•	•	•	•			
06	B2	RIBELAC	6	0•3	0•7	0•8	0•2	•	•	•	•	•			
07				•	•	•	•	•	•	•	•	•			
08				•	•	•	•	•	•	•	•	•			
09				•	•	•	•	•	•	•	•	•			
10				•	•	•	•	•	•	•	•	•			
11	B2	RUBUSPE	6	1•3	0•2	•	•	•	•	•	•	•			
12				•	•	•	•	•	•	•	•	•			
13				•	•	•	•	•	•	•	•	•			
14				•	•	•	•	•	•	•	•	•			
15				•	•	•	•	•	•	•	•	•			
16				•	•	•	•	•	•	•	•	•			
17				•	•	•	•	•	•	•	•	•			
18				•	•	•	•	•	•	•	•	•			
19		NO-SHRUB		0•3	4•2	0•8	3•1	0•2	1•4	•	•	•			
20		NO-SHRUB		•	•	•	•	•	•	•	•	•			

Comments: RIBELAC - plant under drought stress.

FS 505H HRI 99/3

Figure A.8 — Sample field card 5: Range Sampling (RT) (shrub transect 2)

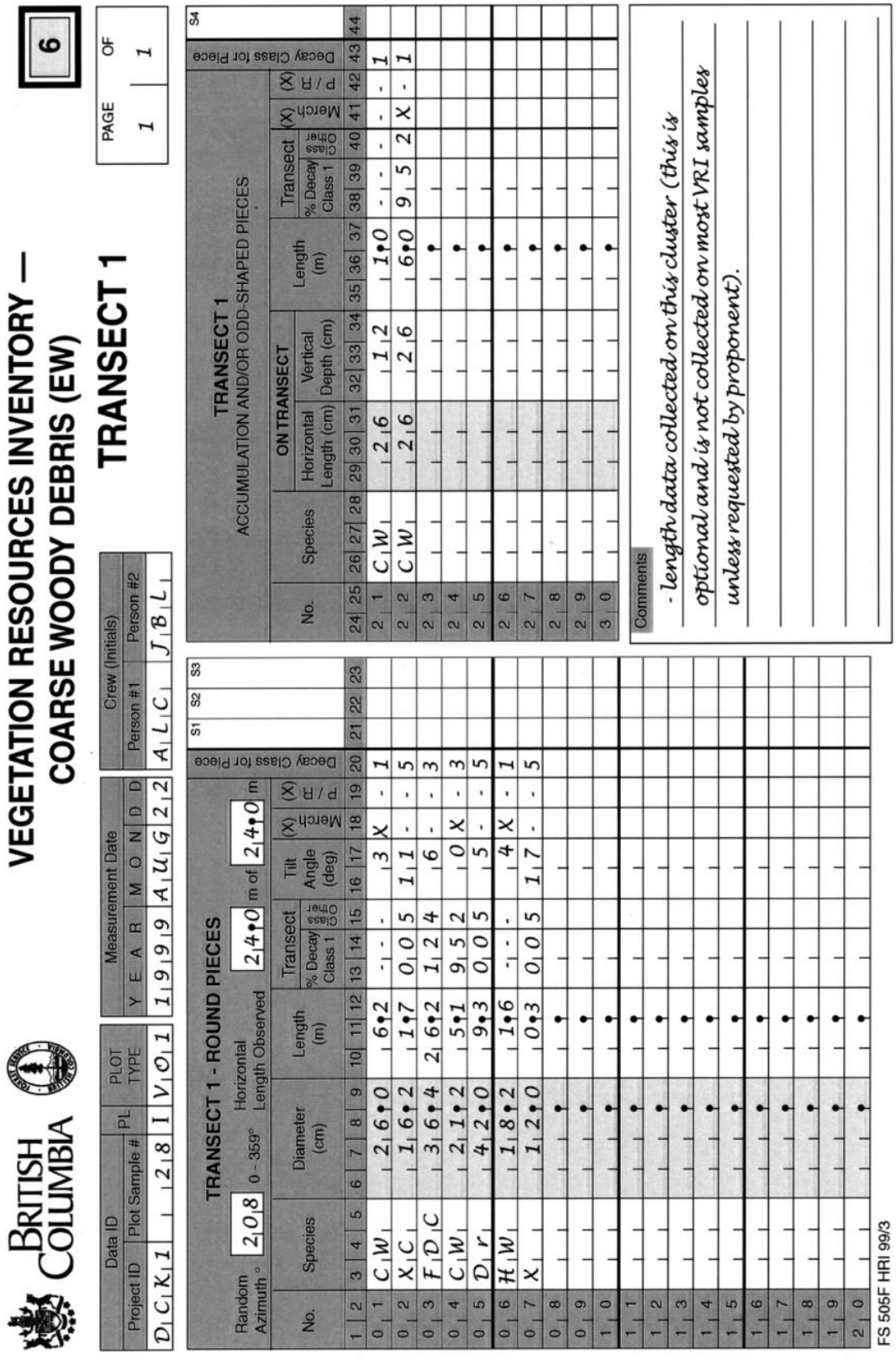


Figure A.9 — Sample field card 6: Coarse Woody Debris (EW) (Transect 1).

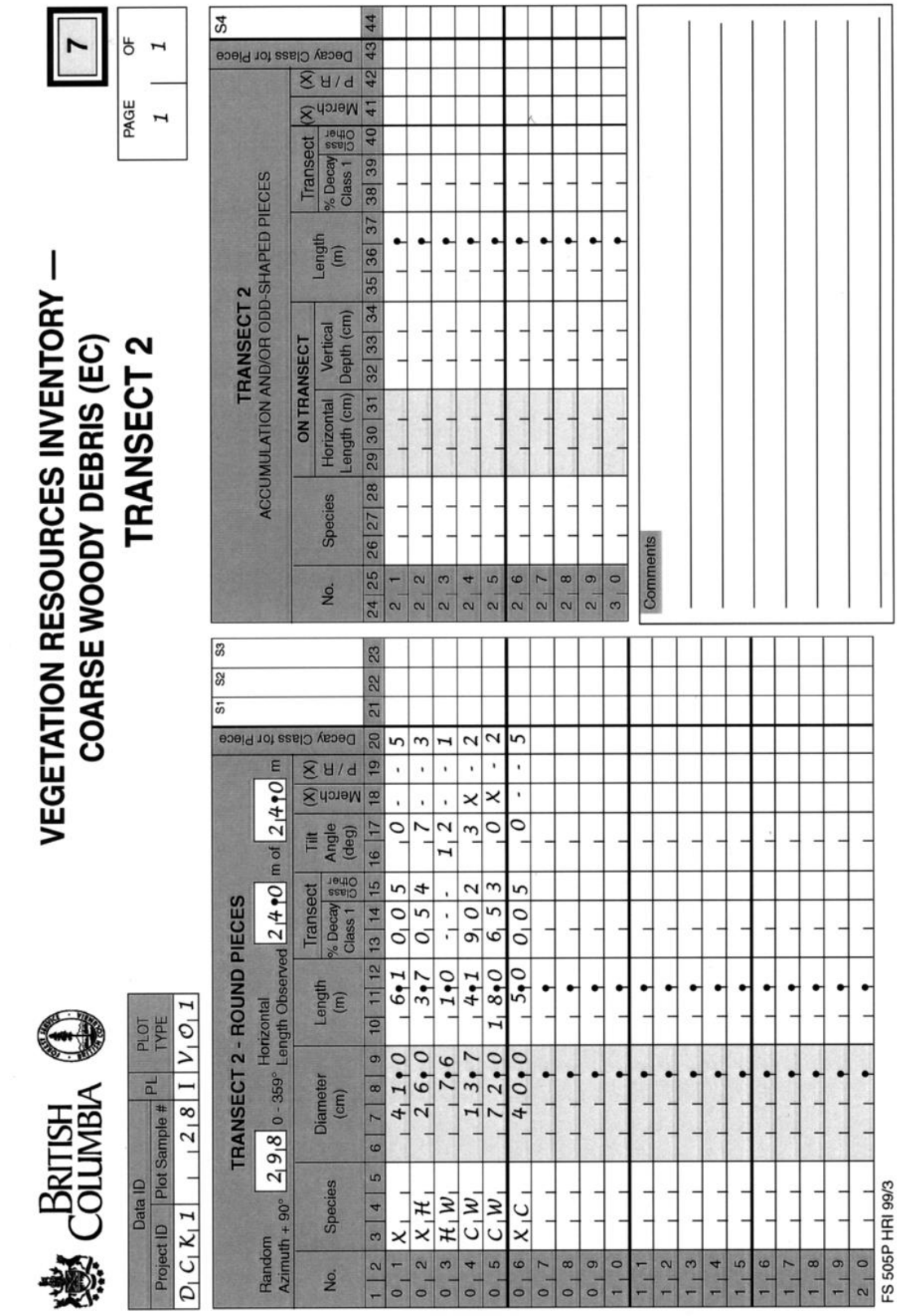


Figure A.10 — Sample field card 7: Coarse Woody Debris (EC) (Transect 2)

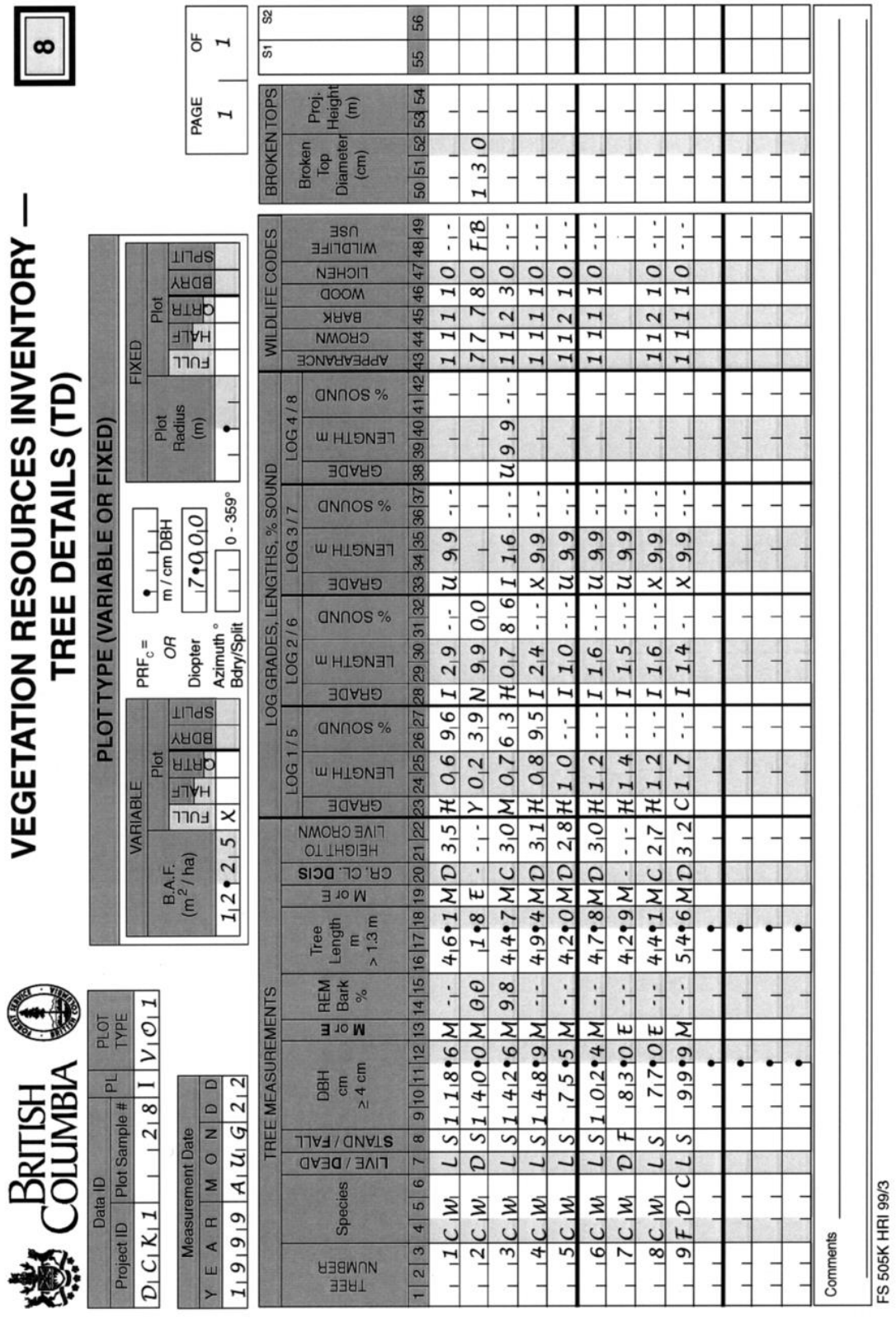


Figure A.11 — Sample field card 8: Tree Details (TD) (front)

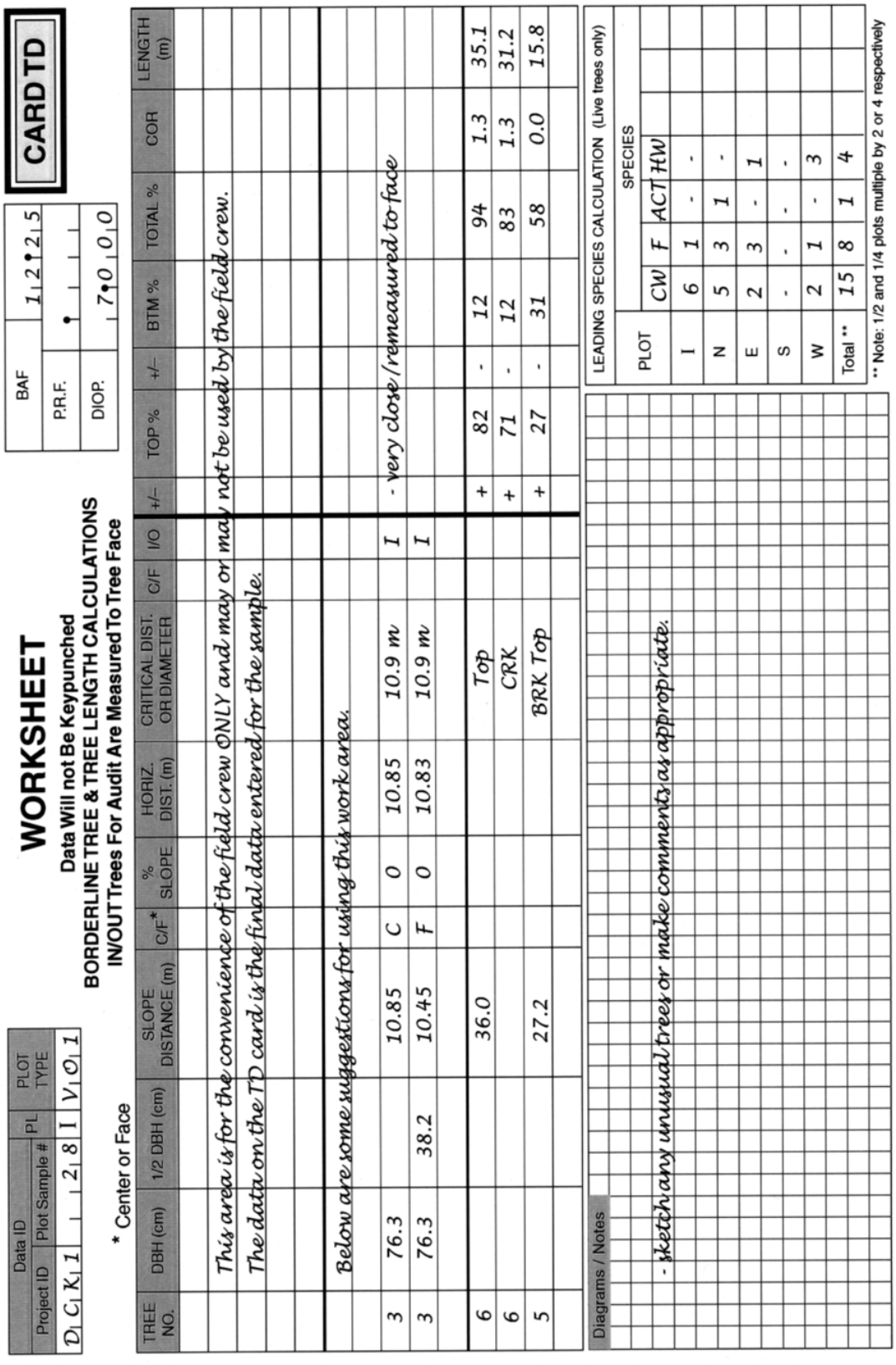


Figure A.12 — Sample field card 8: Tree Details (TD) (reverse).

BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — TREE LOSS INDICATORS (TL)

9

Project ID	Plot Sample #	PL	PLOT TYPE	PAGE	OF
DCK1	28		VO1	1	1

TREE NUMBER (1–3)	DAMAGE AGENTS: Damage Agent Code (A) (4–6)	SEVERITY (7–8)	Damage Agent Code (B) (9–11)	SEVERITY (12–13)	LOSS INDICATORS: Loss Indicator Code (1) (14–16)	+/− (17)	Location From (m) (18–20)	+/− (21)	Location To (m) (22–24)	FREQUENCY (25)
1	O						•		•	
2	O						•		•	
3	-				SCA	+	0•0	+	6•5	4
4	O						•		•	
5	AX				SCA	+	6•0	+	6•3	4
6	O						•		•	
7	AW						•		•	
8	-				SCA	+	0•6	+	2•8	2
9	O						•		•	
							•		•	
							•		•	
							•		•	
							•		•	

TREE NUMBER	Loss Indicator Code (2) (26–28)	+/− (29)	From (m) (30–32)	+/− (33)	To (m) (34–36)	FREQUENCY (37)	Loss Indicator Code (3) (38–40)	+/− (41)	From (m) (42–44)	+/− (45)	To (m) (46–48)	FREQUENCY (49)	STEM MAP: Azimuth to tree° (50–52)	Distance to Tree Face (m) (53–56)	S1 (57)	S2 (58)
1			•		•				•		•		0	0•00		
2			•		•				•		•		21	8•21		
3			•		•				•		•		123	6•20		
4			•		•				•		•		148	6•32		
5			•		•				•		•		194	5•16		
6			•		•				•		•		255	6•37		
7			•		•				•		•		292	6•10		
8			•		•				•		•		326	5•01		
9			•		•				•		•		351	9•02		
			•		•				•		•			•		
			•		•				•		•			•		
			•		•				•		•			•		
			•		•				•		•			•		

Comments *IPC pin located inside tree #1.*

FS 505J HRI 99/3

Figure A.13 — Sample field card 9: Tree Loss Indicators (TL)

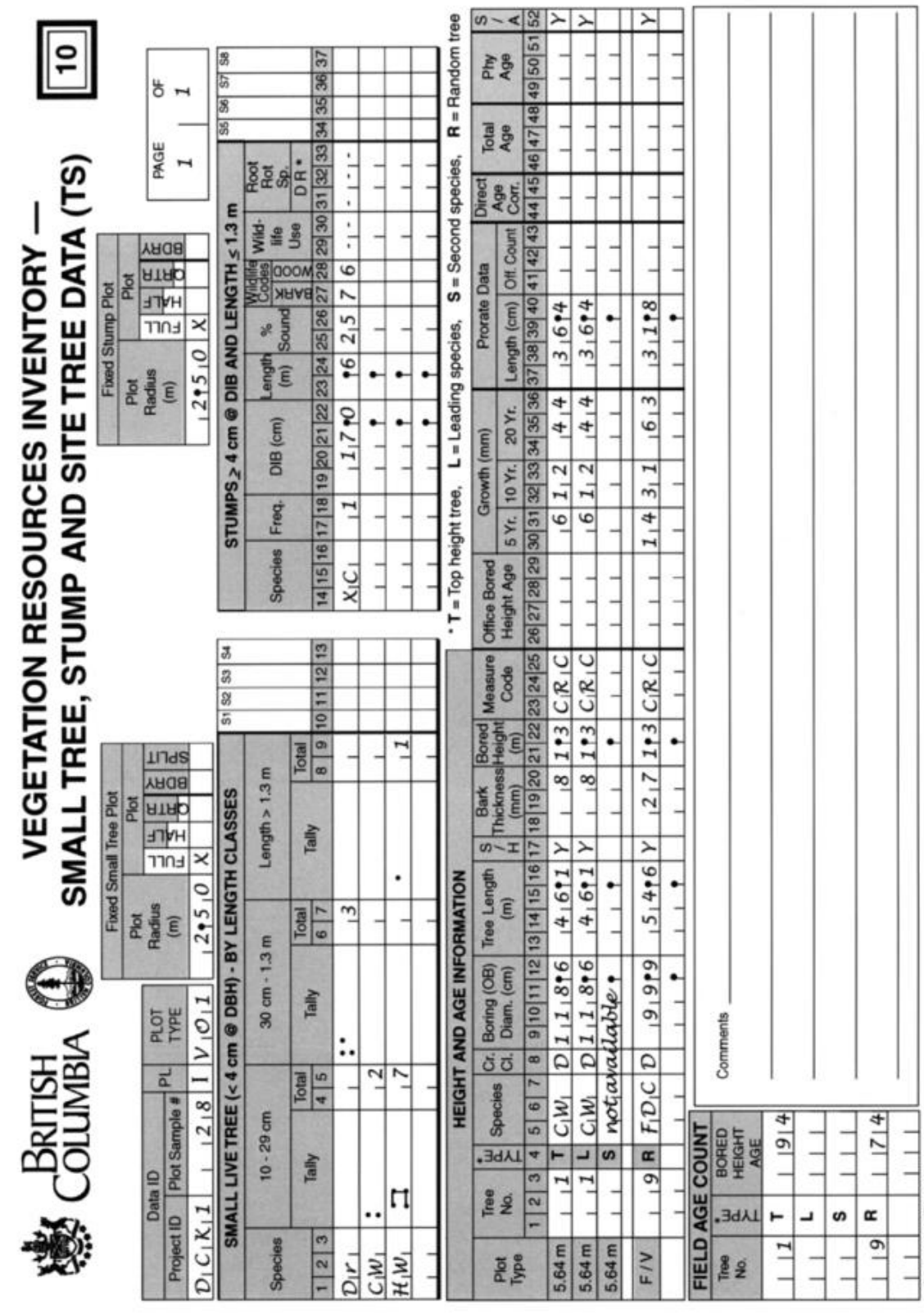


Figure A.14 — Sample field card 10: Small Tree, Stump, and Sample Tree Data (TS)

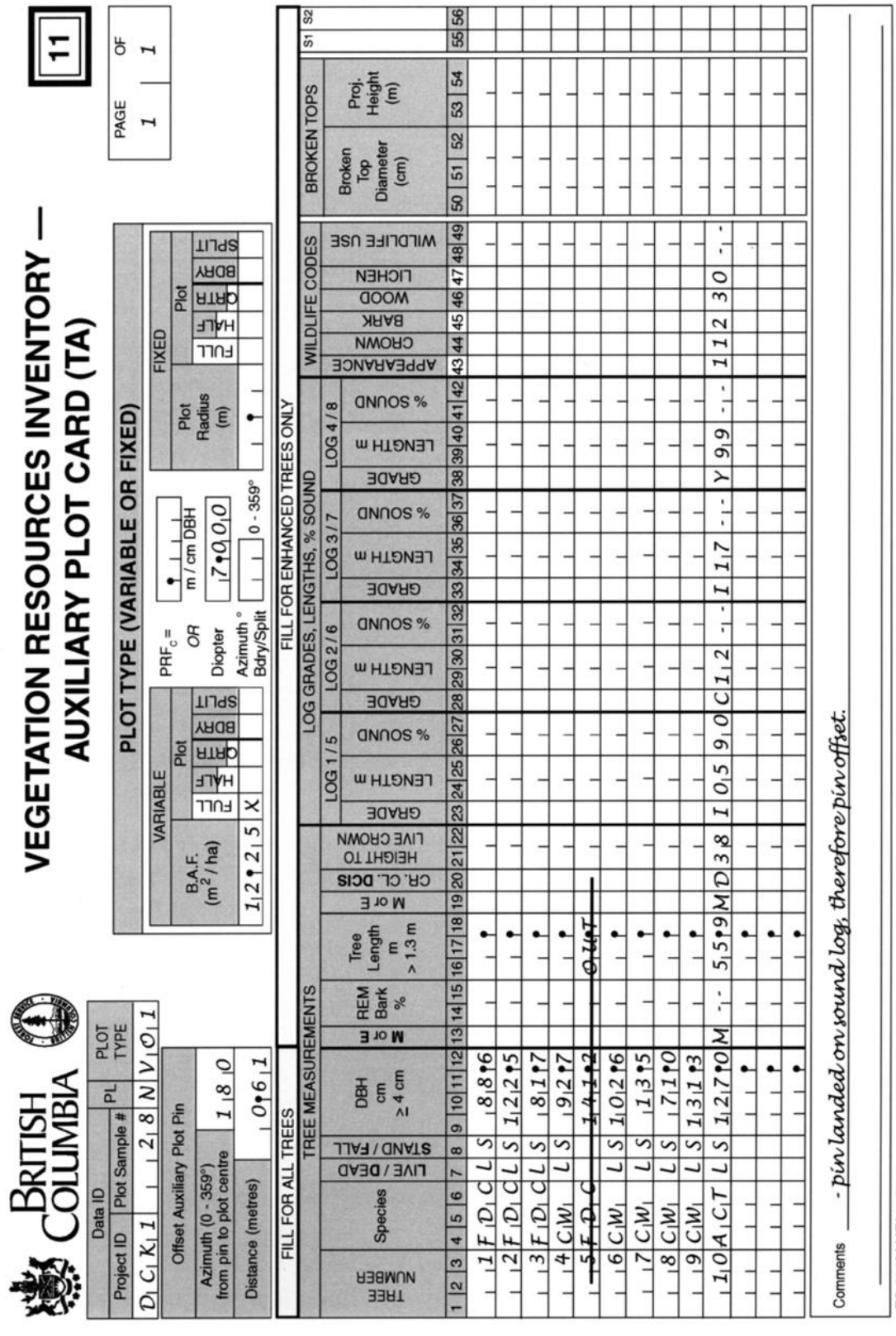


Figure A.15 — Sample field card 11: Auxiliary Plot Card (TA) (front)

BRITISH COLUMBIA

CARD TA

VEGETATION RESOURCES INVENTORY — AUXILIARY PLOT TREE DATA

PAGE	OF
1	1

Data ID: Project ID	Data ID: Plot Sample #	PL	PLOT TYPE
DCK1	28	N	VO1

HEIGHT AND AGE INFORMATION

Plot Type	Tree No. (1-3)	TYPE (4)	Species (5-7)	Cr. Cl. (8)	Boring (OB) Diam. (cm) (9-12)	Tree Length (m) (13-16)	S/H (17)	Bark Thickness (mm) (18-20)	Bored Height (m) (21-22)	Measure Code (23-25)	Office Bored Height Age (26-29)	Growth (mm) 5 Yr. (30-31)	Growth (mm) 10 Yr. (32-33)	Growth (mm) 20 Yr. (34-36)	Prorate Data Length (cm) (37-40)	Prorate Data Off. Count (41-43)	Direct Age Corr. (44-45)	Total Age (46-48)	Phy Age (49-51)	S/A (52)
5.64 m	6	L	CW	C	102.6	35.4	Y	11	1.3	ROT		3	6	12	12.1					N
					.	.			.						.					
					.	.			.						.					

DAMAGE AGENTS / LOSS INDICATORS / FIELD AGE COUNT

TREE NUMBER (1-3)	Damage Agent Code (A) (4-6)	SEVERITY (7-8)	Damage Agent Code (B) (9-11)	SEVERITY (12-13)	Loss Indicator Code (1) (14-16)	+/– (17)	From (m) (18-20)	+/– (21)	To (m) (22-24)	FREQUENCY (25)	Loss Indicator Code (2) (26-28)	+/– (29)	From (m) (30-32)	+/– (33)	To (m) (34-36)	FREQUENCY (37)	Loss Indicator Code (3) (38-40)	+/– (41)	From (m) (42-44)	+/– (45)	To (m) (46-48)	FREQUENCY (49)	S4 (50)	S5 (51)	Field Age Count: Tree No.	TYPE	BORED HEIGHT AGE
10	-				SCA	+	0.0	+	0.8	1	FRK	+	34.6		.	1			.		.				6	L	83
							.		.				.		.				.		.						
							.		.				.		.				.		.						

WORKSHEET DATA WILL NOT BE KEYPUNCHED

BAF	P.R.F.	DIOP.
.	.	.

TREE NO.	DBH (cm)	1/2 DBH (cm)	SLOPE DISTANCE (m)	C/F*	% SLOPE	HORIZ. DIST. (m)	CRITICAL DIST. OR DIAMETER	C/F	I/O	+/–	TOP %	+/–	BTM %	TOTAL %	COR	LENGTH (m)
6			31.0				TOP			+	92	-	18	110	1.3	35.4
10			38.3				FRK			+	63	-	24	87	1.3	34.6

* CENTER OR FACE

Figure A.16 — Sample field card 11: Auxiliary Plot Card (TA) (reverse)

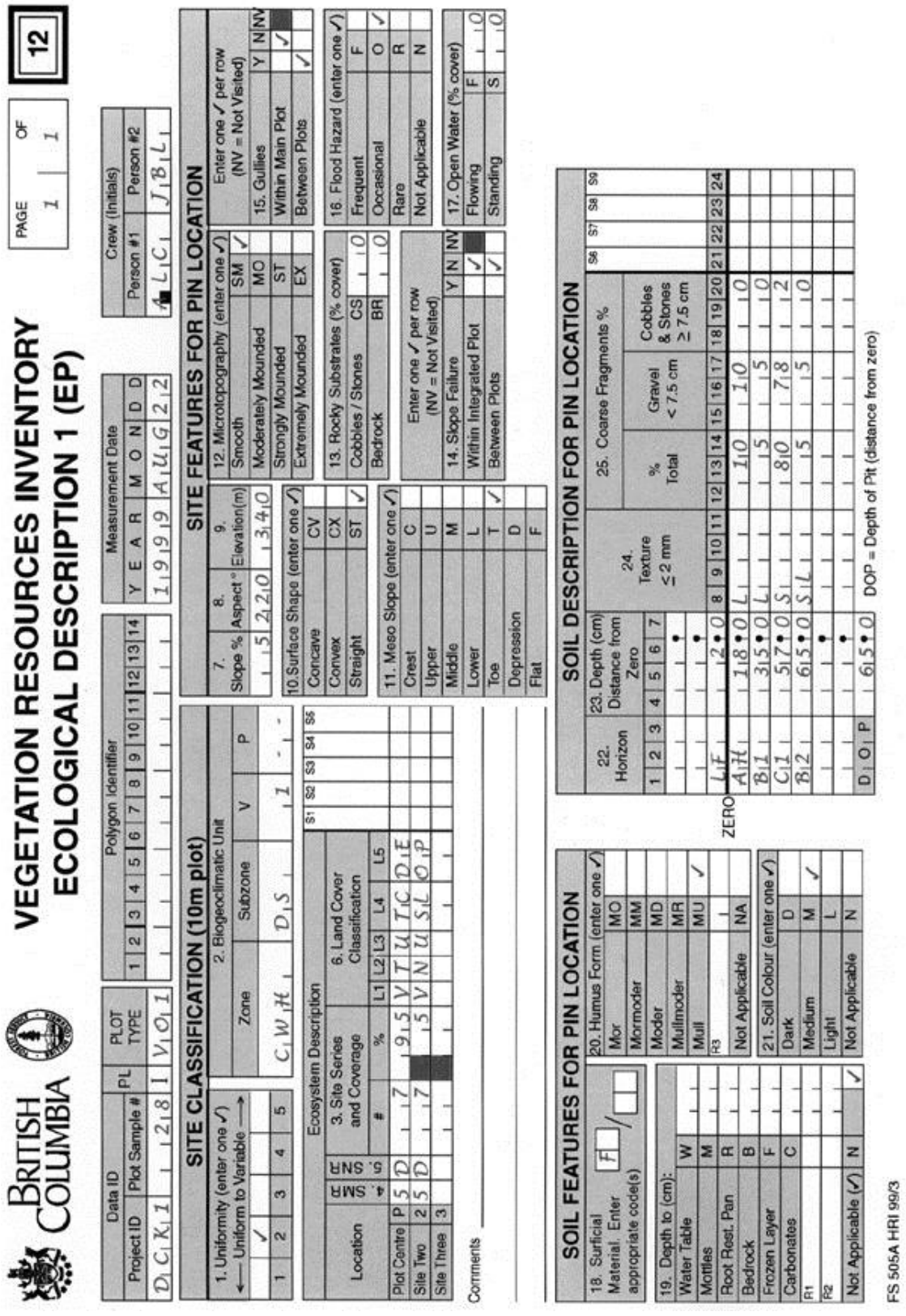


Figure A.17 — Sample field card 12: Ecological Description 1 (EP) (front)

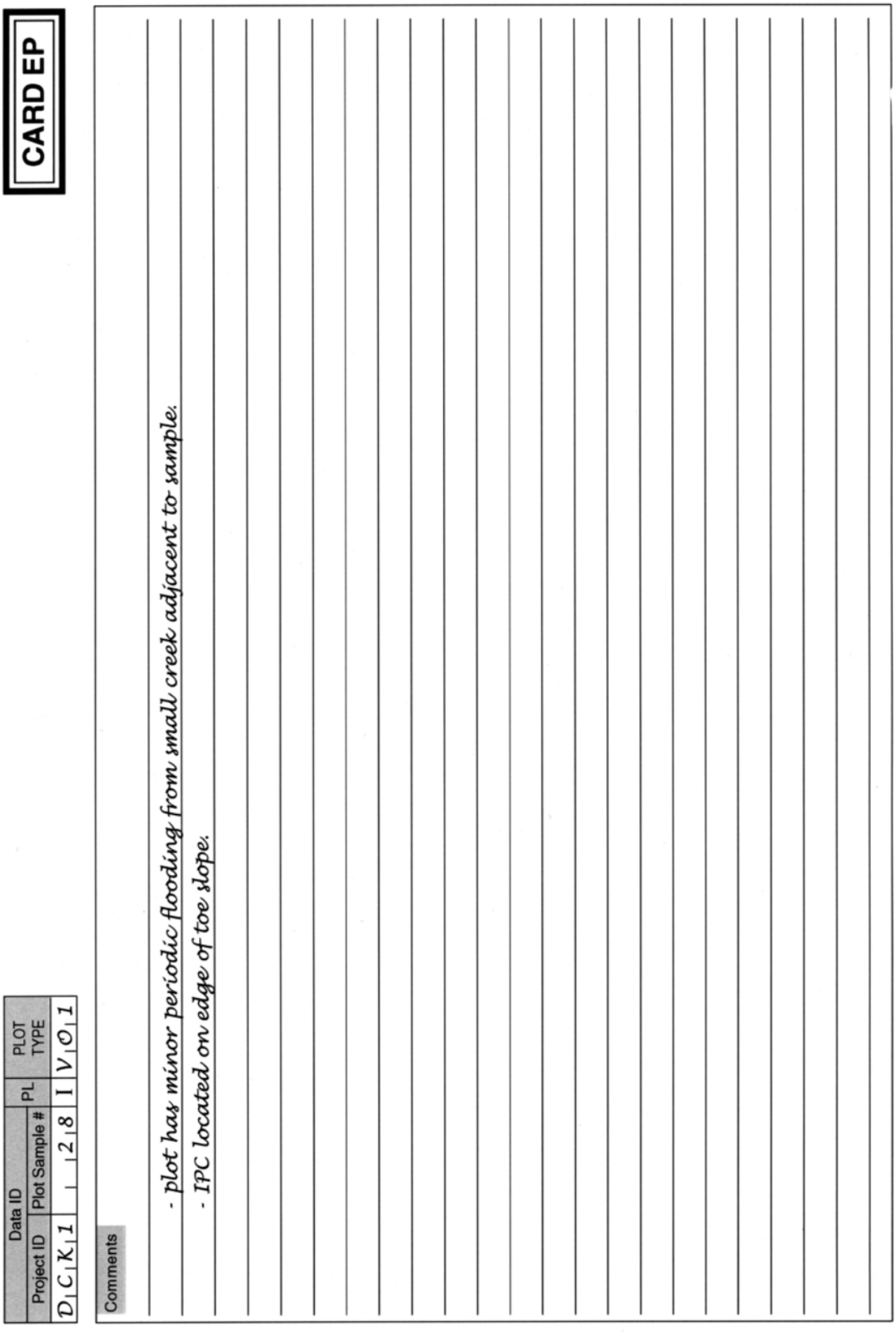


Figure A.18 — Sample field card 12: Ecological Description 1 (EP) (reverse)

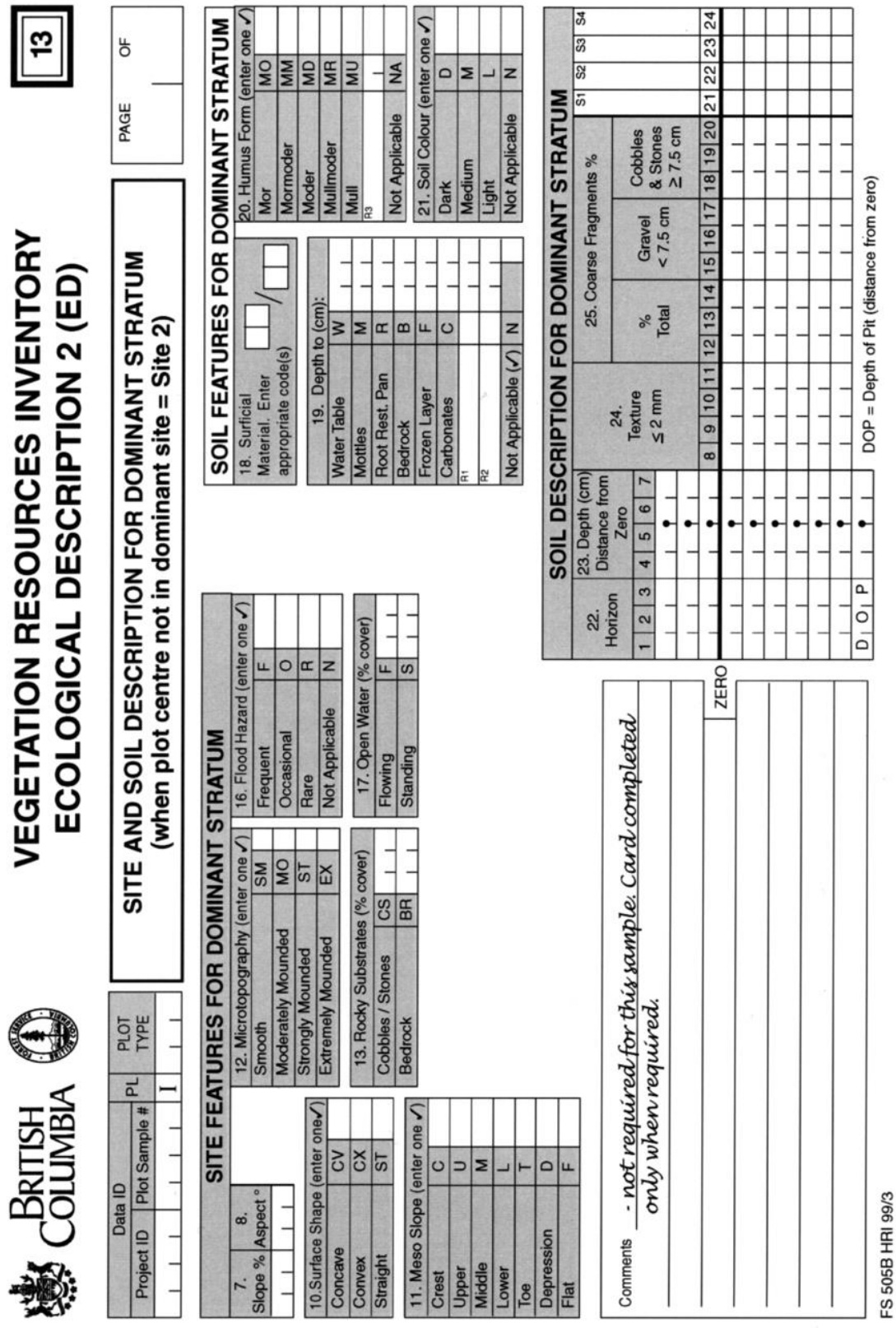


Figure A.19 — Sample field card 13: Ecological Description 2 (ED)

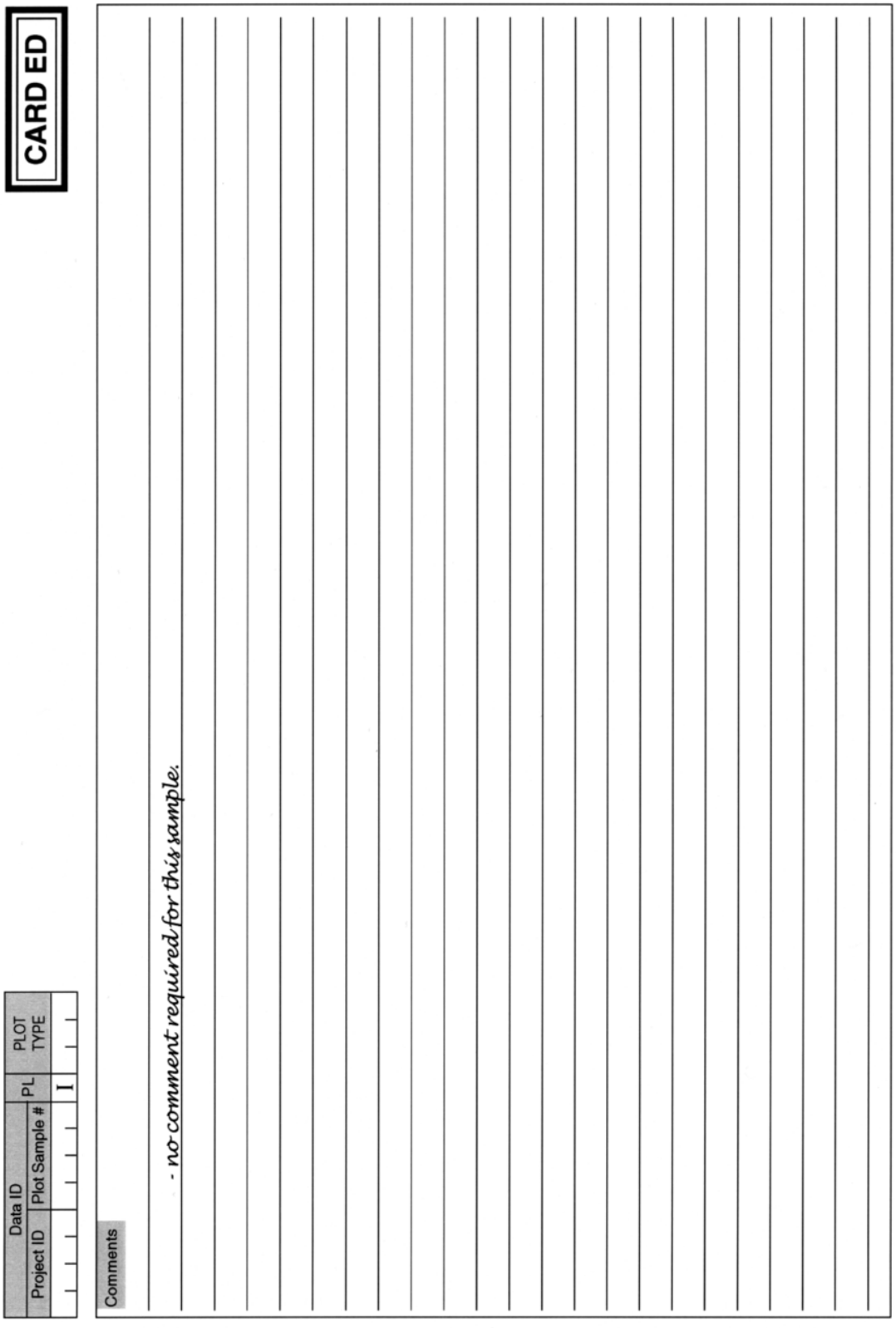


Figure A.20 — Sample field card 13: Ecological Description 2 (ED) (reverse)

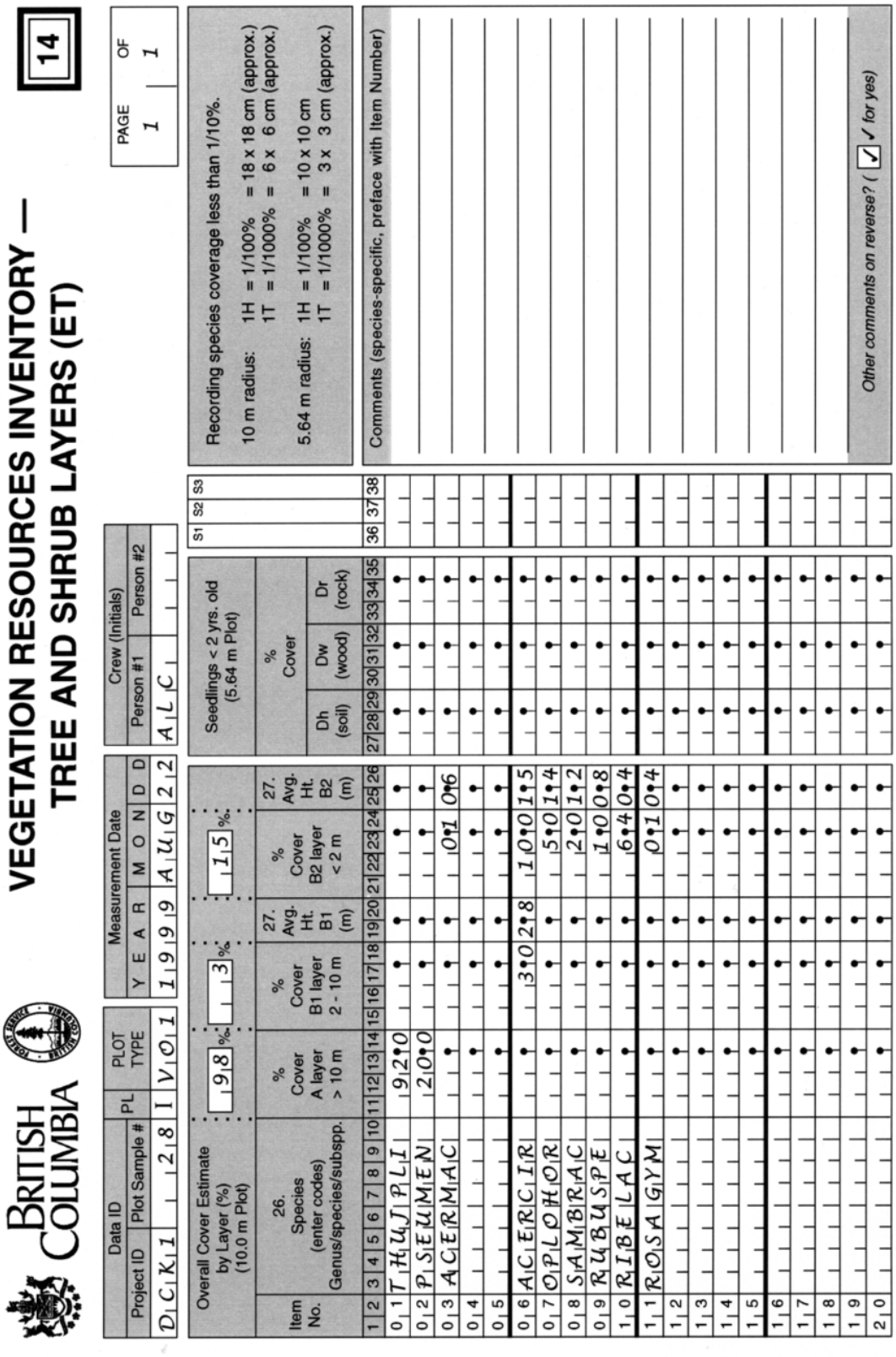


Figure A.21 — Sample field card 14: Tree and Shrub Layers (ET) (front)

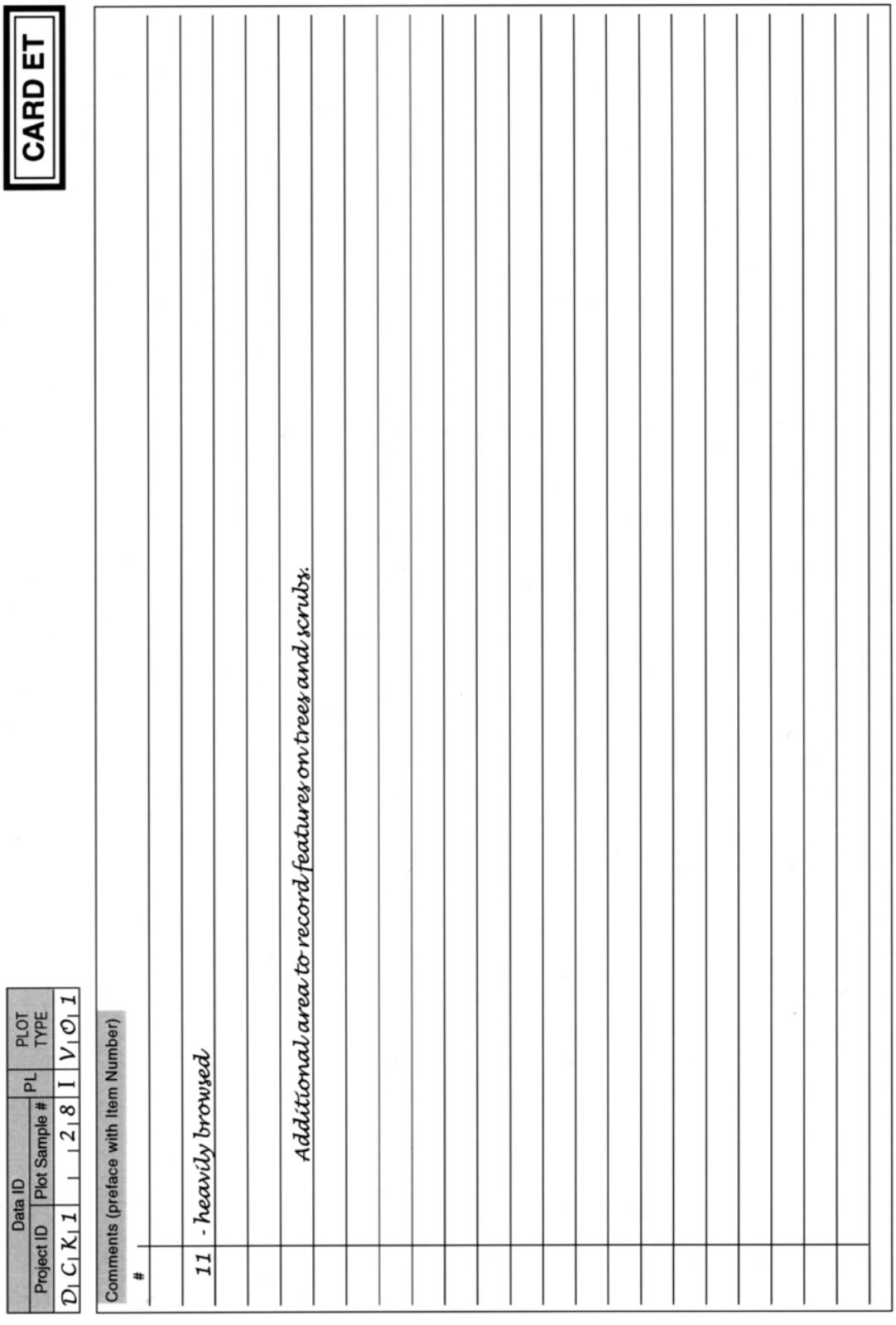


Figure A.22 — Sample field card 14: Tree and Shrub Layers (ET) (reverse)

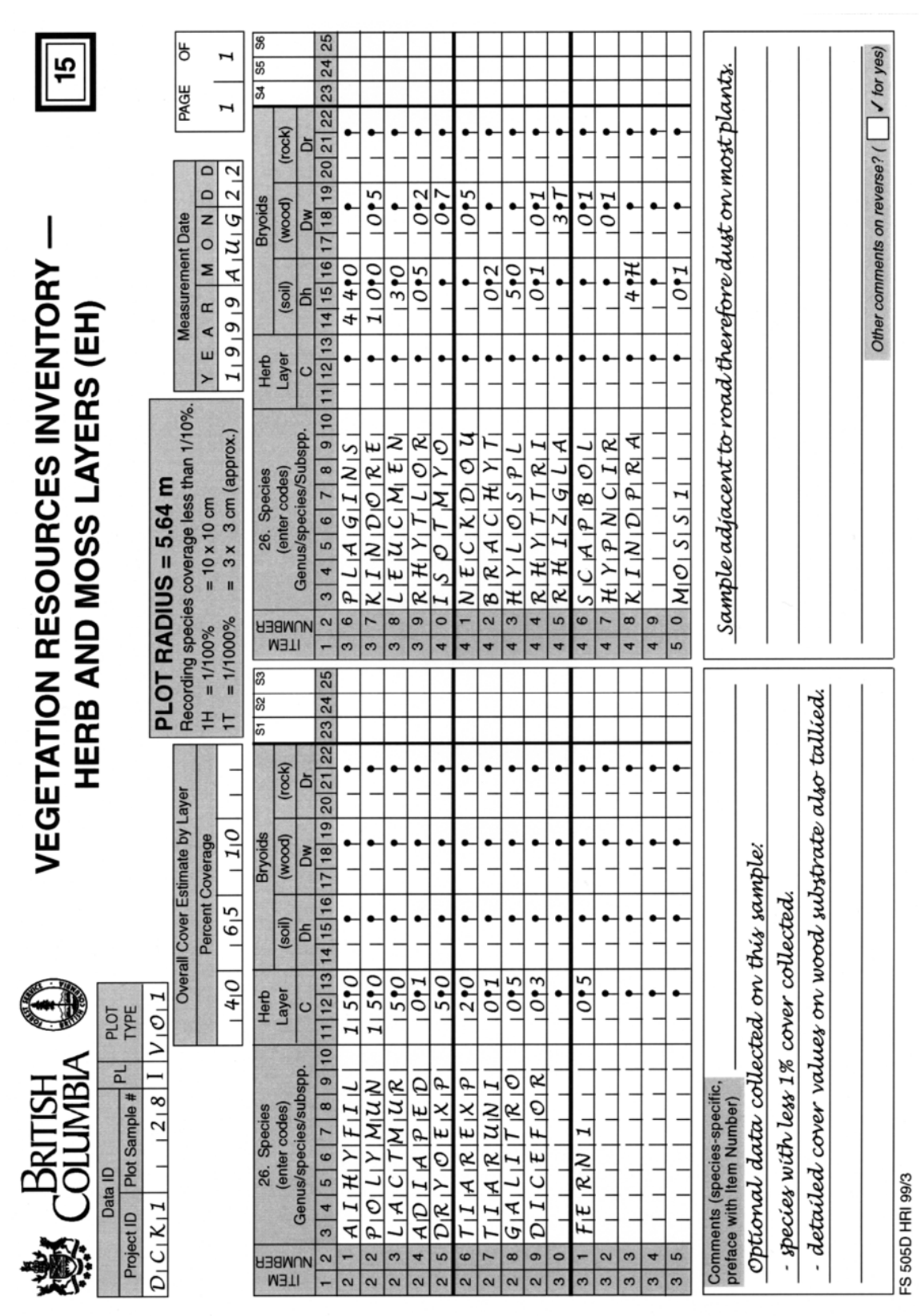


Figure A.23 — Sample field card 15: Herb and Moss Layers (EH) (front)

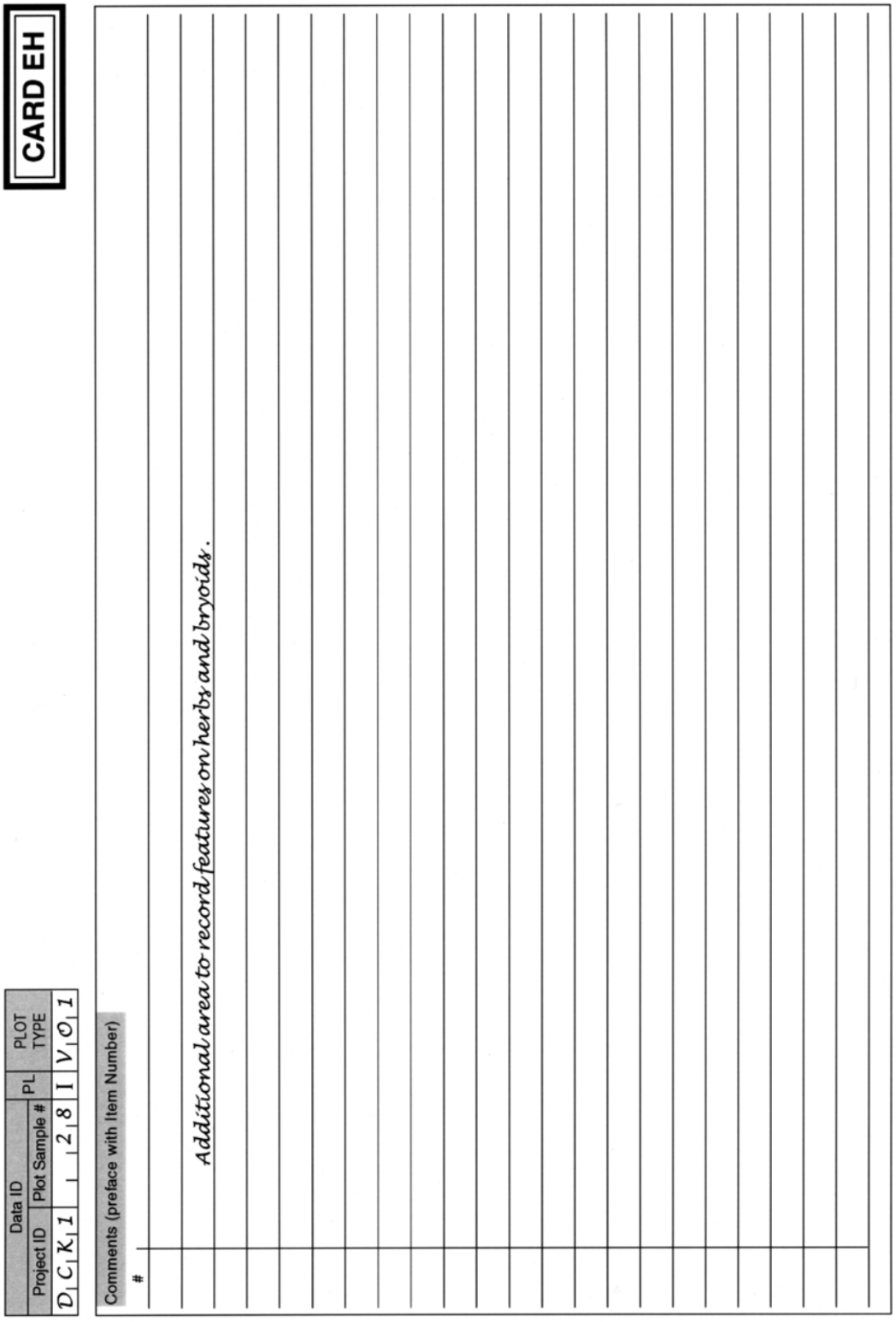
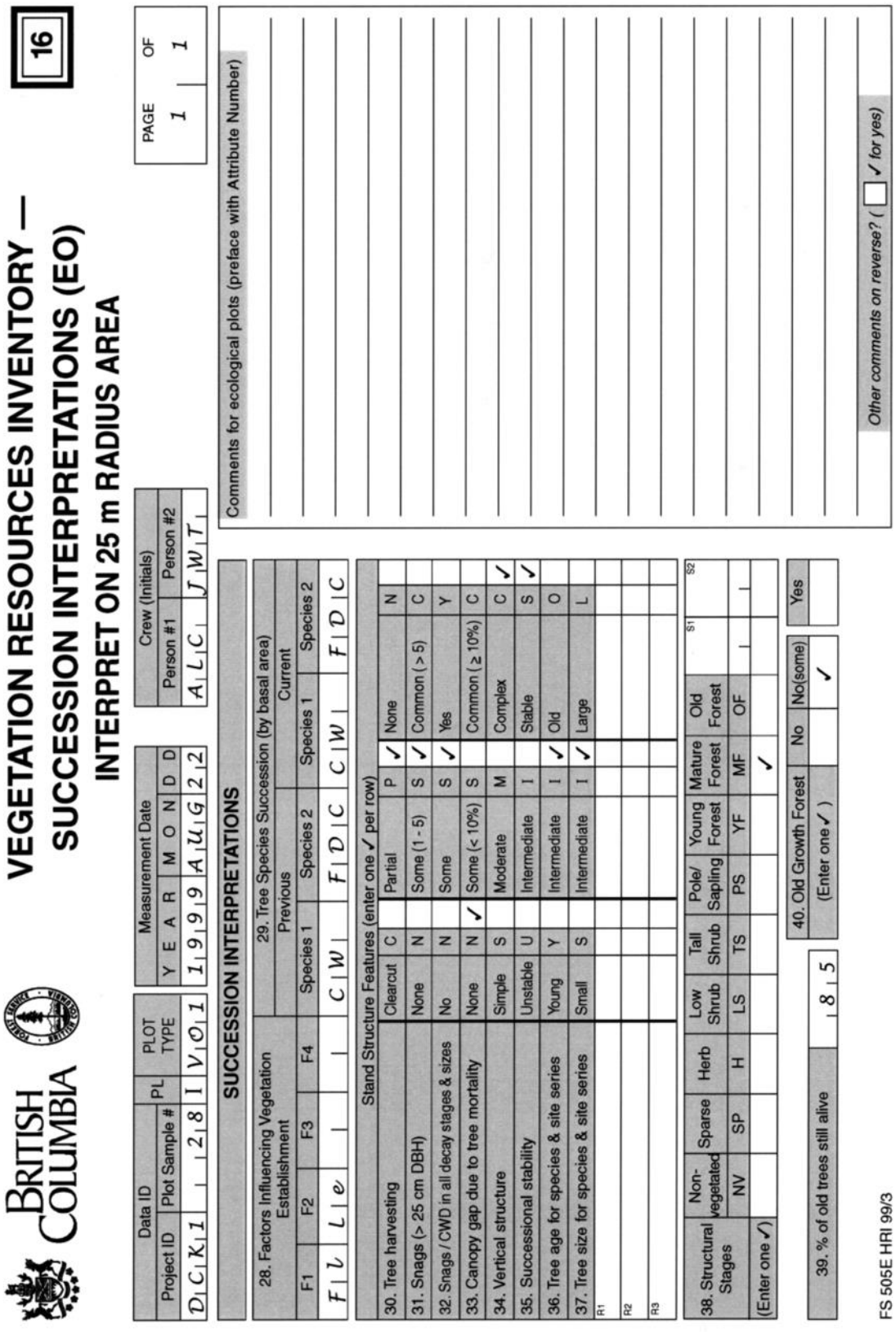


Figure A.24 — Sample field card 15: Herb and Moss Layers (EH) (reverse)



BRITISH COLUMBIA

VEGETATION RESOURCES INVENTORY — SUCCESSION INTERPRETATIONS (EO)
INTERPRET ON 25 m RADIUS AREA

16

Data ID		PL	PLOT TYPE
Project ID	Plot Sample #		
DCK1	28	I	VO1

Measurement Date								
Y	E	A	R	M	O	N	D	D
1	9	9	9	A	U	G	2	2

Crew (Initials)	
Person #1	Person #2
ALC	JWT

PAGE 1 OF 1

SUCCESSION INTERPRETATIONS

28. Factors Influencing Vegetation Establishment			
F1	F2	F3	F4
FL	Le		

29. Tree Species Succession (by basal area)			
Previous		Current	
Species 1	Species 2	Species 1	Species 2
CW	FDC	CW	FDC

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						
R1														
R2														
R3														

38. Structural Stages	Non-vegetated	Sparse	Herb	Low Shrub	Tall Shrub	Pole/ Sapling	Young Forest	Mature Forest	Old Forest	S1	S2
	NV	SP	H	LS	TS	PS	YF	MF	OF		
(Enter one ✓)								✓			

39. % of old trees still alive	85

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 HRI 99/3

Figure A.25 — Sample field card 16: Succession Interpretations (EO) (front).

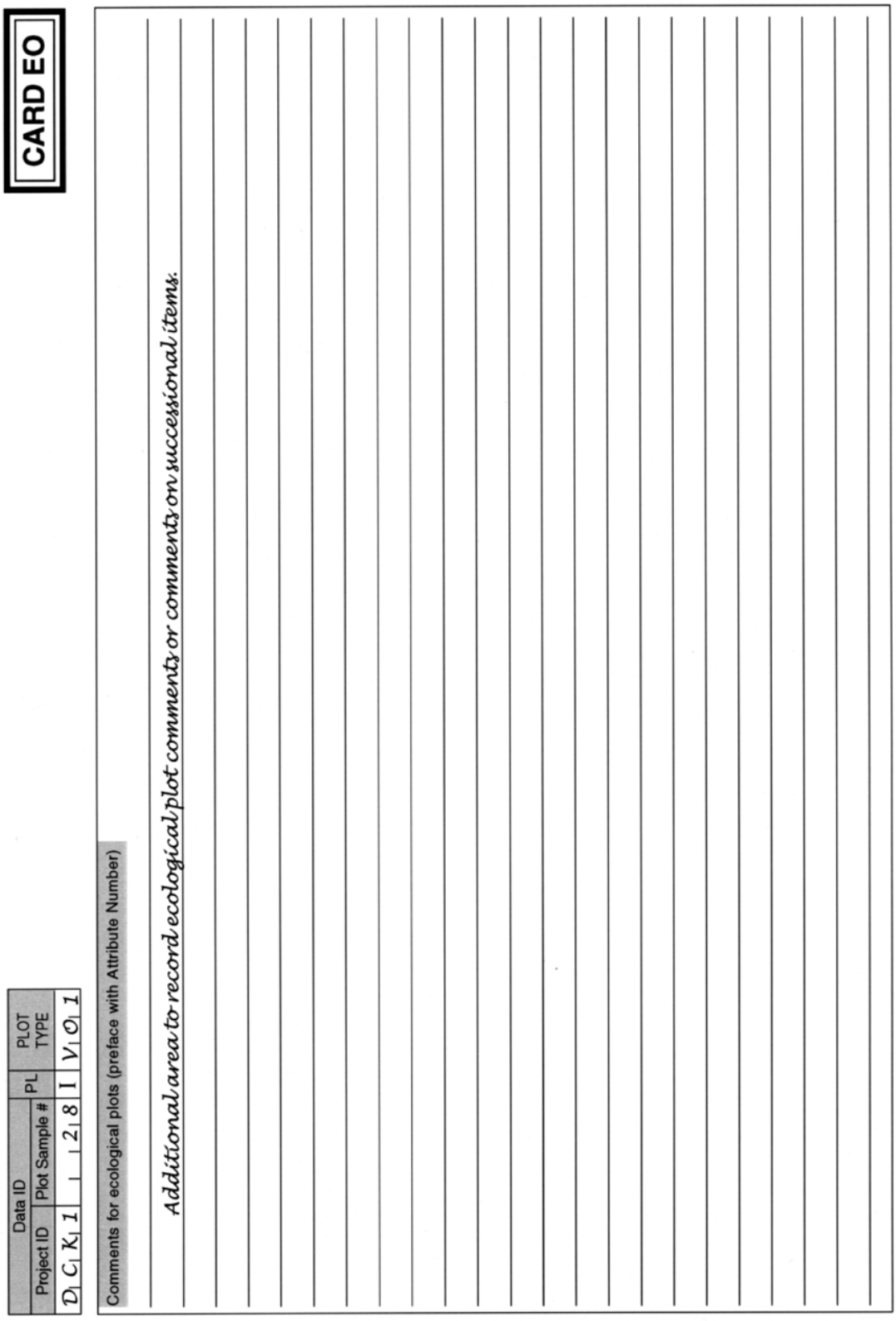


Figure A.26 — Sample field card 16: Succession Interpretations (EO) (reverse).

Appendix B: Ground Sampling Field Guides

This appendix contains copies of the following Field Guides.

Figure B.1 — T-1 Net Factor Procedures for Loss Indicators.

Figure B.2 — T-2 Log Grade Summaries for Fir/Pine/Larch, Common, Small Tree, and Deciduous.

Figure B.3 — T-3 Log Grade Summaries for Cedar and Hemlock/Balsam, Crown Class Codes, Partial Plot Rules.

Figure B.4 — T-4 Log Grade Summaries for Spruce and Cypress/Yew, Loss Indicator Codes, Age Measure Codes, and Tree Class.

Figure B.5 — T-5 Tree Species Codes.

Figure B.6 — T-6 Wildlife Tree Attributes (crown condition, bark retention, wood condition, visual appearance, wildlife use), CWD decay classes and Accumulation codes.

Figure B.7 — T-7 Forest Health: Damage Agent Codes.

Figure B.8 — T-8 Forest Health: Damage Agent Codes. - Continued

Figure B.9 — T-11 Damage Agent Severity Codes, plus Plot Radius Factors to Tree Face.

Figure B.10 — T-12 Hawksworth Mistletoe Scale and Estimating the Abundance of Arboreal Forage Lichens.

Figure B.11 — T-9 Forest Health: Damage Agent Ranking – Growth Reduction & Mortality Agents, Form & Quality Damage Agents.

Figure B.12 — T-10 Forest Health: Damage Agent Ranking – Early Mortality Agents, Late Mortality Agents.

Figure B.13 — T-13 Tree Identification Key – Conifers.

Figure B.14 — T-14 Tree Identification Key – Conifers continued.

Figure B.15 — T-15 Tree Identification Key – Exotic Broadleaves.

Figure B.16 — T-16 Tree Identification Key – Native Broadleaves.

Figure B.17 — R-1 Range Resources: Range Utilization Classes, Phenology Codes, Split Plot Procedures

Figure B.18 — R-2 Range Resources: Low Woody Species and Intermediate Life Forms.

Figure B.19 — N-1 Random numbers for samples ending in 01–50.

Figure B.20 — N-2 Random numbers for samples ending in 51–100.

Figure B.21 — E-1 B.C. Land Cover Classification Scheme Codes – Levels I to IV.

Figure B.22 — E-1 B.C. Land Cover Classification Scheme Codes – Levels V.

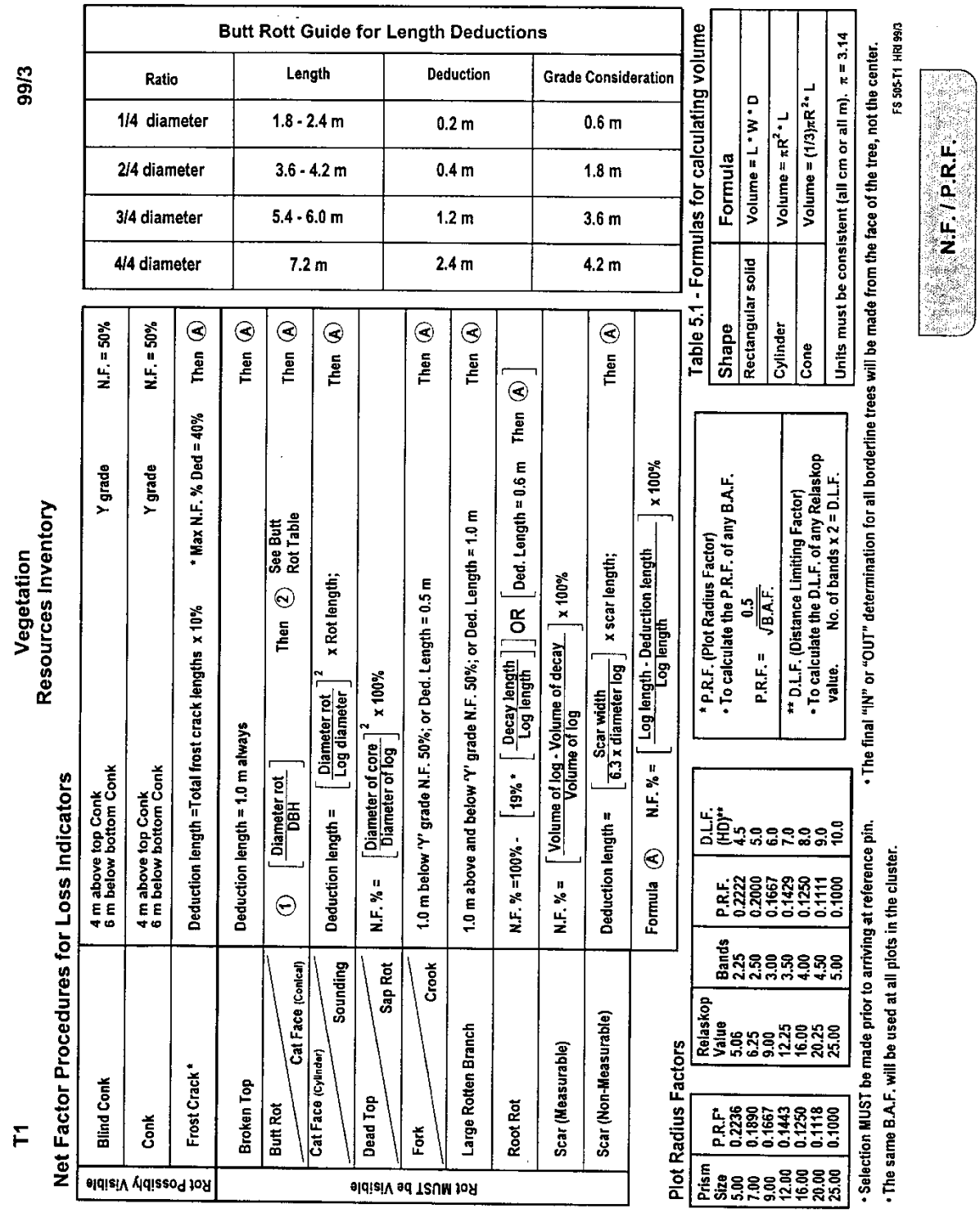


Figure B.1 — Field Guide T-1 Net Factor Procedures for Loss Indicators.

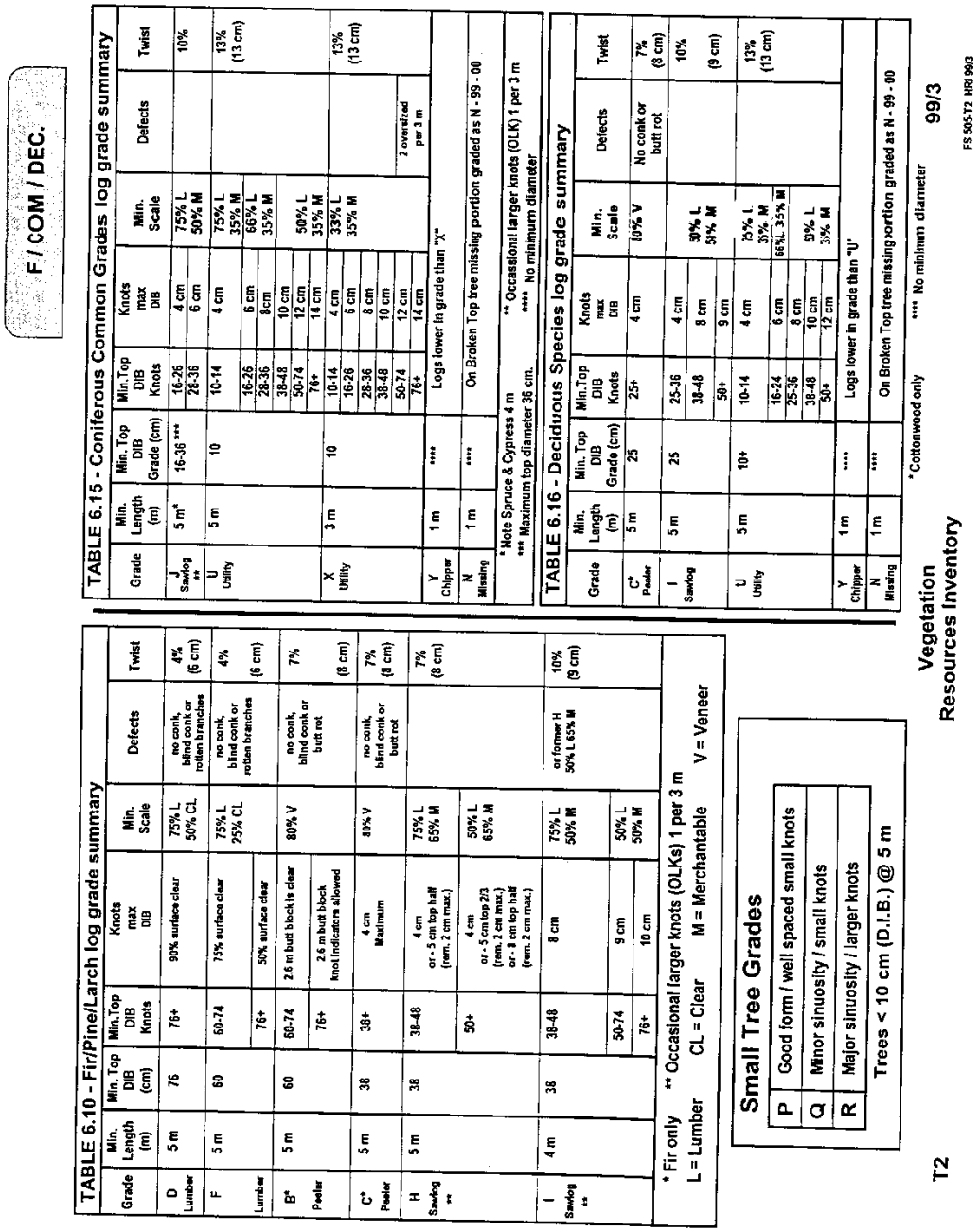


Figure B.2 — Field Guide T-2 Log Grade Summaries for Fir/Pine/Larch, Common, Small Tree, and Deciduous.

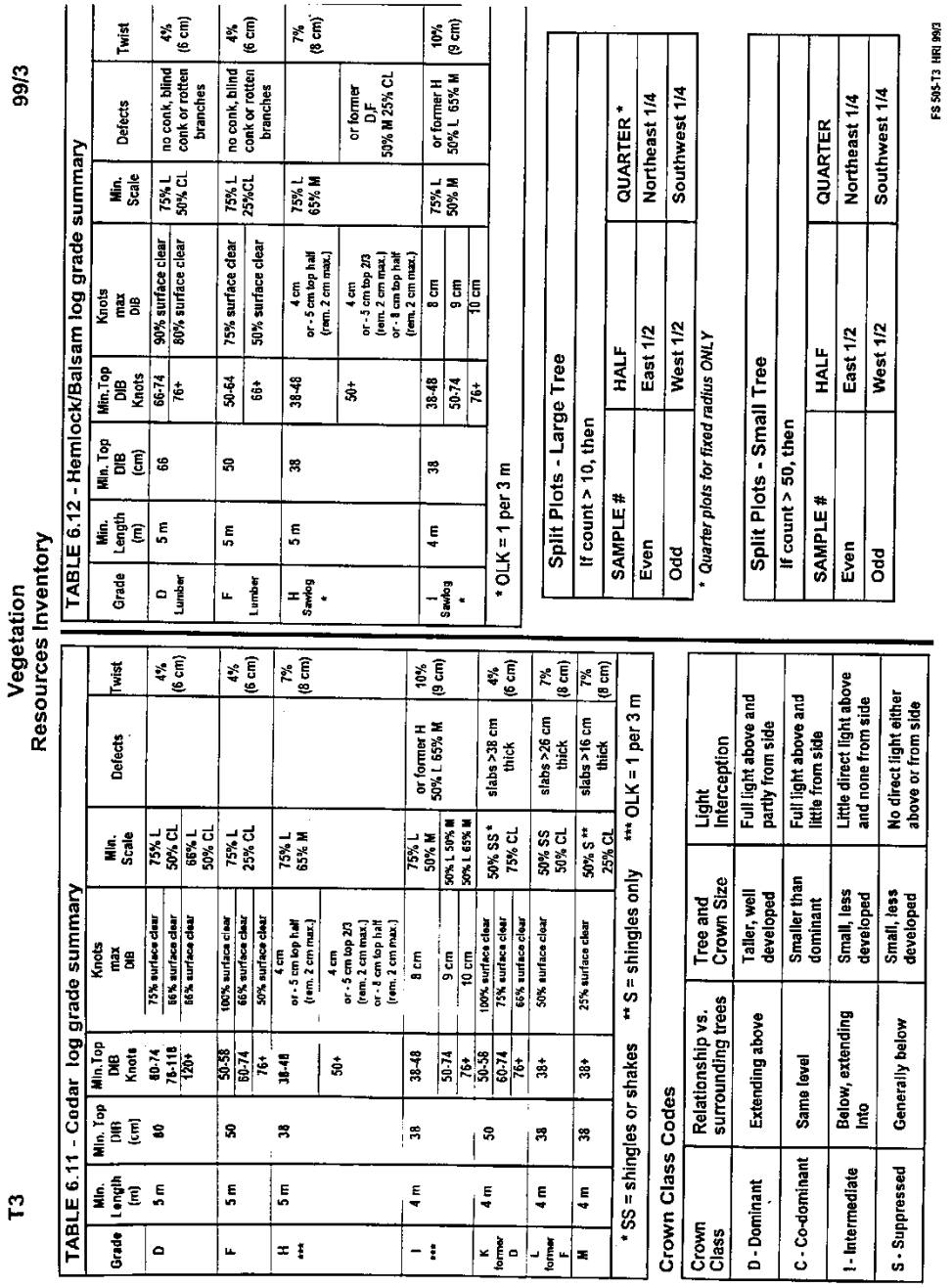


Figure B.3 — Field Guide T-3 Log Grade Summaries for Cedar and Hemlock/Balsam, Crown Class Codes, Partial Plot Rules.

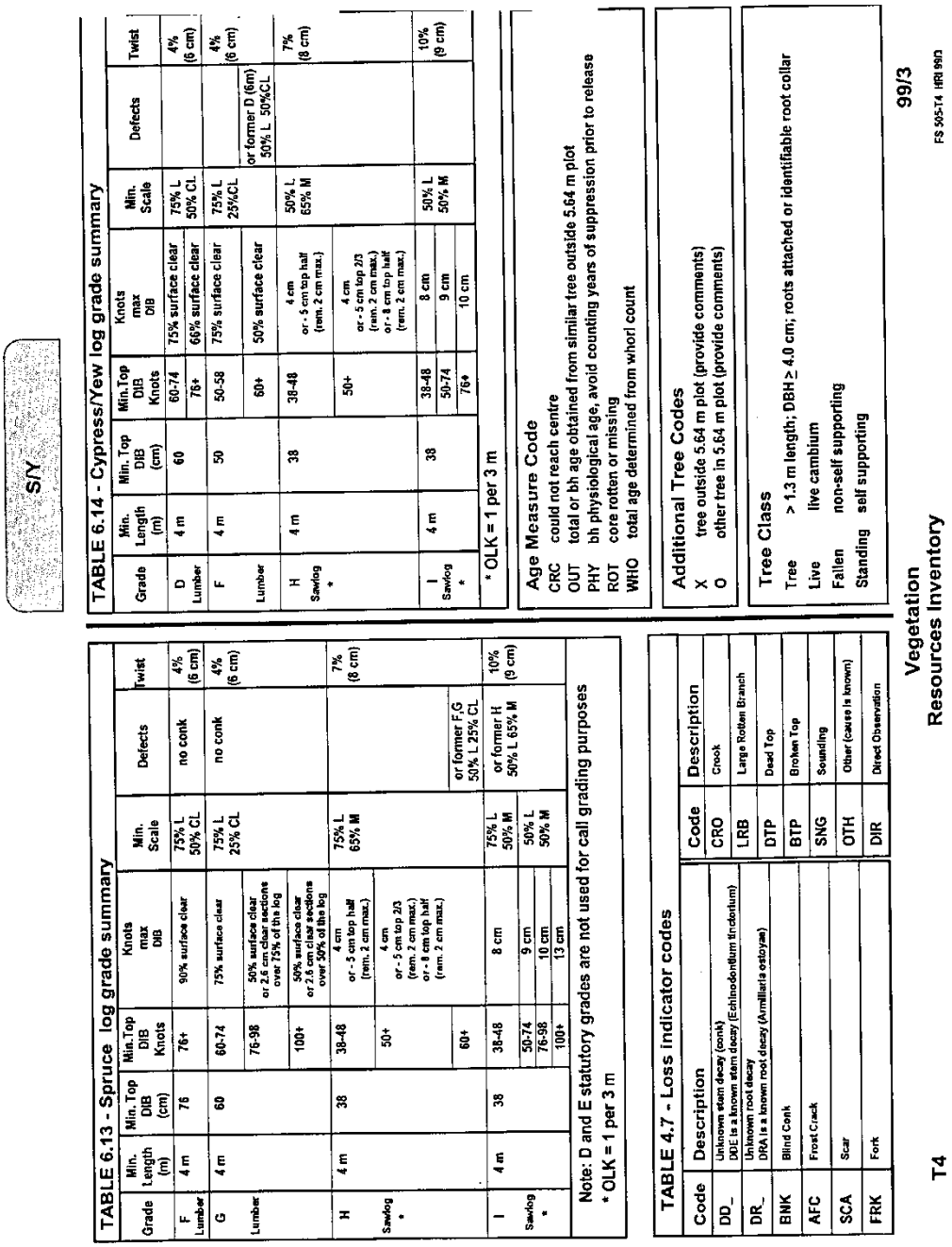


Figure B.4 — Field Guide T-4 Log Grade Summaries for Spruce and Cypress/Yew, Loss Indicator Codes, Age Measure Codes, and Tree Class.

Tree Species List: The attached list recognizes a tree as being woody, single stemmed and capableof growing greater than 10m in height based on Titus 1980). For a list of codes for exotic species to BC consult the sampling procedures.

Common Name	Scientific Name	Code	
NATIVE CONIFERS			
Cedar	***Thuja***	C	
western redcedar	*Thuja plicata*		Cw
Cypress	***Chamaecyparis***	Y	
yellow-cedar	*C. nootkatensis*		Yc
Douglas-fir	***Pseudotsuga***	F	
Douglas-fir	*P. menziesii*		Fd
coastal Douglas-fir	*P. menziesii* var. *menziesii*		Fdc
interior Douglas-fir	*P. menziesii* var. *glauca*		Fdi
Fir (Balsam)	***Abies***	B	
amabilis fir	*A. amabilis*		Ba
grand fir	*A. grandis*		Bg
subalpine fir	*A. lasiocarpa*		Bl
Hemlock	***Tsuga***	H	
mountain hemlock	*T. mertensiana*		Hm
western hemlock	*T. heterophylla*		Hw
mountain x western hemlock hybrid	*T. mertensiana x heterophylla*		Hxm
Juniper	***Juniperus***	J	
Rocky Mtn. Juniper	*J. scopulorum*		Jr
Larch	***Larix***	L	
alpine larch	*L. lyallii*		La
tamarack	*L. laricina*		Lt
western larch	*L. occidentalis*		Lw
Pine	***Pinus***	P	
jack pine	*P. banksiana*		Pj
limber pine	*P. flexilis*		Pf
lodgepole pine	*P. contorta*		Pl
lodgepole pine	*P. contorta* var. *latifolia*		Pli
lodgepole x jack pine hybrid	*P. x murraybanksiana*		Pxj
ponderosa pine	*P. ponderosa*		Py
shore pine	*P. contorta* var. *contorta*		Plc
western white pine	*P. monticola*		Pw
whitebark pine	*P. albicaulis*		Pa
Spruce	***Picea***	S	
black spruce	*P. mariana*		Sb
Engelmann spruce	*P. engelmannii*		Se
Sitka spruce	*P. sitchensis*		Ss
white spruce	*P. glauca*		Sw
spruce hybrid	*Picea* cross		Sx
Engelmann x white	*P. engelmannii x glauca*		Sxw
Sitka x white	*P. x lutzii*		Sxl
Sitka x unknown hybrid	*P. sitchensis x ?*		Sxs
Yew	***Taxus***	T	
western yew	*Taxus brevifolia*		Tw

Version 4.1 , January 1999

Common Name	Scientific Name	Code	
DECIDUOUS			
Alder	***Alnus***	D	
red alder	*A. rubra*		Dr
Apple	***Malus***	U	
Pacific crab apple	*Malus fusca*		Up
Aspen, Cottonwood or Poplar	***Populus***	A	
poplar	*P. balsamifera*		Ac
balsam poplar	*P. b.* ssp. *Balsamifera*		Acb
black cottonwood	*P. b.* ssp. *Trichocarpa*		Act
hybrid poplars	*P.* spp.		Ax
trembling aspen	*P. tremuloides*		At
Arbutus	***Arbutus***	R	
Arbutus	*Arbutus menziesii*		Ra
Birch	***Betula***	E	
Alaska paper birch	*B. neoalaskana*		Ea
Alaska x paper birch hybrid	*B. x winteri*		Exp
paper birch	*B. papyrifera*		Ep
water birch	*B. occidentalis*		Ew
Cascara	***Rhamnus***	K	
cascara	*R. purshiana*		Kc
Cherry	***Prunus***	V	
bitter cherry	*P. emarginata*		Vb
choke cherry	*P. virginiana*		Vv
pin cherry	*P. pensylvanica*		Vp
Dogwood	***Cornus***	G	
Pacific dogwood	*Cornus nuttallii*		Gp
Maple	***Acer***	M	
bigleaf maple	*A. macrophyllum*		Mb
vine maple	*A. circinatum*		Mv
Oak	***Quercus***	Q	
Garry oak	*Q. garryana*		Qg
Willow	***Salix* spp.**	W	
Bebb's willow	*S. bebbiana*		Wb
Pacific willow	*S. lucida*		Wp
peachleaf willow	*S. amygdaloides*		Wa
pussy willow	*S. discolor*		Wd
Scouler's willow	*S. scouleriana*		Ws
Sitka willow	*S. sitchensis*		Wt
UNKNOWN			
Unknown		X	
Unknown conifer			Xc
Unknown hardwood			Xh
OTHERS			
Other tree, not on list		Z	

* not measured on tree data cards

** for a list of introduced species codes refer to VRI procedures

TREE SP.

Figure B.5 — Field Guide T-5 Tree Species Codes.

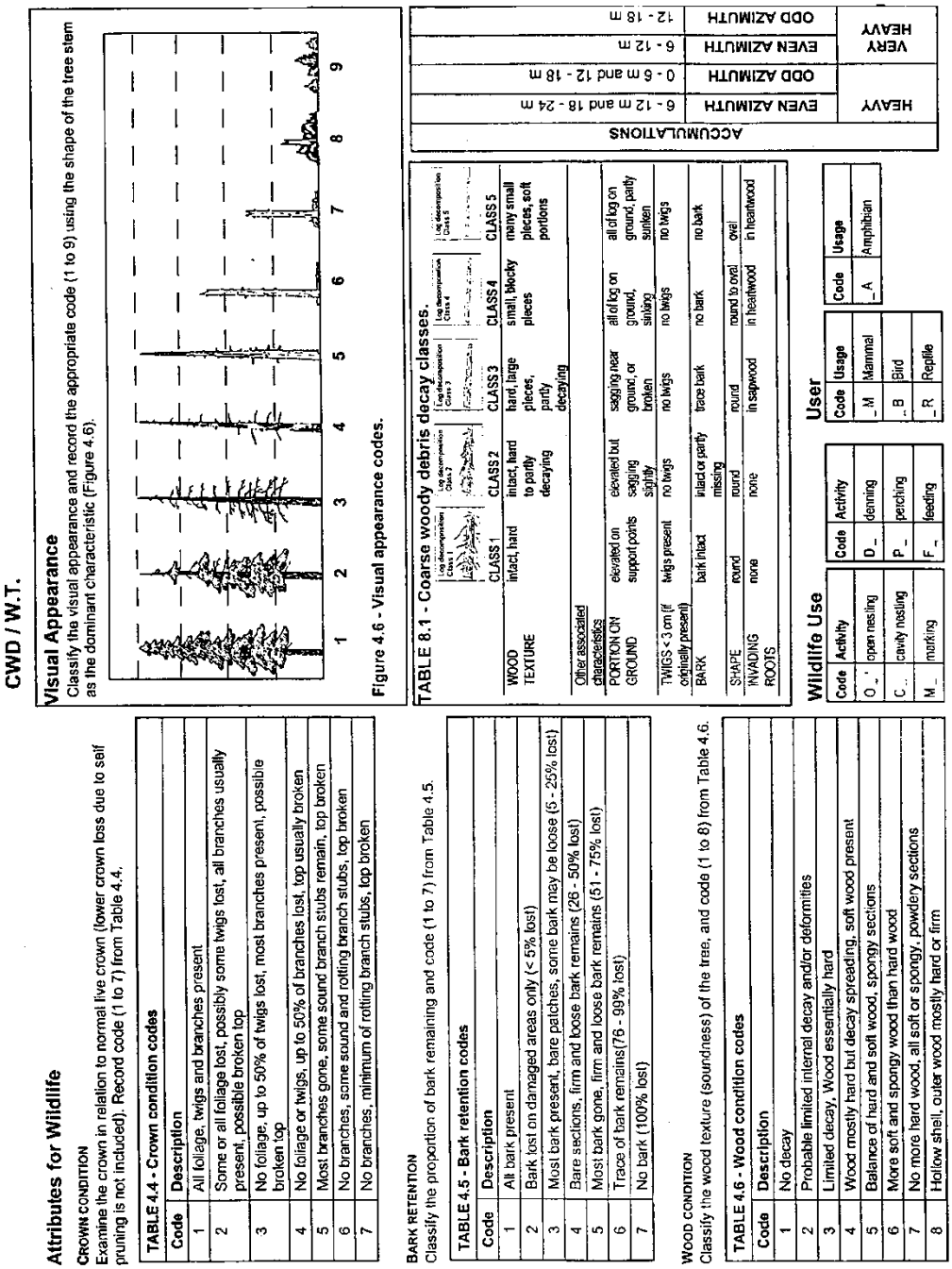


Figure B.6 — Field Guide T-6 Wildlife Tree Attributes (crown condition, bark retention, wood condition, visual appearance, wildlife use), CWD decay classes and Accumulation codes.

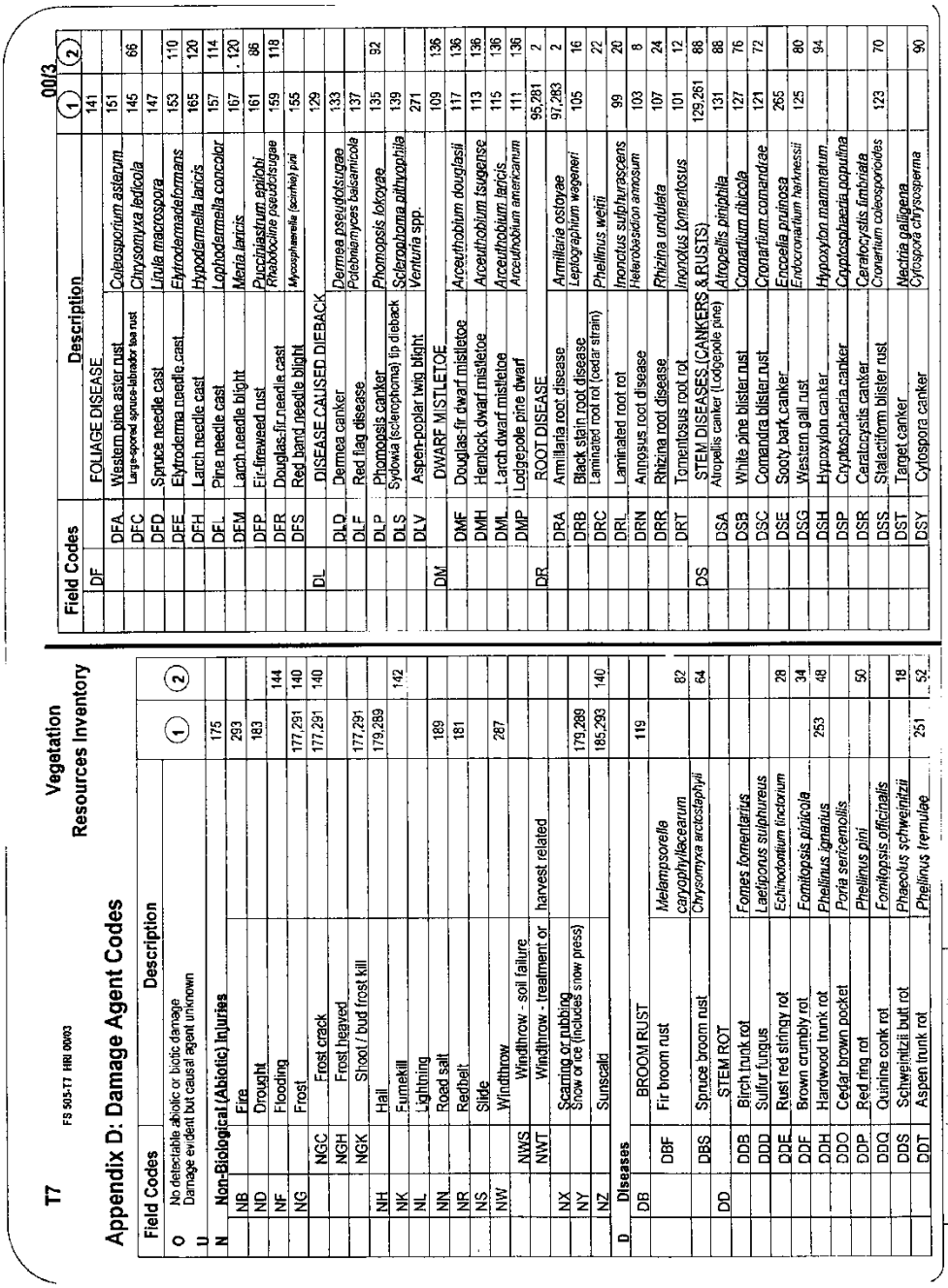


Figure B.7 — Field Guide T-7 Forest Health: Damage Agent Codes.

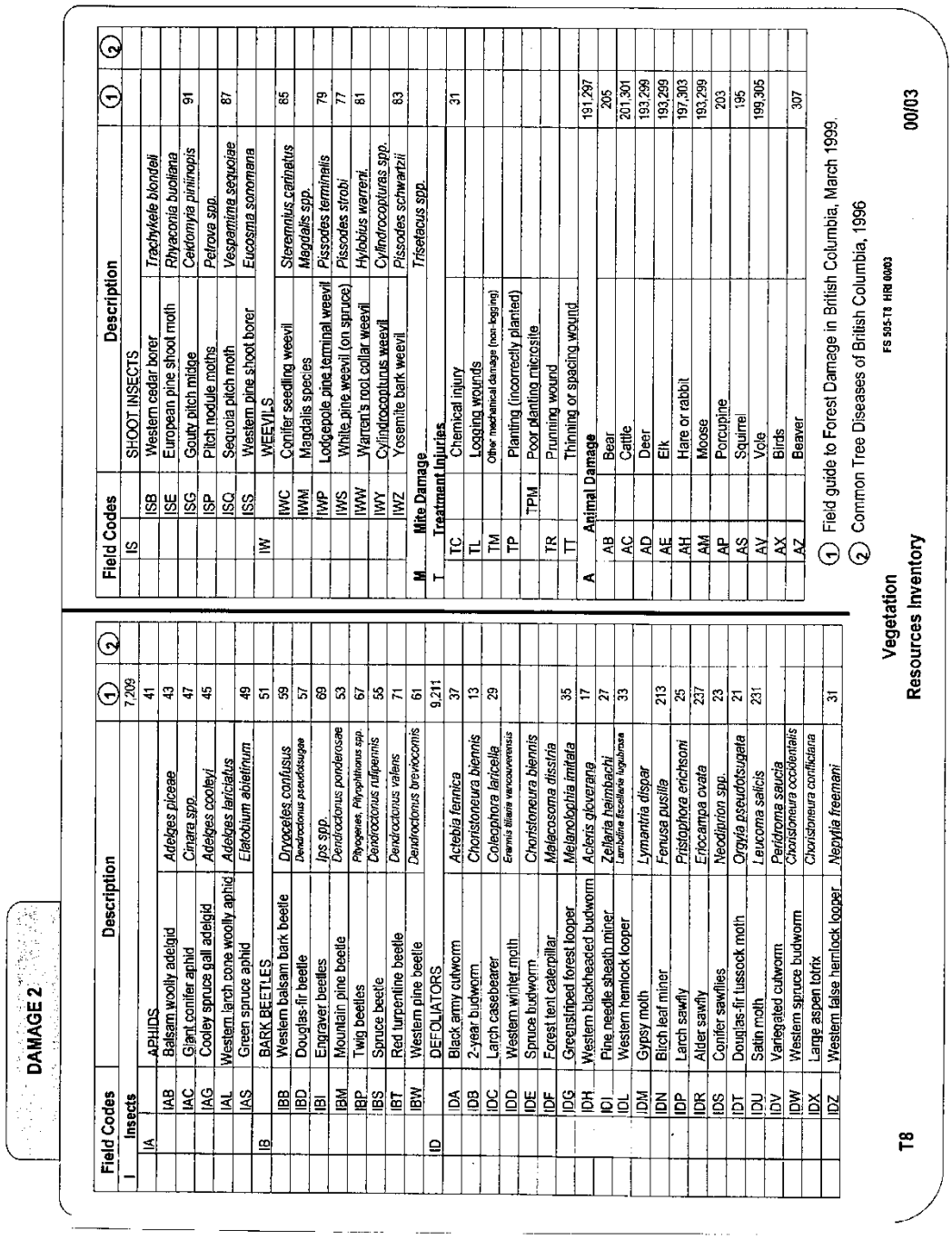
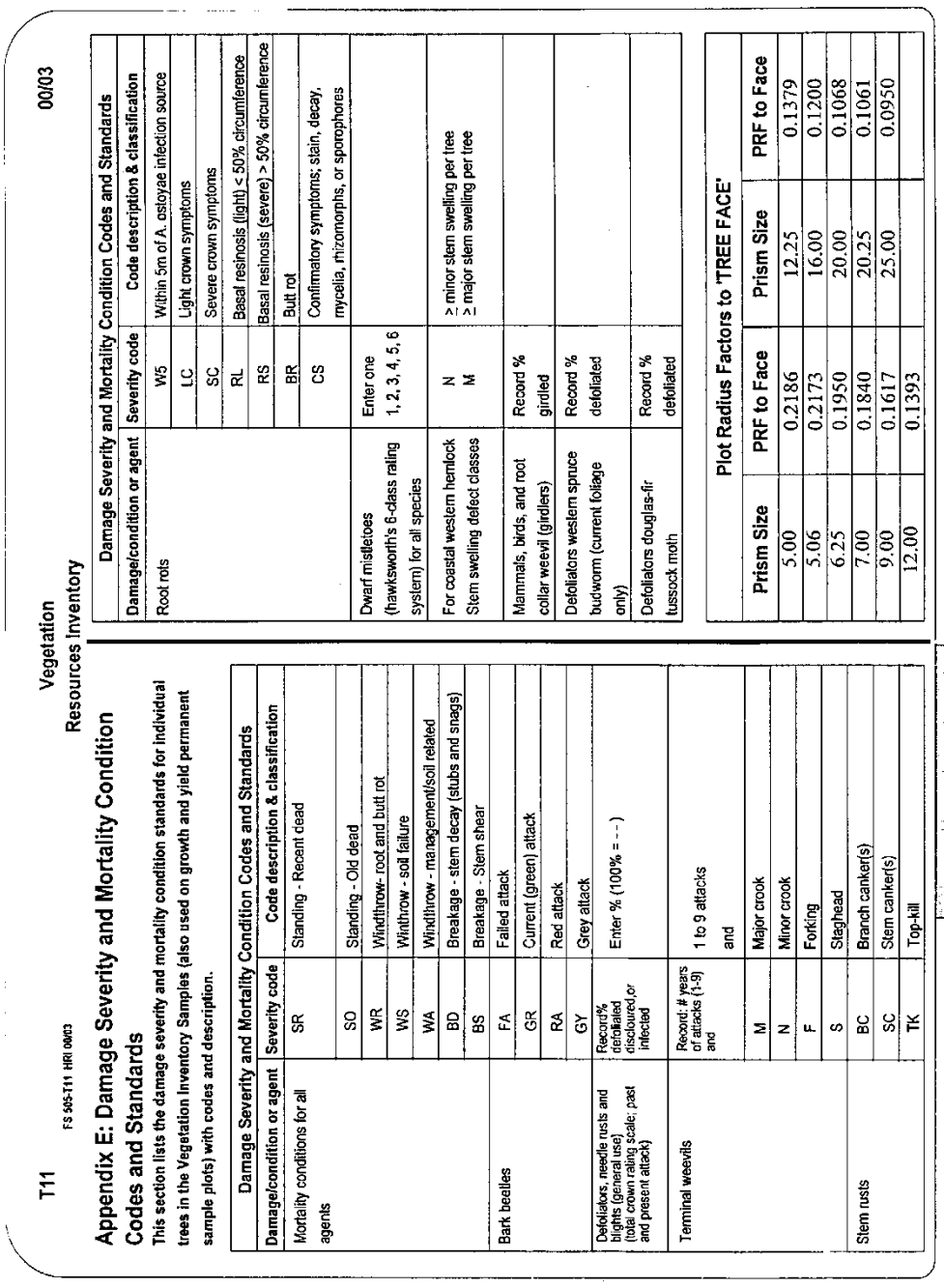


Figure B.8 — Field Guide T-8 Forest Health: Damage Agent Codes - Continued.



T11 FS 985-T11 HRI 00/03

Vegetation
Resources Inventory

00/03

Appendix E: Damage Severity and Mortality Condition Codes and Standards

This section lists the damage severity and mortality condition standards for individual trees in the Vegetation Inventory Samples (also used on growth and yield permanent sample plots) with codes and description.

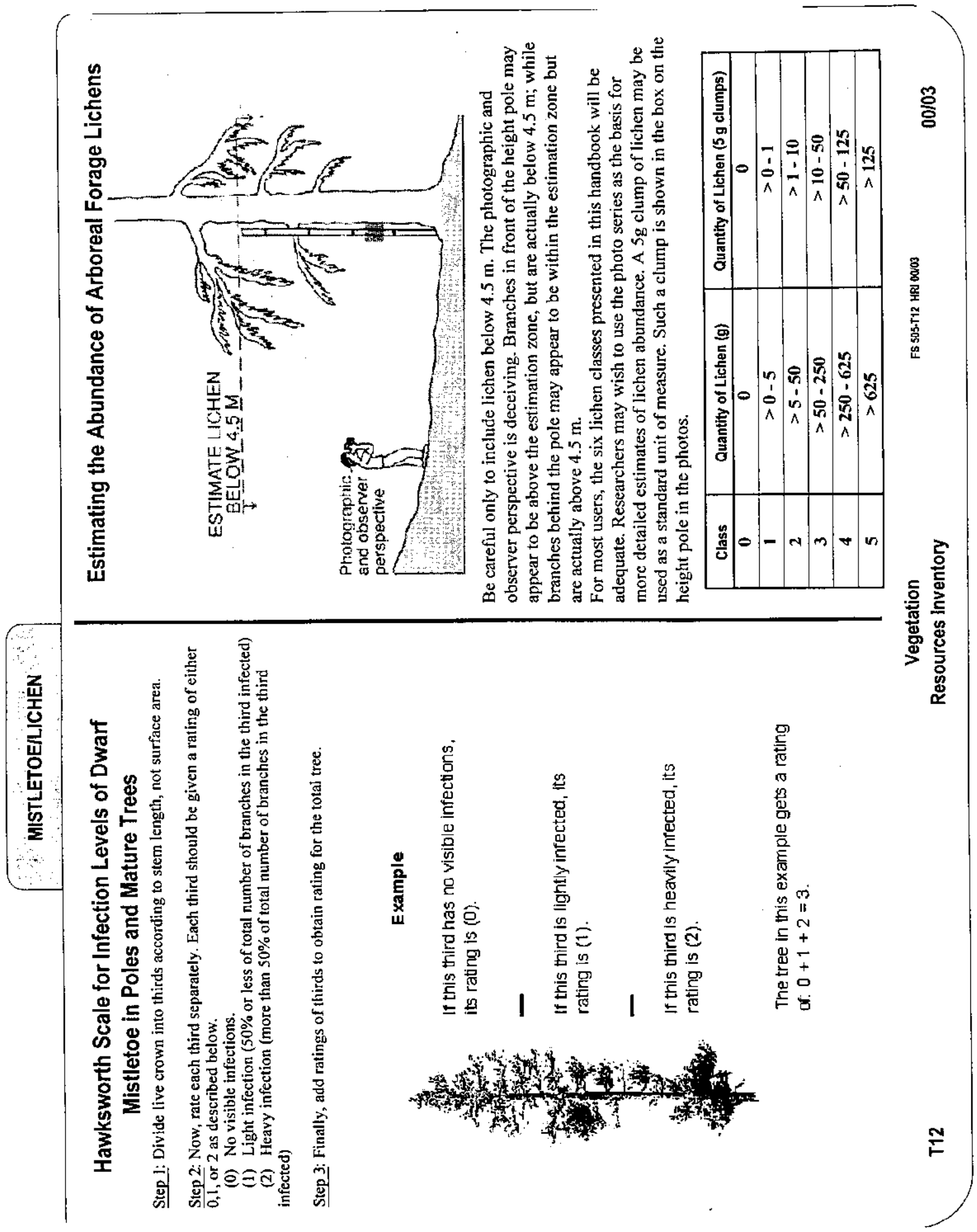
Damage Severity and Mortality Condition Codes and Standards		
Damage/condition or agent	**Severity code**	**Code description & classification**
Mortality conditions for all agents	SR	Standing - Recent dead
	SO	Standing - Old dead
	WR	Windthrow - root and butt rot
	WS	Windthrow - soil failure
	WA	Windthrow - management/soil related
	BD	Breakage - stem decay (stubs and snags)
	BS	Breakage - Stem shear
Bark beetles	FA	Failed attack
	GR	Current (green) attack
	RA	Red attack
	GY	Grey attack
Defoliators, needle rusts and blights (general use) (total crown rating scale; past and present attack)	Record% defoliated discoloured,or infected	Enter % (100% = - -)
Terminal weevils	Record: # years of attacks (1-9) and	1 to 9 attacks and
	M	Major crook
	N	Minor crook
	F	Forking
	S	Stagnead
Stem rusts	BC	Branch canker(s)
	SC	Stem canker(s)
	TK	Top-kill

SEVERITY

Damage Severity and Mortality Condition Codes and Standards		
Damage/condition or agent	**Severity code**	**Code description & classification**
Root rots	W5	Within 5m of A. ostoyae infection source
	LC	Light crown symptoms
	SC	Severe crown symptoms
	RL	Basal resinosis (light) < 50% circumference
	RS	Basal resinosis (severe) > 50% circumference
	BR	Butt rot
	CS	Confirmatory symptoms; stain, decay, mycelia, rhizomorphs, or sporophores
Dwarf mistletoes (hawksworth's 6-class rating system) for all species	Enter one	1, 2, 3, 4, 5, 6
For coastal western hemlock Stem swelling defect classes	N M	≥ minor stem swelling per tree ≥ major stem swelling per tree
Mammals, birds, and root collar weevil (girdlers)	Record % girdled	
Defoliators western spruce budworm (current foliage only)	Record % defoliated	
Defoliators douglas-fir tussock moth	Record % defoliated	

Plot Radius Factors to 'TREE FACE'			
Prism Size	**PRF to Face**	**Prism Size**	**PRF to Face**
5.00	0.2186	12.25	0.1379
5.06	0.2173	16.00	0.1200
6.25	0.1950	20.00	0.1068
7.00	0.1840	20.25	0.1061
9.00	0.1617	25.00	0.0950
12.00	0.1393		

Figure B. 9 — Field Guide T-11 Damage Agent Severity Codes, plus Plot Radius Factors to Tree Face



MISTLETOE/LICHEN

Hawksworth Scale for Infection Levels of Dwarf Mistletoe in Poles and Mature Trees

Step 1: Divide live crown into thirds according to stem length, not surface area.

Step 2: Now, rate each third separately. Each third should be given a rating of either 0,1, or 2 as described below.
(0) No visible infections.
(1) Light infection (50% or less of total number of branches in the third infected)
(2) Heavy infection (more than 50% of total number of branches in the third infected)

Step 3: Finally, add ratings of thirds to obtain rating for the total tree.

Example

If this third has no visible infections, its rating is (0).

If this third is lightly infected, its rating is (1).

If this third is heavily infected, its rating is (2).

The tree in this example gets a rating of: 0 + 1 + 2 = 3.

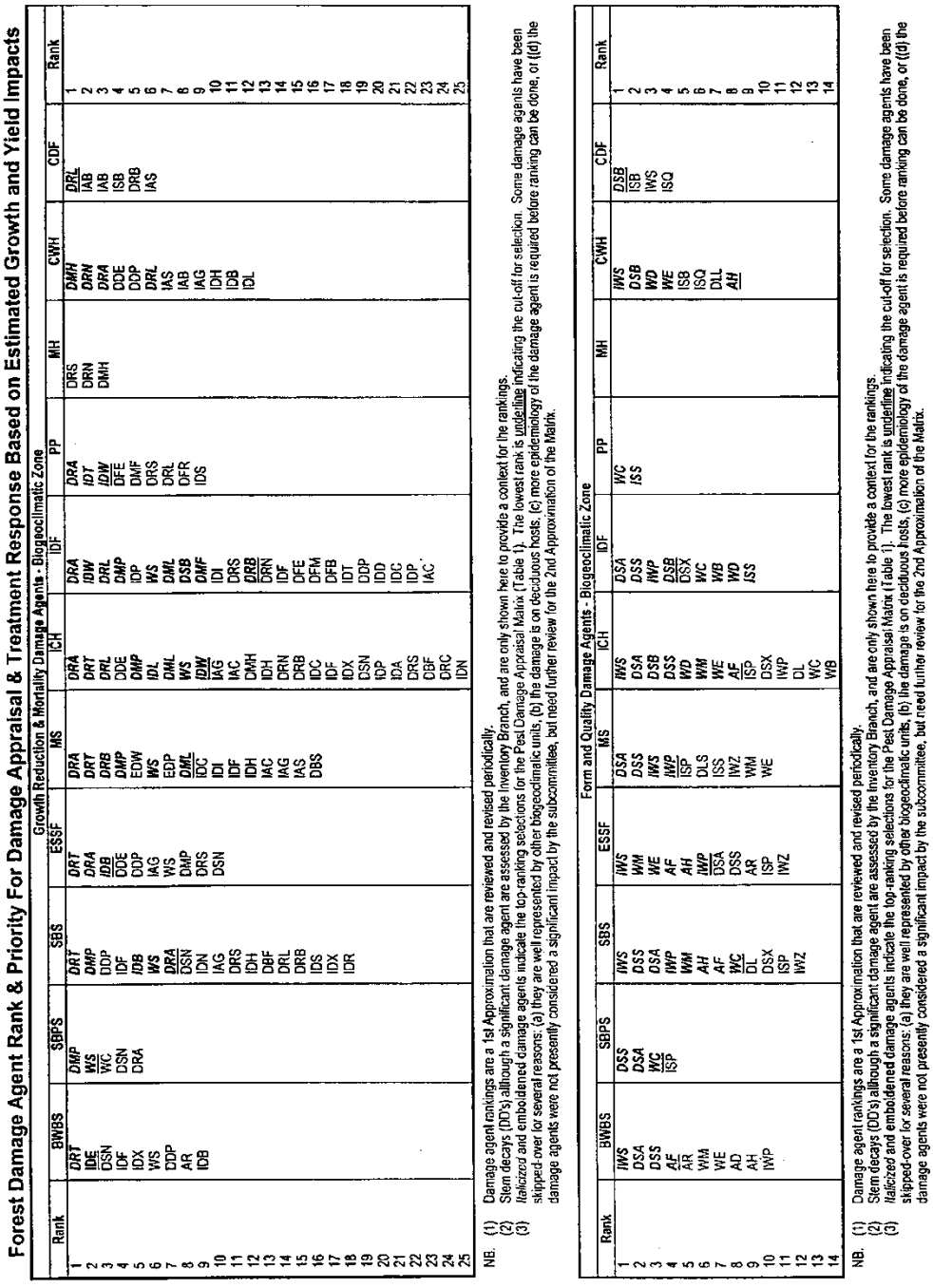
Estimating the Abundance of Arboreal Forage Lichens

Be careful only to include lichen below 4.5 m. The photographic and observer perspective is deceiving. Branches in front of the height pole may appear to be above the estimation zone, but are actually below 4.5 m; while branches behind the pole may appear to be within the estimation zone but are actually above 4.5 m.
For most users, the six lichen classes presented in this handbook will be adequate. Researchers may wish to use the photo series as the basis for more detailed estimates of lichen abundance. A 5g clump of lichen may be used as a standard unit of measure. Such a clump is shown in the box on the height pole in the photos.

Class	Quantity of Lichen (g)	Quantity of Lichen (5 g clumps)
0	0	0
1	> 0 - 5	> 0 - 1
2	> 5 - 50	> 1 - 10
3	> 50 - 250	> 10 - 50
4	> 250 - 625	> 50 - 125
5	> 625	> 125

T12 Vegetation Resources Inventory FS 505-T12 HRI 00/03 00/03

Figure B. 10— Field Guide T-12 Hawksworth Mistletoe Scale and Estimating the Abundance of Arboreal Forage Lichens



Forest Damage Agent Rank & Priority For Damage Appraisal & Treatment Response Based on Estimated Growth and Yield Impacts

Growth Reduction & Mortality Damage Agents - Biogeoclimatic Zone

Rank	BWBS	SBPS	SBS	ESSF	MS	ICH	IDF	PP	MH	CWH	CDF	Rank
1	*DRT*	*DMP*	*DRT*	*DRT*	*DRA*	*DRA*	*DRA*	*DRA*	DRS	*DMH*	*DRL*	1
2	*IDE*	*WS*	*DMP*	*DRA*	*DRT*	*DRT*	*IDW*	*IDT*	DRN	*DRN*	IAB	2
3	DSN	WC	DDP	*IDB*	*DRB*	*DRL*	*DRL*	*IDW*	DMH	*DRA*	IAB	3
4	IDF	DSN	IDF	DDE	*DMP*	DDE	*DMP*	DFE		DDE	ISB	4
5	IDX	*DRA*	*IDB*	DDP	EDW	*DMP*	IDP	DMF		DDP	DRB	5
6	*WS*		*WS*	IAG	*WS*	*IDL*	*WS*	DRS		*DRL*	IAS	6
7	DDP		*DRA*	WS	EDP	*DML*	*DML*	DRL		IAS		7
8	AR		DSN	DMP	*DML*	*WS*	*DSB*	DFR		IAB		8
9	IDB		IDN	DRS	IDC	*IDW*	*DMF*	IDS		IAG		9
10			IAG	DSN	IDI	IAG	IDI			IDH		10
11			DRS		IDF	IAC	DRS			IDB		11
12			IDH		IDH	DMH	*DRB*			IDL		12
13			DBF		IAC	IDH	DRN					13
14			DRL		IAG	DRN	IDF					14
15			DRB		IAS	DRB	DFE					15
16			IDS		DBS	IDC	DFM					16
17			IDX			IDF	DFB					17
18			IDR			IDX	IDT					18
19						DSN	DDP					19
20						IDP	IDD					20
21						IDA	IDC					21
22						DRS	IDP					22
23						DBF	IAC					23
24						DRC						24
25						IDN						25

NB. (1) Damage agent rankings are a 1st Approximation that are reviewed and revised periodically.
(2) Stem decays (DD's) although a significant damage agent are assessed by the Inventory Branch, and are only shown here to provide a context for the rankings.
(3) *Italicized* and emboldened damage agents indicate the top-ranking selections for the Pest Damage Appraisal Matrix (Table 1). The lowest rank is underline indicating the cut-off for selection. Some damage agents have been skipped-over for several reasons: (a) they are well represented by other biogeoclimatic units, (b) the damage is on deciduous hosts, (c) more epidemiology of the damage agent is required before ranking can be done, or ((d) the damage agents were not presently considered a significant impact by the subcommittee, but need further review for the 2nd Approximation of the Matrix.

Form and Quality Damage Agents - Biogeoclimatic Zone

Rank	BWBS	SBPS	SBS	ESSF	MS	ICH	IDF	PP	MH	CWH	CDF	Rank
1	*IWS*	*DSS*	*IWS*	*IWS*	*DSA*	*IWS*	*DSA*	*WC*		*IWS*	*DSB*	1
2	*DSA*	*DSA*	*DSS*	*WM*	*DSS*	*DSA*	*DSS*	*ISS*		*DSB*	ISB	2
3	*DSS*	*WC*	*DSA*	*WE*	*IWS*	*DSB*	*IWP*			*WD*	IWS	3
4	*AF*	ISP	*IWP*	*AF*	*IWP*	*DSS*	*DSB*			*WE*	ISQ	4
5	AR		*WM*	*AH*	ISP	*WD*	DSX			ISB		5
6	WM		*AH*	*IWP*	DLS	*WM*	*WC*			ISQ		6
7	WE		*AF*	DSA	ISS	*WE*	*WB*			DLL		7
8	AD		*WC*	DSS	IWZ	*AF*	*WD*			*AH*		8
9	AH		DL	AR	WM	ISP	*ISS*					9
10	IWP		DSX	ISP	WE	IWP						10
11			ISP	IWZ		DL						11
12			IWZ			WC						12
13						WB						13
14												14

NB. (1) Damage agent rankings are a 1st Approximation that are reviewed and revised periodically.
(2) Stem decays (DD's) although a significant damage agent are assessed by the Inventory Branch, and are only shown here to provide a context for the rankings.
(3) *Italicized* and emboldened damage agents indicate the top-ranking selections for the Pest Damage Appraisal Matrix (Table 1). The lowest rank is underline indicating the cut-off for selection. Some damage agents have been skipped-over for several reasons: (a) they are well represented by other biogeoclimatic units, (b) the damage is on deciduous hosts, (c) more epidemiology of the damage agent is required before ranking can be done, or ((d) the damage agents were not presently considered a significant impact by the subcommittee, but need further review for the 2nd Approximation of the Matrix.

FH RANKING

Figure B.11— Field Guide T-9 Forest Health: Damage Agent Ranking – Growth Reduction & Mortality Agents, Form & Quality Damage Agents.

FH RANKING

Forest Damage Agent Rank & Priority For Damage Appraisal & Treatment Response Based on Estimated Growth and Yield Impacts

	Early Mortality Damage Agents - Biogeoclimatic Zone											
Rank	BWBS	SBPS	SBS	ESSF	MS	ICH	IDF	PP	MH	CWH	CDF	Rank
1	***DSG***	***DSG***	***DSC***	***AY***	***DSC***	***DRR***	IWW	WC	***AY***	***WD***	WD	1
2	***AFK***	***WH***	***DSG***	***AF***	***DSG***	***DSC***	***DSC***	DSC	***AF***	***WV***	WV	2
3	***WH***	IWW	IWW	***IWW***	IWW	***DSG***	***DSG***	WV		IWC		3
4	AY	DSC	***WH***	***DSC***	AD	IWW	DRR	WH		DRR		4
5	IWW	IBI	IDA	***WH***	WC	IDA	IDA	AF				5
6	IWB	WV	***AF***	***DSG***	IBI	***AF***	AD	AH				6
7			DRR	WV	IDI	***WH***	***WH***	WD				7
8			WV	IDA	WH	***WV***	AF					8
9			AY		WP	***WP***	WP					9
10			IBI		DRR	IWZ	***AY***					10
11			AD		WV	***WS***	***WD***					11
12			IS(salix)		WB							12
13					IBP							14

NB. (1) Damage agent rankings are a 1st Approximation that are reviewed and revised periodically.

(2) Stem decays (DD's) although a significant damage agent are assessed by the Inventory Branch, and are only shown here to provide a context for the rankings.

(3) *Italicized* and **emboldened** damage agents indicate the top-ranking selections for the Pest Damage Appraisal Matrix (Table 1). The lowest rank is underline indicating the cut-off for selection. Some damage agents have been skipped-over for several reasons: (a) they are well represented by other biogeoclimatic units, (b) on deciduous hosts, (c) the damage agents were not presently considered a significant impact by the subcommittee, but need further review for the 2nd Approximation of the Matrix.

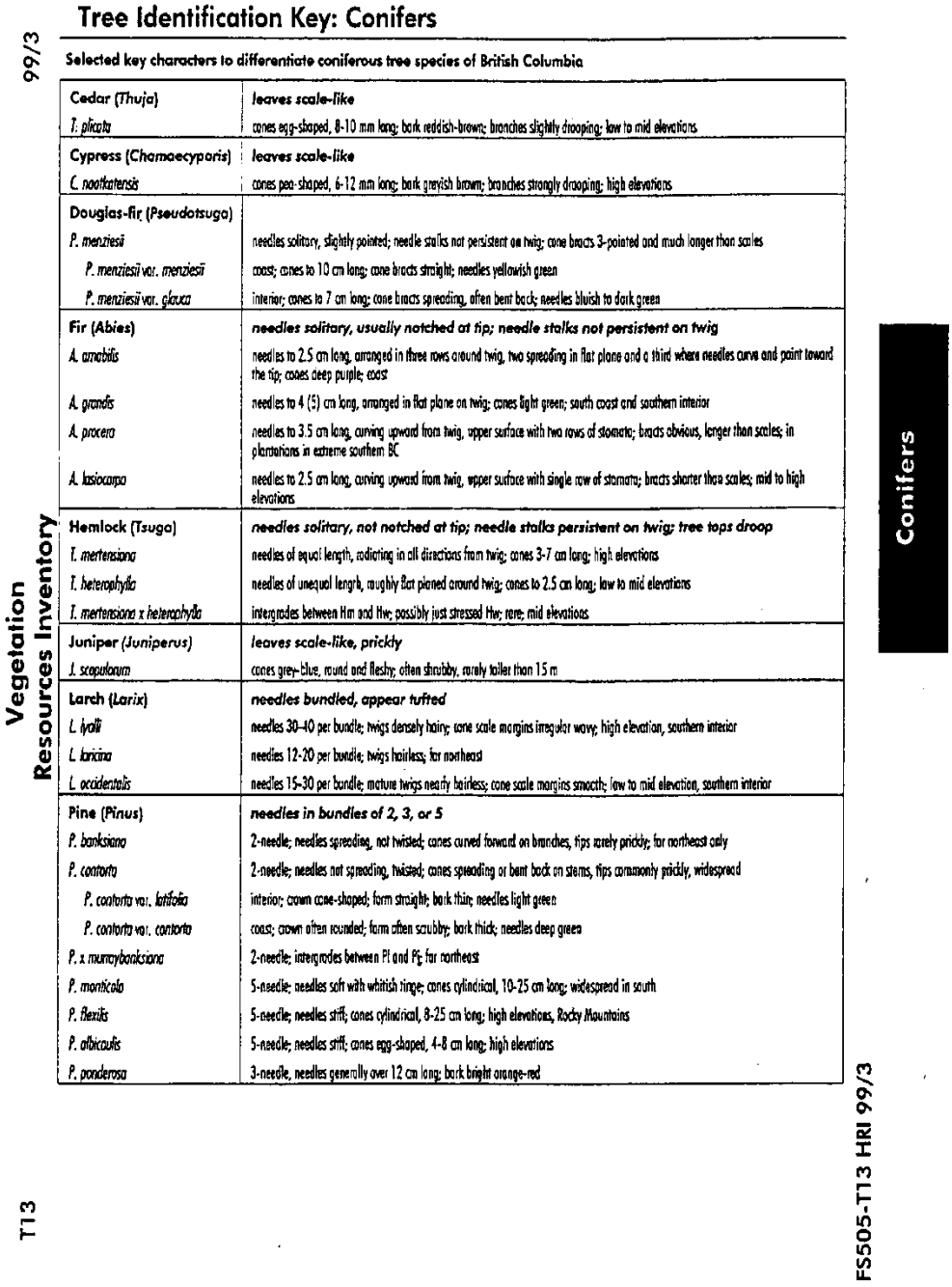
	Late Mortality Damage Agents - Biogeoclimatic Zone											
Rank	BWBS	SBPS	SBS	ESSF	MS	ICH	IDF	PP	MH	CWH	CDF	Rank
1	*IBS*	*IBM*	*IBS*	*IBS*	*IBM*	*IBM*	*IBM*	*IBM*		*WP*		1
2	*IBB*		*IBM*	*IBB*	IBS	*IBB*	*IBD*	*IBT*		IBD		2
3	*AW*		*IBB*	*IBM*	IBI	*IBS*	*IBS*	*IBP*		IBM		3
4	SP		*IBD*	WP		*IBD*	*IBB*	*IBW*		IBS		4
5			*WP*	AW		*SP*	*IDT*	*IBD*				5
6			*AW*			*IDL*	WP					6
7			DRB			AW	IBI					7

NB. (1) Damage agent rankings are a 1st Approximation that are reviewed and revised periodically.

(2) Stem decays (DD's) although a significant damage agent are assessed by the Inventory Branch, and are only shown here to provide a context for the rankings.

(3) *Italicized* and **emboldened** damage agents indicate the top-ranking selections for the Pest Damage Appraisal Matrix (Table 1). The lowest rank is underline indicating the cut-off for selection. Some damage agents have been skipped-over for several reasons: (a) they are well represented by other biogeoclimatic units, (b) the damage is on deciduous hosts, (c) more epidemiology of the damage agent is required before ranking can be done, or ((d) the damage agents were not presently considered a significant impact by the subcommittee, but need further review for the 2nd Approximation of the Matrix.

Figure B. 12— Field Guide T-10 Forest Health: Damage Agent Ranking – Early Mortality Agents, Late Mortality Agents.



Tree Identification Key: Conifers

99/3

Selected key characters to differentiate coniferous tree species of British Columbia

Cedar (*Thuja*)	***leaves scale-like***
T. plicata	cones egg-shaped, 8-10 mm long; bark reddish-brown; branches slightly drooping; low to mid elevations
Cypress (*Chamaecyparis*)	***leaves scale-like***
C. nootkatensis	cones pea-shaped, 6-12 mm long; bark greyish brown; branches strongly drooping; high elevations
Douglas-fir (*Pseudotsuga*)	
P. menziesii	needles solitary, slightly pointed; needle stalks not persistent on twig; cone bracts 3-pointed and much longer than scales
P. menziesii var. *menziesii*	coast; cones to 10 cm long; cone bracts straight; needles yellowish green
P. menziesii var. *glauca*	interior; cones to 7 cm long; cone bracts spreading, often bent back; needles bluish to dark green
Fir (*Abies*)	***needles solitary, usually notched at tip; needle stalks not persistent on twig***
A. amabilis	needles to 2.5 cm long, arranged in three rows around twig, two spreading in flat plane and a third where needles curve and point toward the tip; cones deep purple; coast
A. grandis	needles to 4 (5) cm long, arranged in flat plane on twig; cones light green; south coast and southern interior
A. procera	needles to 3.5 cm long, curving upward from twig, upper surface with two rows of stomata; bracts obvious, longer than scales; in plantations in extreme southern BC
A. lasiocarpa	needles to 2.5 cm long, curving upward from twig, upper surface with single row of stomata; bracts shorter than scales; mid to high elevations
Hemlock (*Tsuga*)	***needles solitary, not notched at tip; needle stalks persistent on twig; tree tops droop***
T. mertensiana	needles of equal length, radiating in all directions from twig; cones 3-7 cm long; high elevations
T. heterophylla	needles of unequal length, roughly flat pleated around twig; cones to 2.5 cm long; low to mid elevations
T. mertensiana x *heterophylla*	intergrades between Hm and Hw; possibly just stressed Hw; rare; mid elevations
Juniper (*Juniperus*)	***leaves scale-like, prickly***
J. scopulorum	cones grey-blue, round and fleshy; often shrubby, rarely taller than 15 m
Larch (*Larix*)	***needles bundled, appear tufted***
L. lyallii	needles 30–40 per bundle; twigs densely hairy; cone scale margins irregular wavy; high elevation, southern interior
L. laricina	needles 12-20 per bundle; twigs hairless; far northeast
L. occidentalis	needles 15-30 per bundle; mature twigs nearly hairless; cone scale margins smooth; low to mid elevation, southern interior
Pine (*Pinus*)	***needles in bundles of 2, 3, or 5***
P. banksiana	2-needle; needles spreading, not twisted; cones curved forward on branches, tips rarely prickly; far northeast only
P. contorta	2-needle; needles not spreading, twisted; cones spreading or bent back on stems, tips commonly prickly, widespread
P. contorta var. *latifolia*	interior; crown cone-shaped; form straight; bark thin; needles light green
P. contorta var. *contorta*	coast; crown often rounded; form often scrubby; bark thick; needles deep green
P. x murrayibanksiana	2-needle; intergrades between Pl and Pj; far northeast
P. monticola	5-needle; needles soft with whitish tinge; cones cylindrical, 10-25 cm long; widespread in south
P. flexilis	5-needle; needles stiff; cones cylindrical, 8-25 cm long; high elevations, Rocky Mountains
P. albicaulis	5-needle; needles stiff; cones egg-shaped, 4-8 cm long; high elevations
P. ponderosa	3-needle, needles generally over 12 cm long; bark bright orange-red

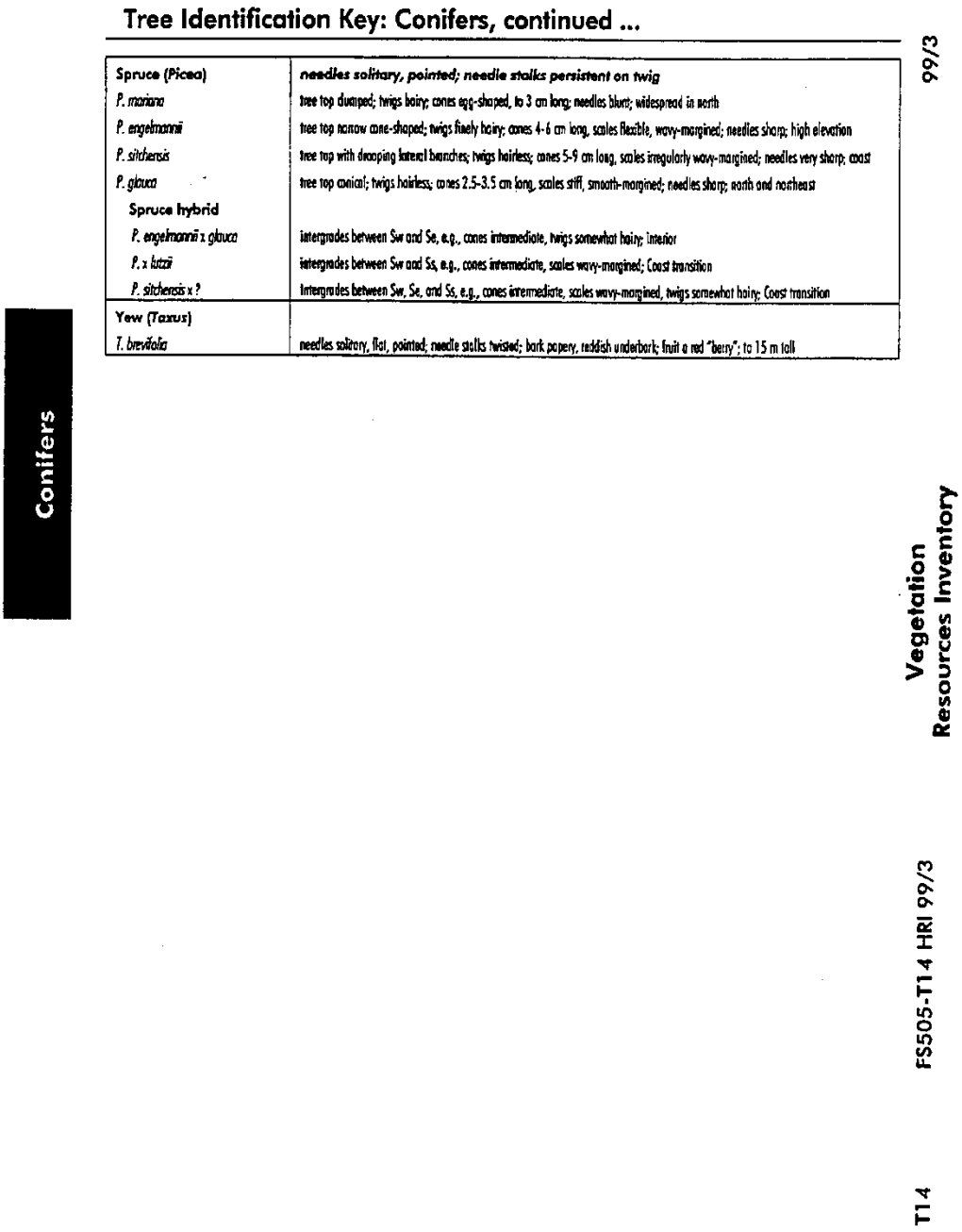
Vegetation Resources Inventory

Conifers

T13

FS505-T13 HRI 99/3

Figure B. 13— Field Guide T-13 Tree Identification Key – Conifers.



Tree Identification Key: Conifers, continued ...

Spruce (Picea)	***needles solitary, pointed; needle stalks persistent on twig***
P. mariana	tree top dumped; twigs hairy; cones egg-shaped, to 3 cm long; needles blunt; widespread in north
P. engelmannii	tree top narrow cone-shaped; twigs finely hairy; cones 4-6 cm long, scales flexible, wavy-margined; needles sharp; high elevation
P. sitchensis	tree top with drooping lateral branches; twigs hairless; cones 5-9 cm long, scales irregularly wavy-margined; needles very sharp; coast
P. glauca	tree top conical; twigs hairless; cones 2.5-3.5 cm long, scales stiff, smooth-margined; needles sharp; north and northeast
Spruce hybrid	
P. engelmannii x glauca	intergrades between Sw and Se, e.g., cones intermediate, twigs somewhat hairy; interior
P. x lutzii	intergrades between Sw and Ss, e.g., cones intermediate, scales wavy-margined; Coast transition
P. sitchensis x ?	intergrades between Sw, Se, and Ss, e.g., cones intermediate, scales wavy-margined, twigs somewhat hairy; Coast transition
Yew (Taxus)	
T. brevifolia	needles solitary, flat, pointed; needle stalks twisted; bark papery, reddish underbark; fruit a red "berry"; to 15 m tall

Conifers

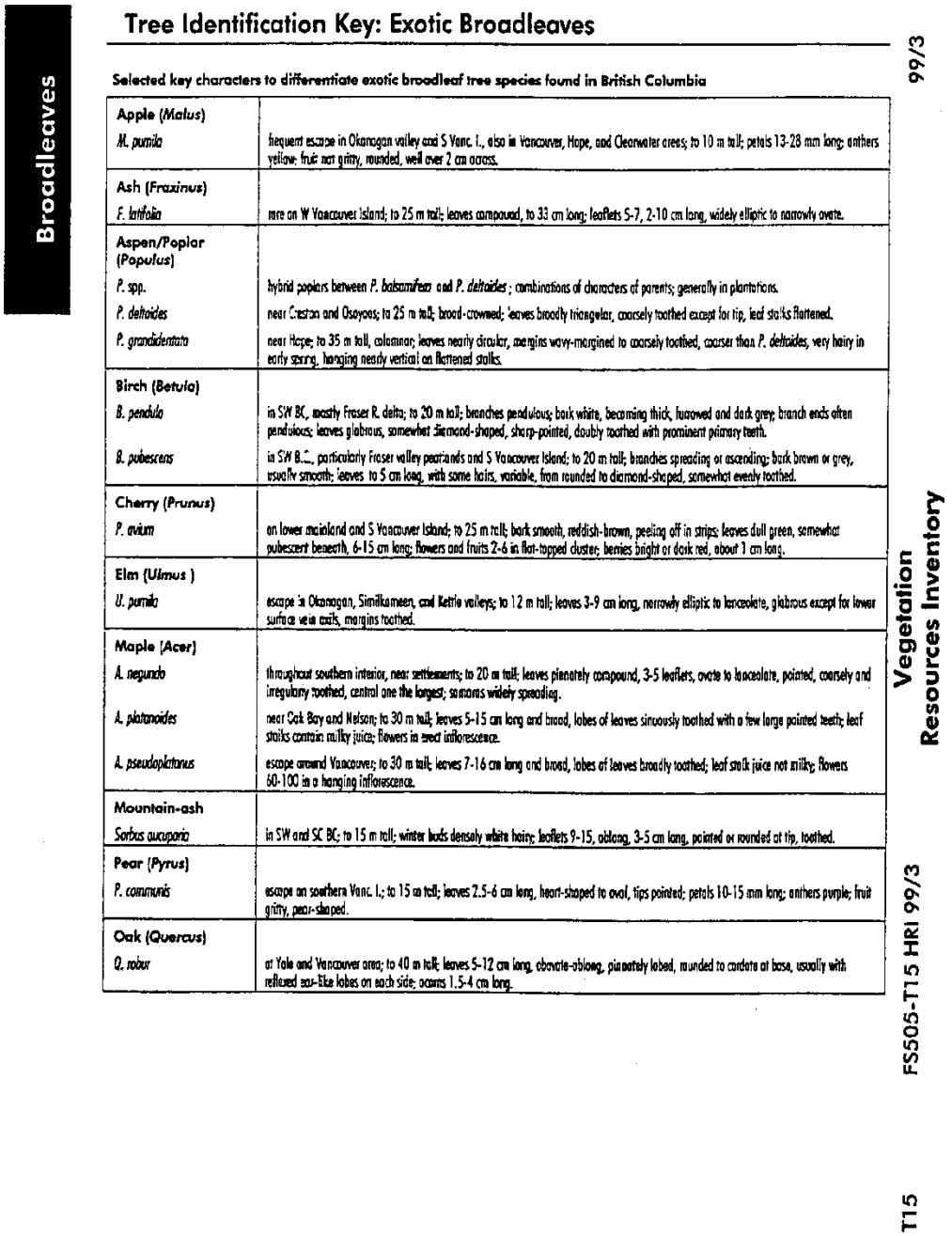
99/3

Vegetation Resources Inventory

FS505-T14 HRI 99/3

T14

Figure B. 14— Field Guide T-14 Tree Identification Key – Conifers continued.



Broadleaves

Tree Identification Key: Exotic Broadleaves

Selected key characters to differentiate exotic broadleaf tree species found in British Columbia

Apple (*Malus*)	
M. pumila	frequent escape in Okanagan valley and S Vanc. I., also in Vancouver, Hope, and Clearwater areas; to 10 m tall; petals 13-28 mm long; anthers yellow; fruit not gritty, rounded, well over 2 cm across.
Ash (*Fraxinus*)	
F. latifolia	rare on W Vancouver Island; to 25 m tall; leaves compound, to 33 cm long; leaflets 5-7, 2-10 cm long, widely elliptic to narrowly ovate.
Aspen/Poplar (*Populus*)	
P. spp.	hybrid poplars between *P. balsamifera* and *P. deltoides*; combinations of characters of parents; generally in plantations.
P. deltoides	near Creston and Osoyoos; to 25 m tall; broad-crowned; leaves broadly triangular, coarsely toothed except for tip, leaf stalks flattened.
P. grandidentata	near Hope; to 35 m tall, columnar; leaves nearly circular, margins wavy-margined to coarsely toothed, coarser than *P. deltoides*, very hairy in early spring, hanging nearly vertical on flattened stalks.
Birch (*Betula*)	
B. pendula	in SW BC, mostly Fraser R. delta; to 20 m tall; branches pendulous; bark white, becoming thick, furrowed and dark grey; branch ends often pendulous; leaves glabrous, somewhat diamond-shaped, sharp-pointed, doubly toothed with prominent primary teeth.
B. pubescens	in SW B.C., particularly Fraser valley peatlands and S Vancouver Island; to 20 m tall; branches spreading or ascending; bark brown or grey, usually smooth; leaves to 5 cm long, with some hairs, variable, from rounded to diamond-shaped, somewhat evenly toothed.
Cherry (*Prunus*)	
P. avium	on lower mainland and S Vancouver Island; to 25 m tall; bark smooth, reddish-brown, peeling off in strips; leaves dull green, somewhat pubescent beneath, 6-15 cm long; flowers and fruits 2-6 in flat-topped cluster; berries bright or dark red, about 1 cm long.
Elm (*Ulmus*)	
U. pumila	escape in Okanagan, Similkameen, and Kettle valleys; to 12 m tall; leaves 3-9 cm long, narrowly elliptic to lanceolate, glabrous except for lower surface vein axils, margins toothed.
Maple (*Acer*)	
A. negundo	throughout southern interior, near settlements; to 20 m tall; leaves pinnately compound, 3-5 leaflets, ovate to lanceolate, pointed, coarsely and irregularly toothed, central one the largest; samaras widely spreading.
A. platanoides	near Oak Bay and Nelson; to 30 m tall; leaves 5-15 cm long and broad, lobes of leaves sinuously toothed with a few large pointed teeth; leaf stalks contain milky juice; flowers in erect inflorescence.
A. pseudoplatanus	escape around Vancouver; to 30 m tall; leaves 7-16 cm long and broad, lobes of leaves broadly toothed; leaf stalk juice not milky; flowers 60-100 in a hanging inflorescence.
Mountain-ash	
Sorbus aucuparia	in SW and SC BC; to 15 m tall; winter buds densely white hairy; leaflets 9-15, oblong, 3-5 cm long, pointed or rounded at tip, toothed.
Pear (*Pyrus*)	
P. communis	escape on southern Vanc. I.; to 15 m tall; leaves 2.5-6 cm long, heart-shaped to oval, tips pointed; petals 10-15 mm long; anthers purple; fruit gritty, pear-shaped.
Oak (*Quercus*)	
Q. robur	at Yale and Vancouver area; to 40 m tall; leaves 5-12 cm long, obovate-oblong, pinnately lobed, rounded to cordate at base, usually with reflexed ear-like lobes on each side; acorns 1.5-4 cm long.

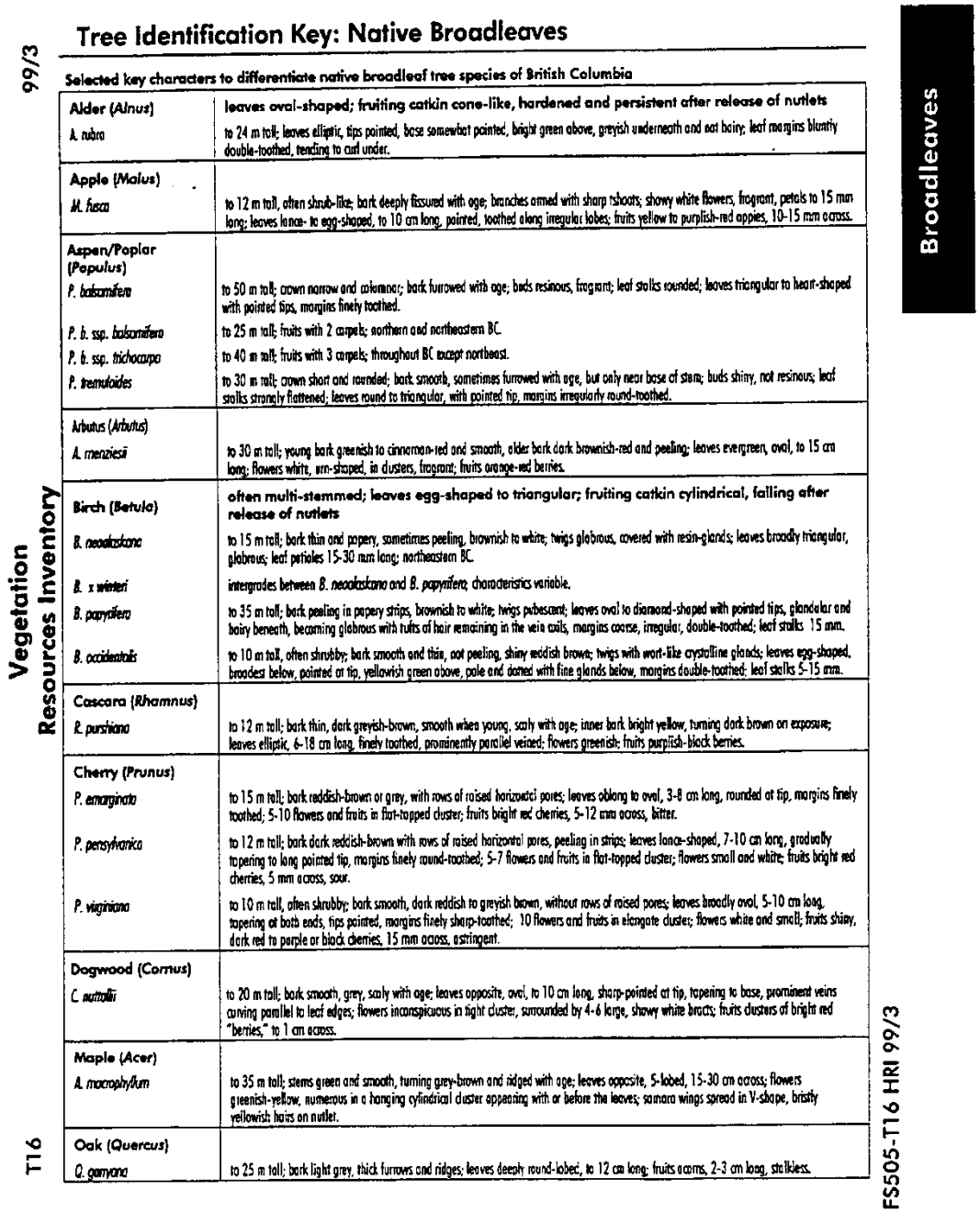
99/3

Vegetation Resources Inventory

FS505-T15 HRI 99/3

T15

Figure B. 15— Field Guide T-15 Tree Identification Key – Exotic Broadleaves.



99/3

Tree Identification Key: Native Broadleaves

Selected key characters to differentiate native broadleaf tree species of British Columbia

Alder (*Alnus*)	**leaves oval-shaped; fruiting catkin cone-like, hardened and persistent after release of nutlets**
A. rubra	to 24 m tall; leaves elliptic, tips pointed, base somewhat pointed, bright green above, greyish underneath and not hairy; leaf margins bluntly double-toothed, tending to curl under.
Apple (*Malus*)	
M. fusca	to 12 m tall, often shrub-like; bark deeply fissured with age; branches armed with sharp tshoots; showy white flowers, fragrant, petals to 15 mm long; leaves lance- to egg-shaped, to 10 cm long, pointed, toothed along irregular lobes; fruits yellow to purplish-red apples, 10-15 mm across.
Aspen/Poplar (*Populus*)	
P. balsamifera	to 50 m tall; crown narrow and columnar; bark furrowed with age; buds resinous, fragrant; leaf stalks rounded; leaves triangular to heart-shaped with pointed tips, margins finely toothed.
P. b. ssp. balsamifera	to 25 m tall; fruits with 2 carpels; northern and northeastern BC.
P. b. ssp. trichocarpa	to 40 m tall; fruits with 3 carpels; throughout BC except northeast.
P. tremuloides	to 30 m tall; crown short and rounded; bark smooth, sometimes furrowed with age, but only near base of stem; buds shiny, not resinous; leaf stalks strongly flattened; leaves round to triangular, with pointed tip, margins irregularly round-toothed.
Arbutus (*Arbutus*)	
A. menziesii	to 30 m tall; young bark greenish to cinnamon-red and smooth, older bark dark brownish-red and peeling; leaves evergreen, oval, to 15 cm long; flowers white, urn-shaped, in clusters, fragrant; fruits orange-red berries.
Birch (*Betula*)	**often multi-stemmed; leaves egg-shaped to triangular; fruiting catkin cylindrical, falling after release of nutlets**
B. neoalaskana	to 15 m tall; bark thin and papery, sometimes peeling, brownish to white; twigs glabrous, covered with resin-glands; leaves broadly triangular, glabrous; leaf petioles 15-30 mm long; northeastern BC.
B. x winteri	intergrades between *B. neoalaskana* and *B. papyrifera*; characteristics variable.
B. papyrifera	to 35 m tall; bark peeling in papery strips, brownish to white; twigs pubescent; leaves oval to diamond-shaped with pointed tips, glandular and hairy beneath, becoming glabrous with tufts of hair remaining in the vein axils, margins coarse, irregular, double-toothed; leaf stalks 15 mm.
B. occidentalis	to 10 m tall, often shrubby; bark smooth and thin, not peeling, shiny reddish brown; twigs with wart-like crystalline glands; leaves egg-shaped, broadest below, pointed at tip, yellowish green above, pale and dotted with fine glands below, margins double-toothed; leaf stalks 5-15 mm.
Cascara (*Rhamnus*)	
R. purshiana	to 12 m tall; bark thin, dark greyish-brown, smooth when young, scaly with age; inner bark bright yellow, turning dark brown on exposure; leaves elliptic, 6-18 cm long, finely toothed, prominently parallel veined; flowers greenish; fruits purplish-black berries.
Cherry (*Prunus*)	
P. emarginata	to 15 m tall; bark reddish-brown or grey, with rows of raised horizontal pores; leaves oblong to oval, 3-8 cm long, rounded at tip, margins finely toothed; 5-10 flowers and fruits in flat-topped cluster; fruits bright red cherries, 5-12 mm across, bitter.
P. pensylvanica	to 12 m tall; bark dark reddish-brown with rows of raised horizontal pores, peeling in strips; leaves lance-shaped, 7-10 cm long, gradually tapering to long pointed tip, margins finely round-toothed; 5-7 flowers and fruits in flat-topped cluster; flowers small and white; fruits bright red cherries, 5 mm across, sour.
P. virginiana	to 10 m tall, often shrubby; bark smooth, dark reddish to greyish brown, without rows of raised pores; leaves broadly oval, 5-10 cm long, tapering at both ends, tips pointed, margins finely sharp-toothed; 10 flowers and fruits in elongate cluster; flowers white and small; fruits shiny, dark red to purple or black cherries, 15 mm across, astringent.
Dogwood (*Cornus*)	
C. nuttallii	to 20 m tall; bark smooth, grey, scaly with age; leaves opposite, oval, to 10 cm long, sharp-pointed at tip, tapering to base, prominent veins curving parallel to leaf edges; flowers inconspicuous in tight cluster, surrounded by 4-6 large, showy white bracts; fruits clusters of bright red "berries," to 1 cm across.
Maple (*Acer*)	
A. macrophyllum	to 35 m tall; stems green and smooth, turning grey-brown and ridged with age; leaves opposite, 5-lobed, 15-30 cm across; flowers greenish-yellow, numerous in a hanging cylindrical cluster appearing with or before the leaves; samara wings spread in V-shape, bristly yellowish hairs on nutlet.
Oak (*Quercus*)	
Q. garryana	to 25 m tall; bark light grey, thick furrows and ridges; leaves deeply round-lobed, to 12 cm long; fruits acorns, 2-3 cm long, stalkless.

Broadleaves

Vegetation Resources Inventory

T16

FS505-T16 HRI 99/3

Figure B. 16— Field Guide T-16 Tree Identification Key – Native Broadleaves.

R1 | Vegetation Resources Inventory | 99/3

RANGE RESOURCES

TABLE 9.1 - Herbaceous forage utilization classes and codes

Code	Class	Range (% utilized)	Utilization
O	Nil	(0%)	The plants show no evidence of use.
1	Slight	(1 to 15%)	The plants show very little evidence of use and have the appearance of very slight grazing. Key forage plants may be topped or slightly used. Current seed stalks and young plants of key species show little disturbance.
2	Light	(16 to 35%)	The plants may be topped, skimmed, or grazed in patches. Low-value plants are ungrazed and 60% to 80% of current leafage of key plants remain intact.
3	Moderate	(36 to 65%)	The plants appear rather uniformly grazed. Fifteen to 25% of the number of current leafage of key species remain intact. No more than 10% of the number of low-value forage plants are used. (Moderate use does not imply proper use). Applied to a use zone, the area is entirely covered as uniformly as natural features or livestock facilities will allow.
4	Heavy	(66 to 80%)	Key species are almost entirely used, with <10% of the current leafage remaining. More than 30% of the number of low-value plants have been utilized. Applied to a use zone, the area has the appearance of complete search. Some trampling damage may be evident.
5	Extreme	(> 80%)	Key species that are carrying the grazing load and are closely cropped. There is no evidence of reproduction or current seed stalks of key species. Applied to a use zone. the area has a mown appearance, and there are indications of repeated coverage. Trampling and trailing is evident.

From *Procedures for Environmental Monitoring in Range and Wildlife Habitat Management*, Habitat Committee 1990

TABLE 9.1 - Herbaceous forage utilization classes and codes

	Deciduous Trees or Shrubs		Conifers
0	Closed bud	0	Closed bud
1	Buds with green tips	1	Swollen bud
2	Green leaf out but not unfolded	2	Split bud
3	Leaf unfolding up to 25%	3	Shoot capped
4	Leaf unfolding up to 50%	4	Shoot elongate
5	Leaf unfolding up to 75%	5	Shoot full length, lighter green
6	Full leaf unfolded	6	Shoot mature, equally green
7	First leaves turned yellow		
8	Leaf yellowing up to 50%		
9	Leaf yellowing over 50%		
10	Bare		

Adapted from Table 4.4 Phenology (after Dierschke, 1972) from *Describing Ecosystems in the Field, 2nd Ed.* MOE Manual 11

High Amount Shrub Cover	
Odd Sample #	Measure Transect 1
Even Sample #	Measure Transect 2

Split Forage Plots

Sample #	Half	Quarter
Even	East 1/2	Northeast 1/4
Odd	West 1/2	Southwest 1/4

FS 505-R1 HRI 99/3

RANGE 1

Figure B. 17— Field Guide R-1 Range Resources: Range Utilization Classes, Phenology Codes, Split Plot Procedures.

RANGE 2

TABLE 9.2 - Low woody species and intermediate life forms from Habitat Monitoring Committee 1990

Note: Plants on this list are collected as forbs in the forage production plots. These plants are not measured on the shrub transects.

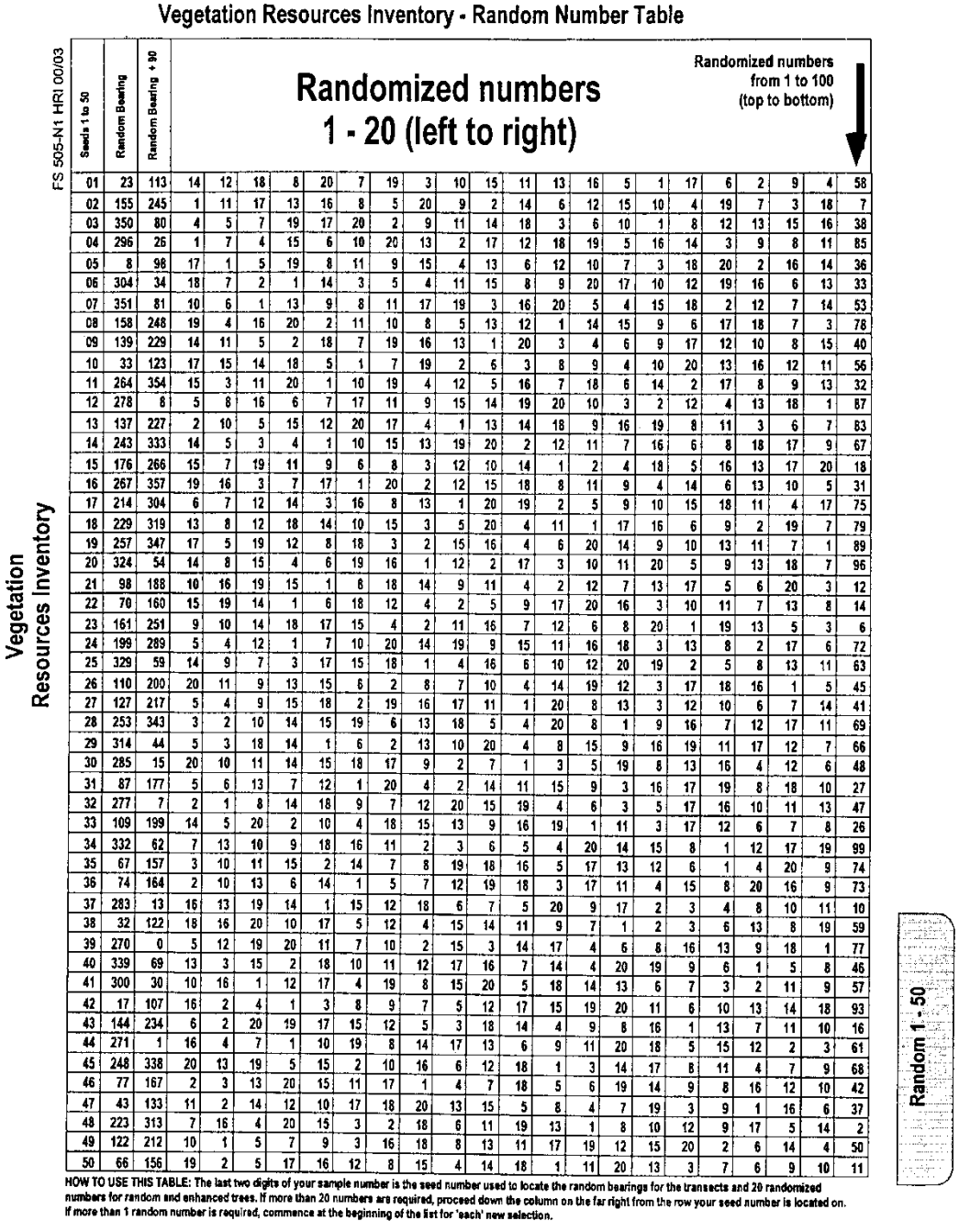
Scientific Name	Common Name	Genus Code	Species Code
Andromeda polifolia	bog-rosemary	ANDR	POL
Anemone multifida	cut-leaved anemone	ANEM	MUL
Apocynum androsaemifolium	spreading dogbane	APOC	AND
Apocynum cannabinum	hemp dogbane	APOC	CAN
Apocynum sibiricum	clasping-leaved dogbane	APOC	SIB
Arctostaphylos alpina	alpine bearberry	ARCT	ALP
Arctostaphylos rubra	red bearberry	ARCT	RUB
Arctostaphylos uva-ursi	kinnikinnick	ARCT	UVA
Aruncus dioicus	goatsbeard	ARUN	DIO
Asclepias ovalifolia	oak-leaf milkweed	ASCL	OVA
Asclepias speciosus	showy milkweed	ASCL	SPE
Cassiope lycopodioides	club-moss mountain-heather	CASS	LYC
Cassiope mertensiana	white mountain-heather	CASS	MER
Cassiope stelleriana	Alaskan mountain-heather	CASS	STE
Cassiope tetragona	four-angled mountain-heather	CASS	TET
Chamaerhodos erecta	chamaerhodos	CHAM	ERE
Chimaphila menziesii	Menzies' pipsissewa	CHIM	MEN
Chimaphila umbellata	prince's pine	CHIM	UMB
Comandra umbellata	pale comandra	COMA	UMB
Cornus canadensis	bunchberry	CORN	CAN
Cornus suecica	bog bunchberry	CORN	SUE
Cornus unalaschkensis	cordilleran bunchberry	CORN	UNA
Draba spp.	draba	DRABA	
Dryas drummondii	yellow mountain-avens	DRYA	DRU
Dryas integrifolia	entire-leaved mountain-avens	DRYA	INT
Dryas octopetala	white mountain-avens	DRYA	OCT
Empetrum nigrum	crowberry	EMPE	NIG
Eriogonum androscaceum	androscace buckwheat	ERIO	AND
Eriogonum flavum	yellow buckwheat	ERIO	FLA
Eriogonum heracleoides	parsnip-flowered buckwheat	ERIO	HER
Eriogonum niveum	snow buckwheat	ERIO	NIV
Eriogonum ovalifolium	cushion buckwheat	ERIO	OVA
Eriogonum pauciflorum	few-flowered buckwheat	ERIO	PAU
Eriogonum umbellatum	sulfur buckwheat	ERIO	UMB
Fragaria chiloensis	coastal strawberry	FRAG	CHI
Fragana vesc	wood strawberry	FRAG	VES
Fragaria virginiana	wild strawberry	FRAG	VIR
Galium boreale	northern bedstraw	GALI	BOR
Gaultheria humifusa	alpine wintergreen	GAUL	HUM
Gaultheria hispidula	creeping snowberry	GAUL	HIS
Gaultheria ovatifolia	western tea-berry	GAUL	OVA
Geocaulon lividum	bastard toad-flax	GEOC	LIV
Kalmia microphylla	alpine bog-laurel	KALM	MIC
Linnaea borealis	twinflower	LINN	BOR
Lithospermum incisum	yellow gromwell	LITH	INC
Lithospermum ruderale	lemonweed	LITH	RUD
Loiseleuria procumbens	alpine-azalea	LOIS	PRO
Luetkea pectinata	partridgefoot	LUET	PEC
Orthilia secunda	one-sided wintergreen	ORTH	SEC
Penstemon davidsonii	Davidson's penstemon	PENS	DAV
Penstemon ellipticus	oval-leaved penstemon	PENS	ELL
Phlox caespitosa	tufted phlox	PHLO	CAE
Phyllodoce empetriformis	pink mountain-heather	PHYL	EMP
Phyllodoce glanduliflora	yellow mountain-heather	PHYL	GLA
Polygonum cuspidatum	Japanese knotweed	POLY	CUS
Polygonum paronychia	beach knotweed	POLY	PAR
Polygonum polystachyum	Himalayan knotweed	POLY	POL
Polygonum sachalinense	giant knotweed	POLY	SAC
Pyrola spp.	wintergreens	PYROLA	
Rhododendron lapponicum	lapland rosebay	RHOD	LAP
Rubus arcticus	dwarf nagoonberry	RUBU	ARC
Rubus chamaemorus	cloudberr	RUBU	CHA
Rubus lasiococcus	dwarf bramble	RUBU	LAS
Rubus nivalis	snow bramble	RUBU	NIV
Rubus pedatus	five-leaved bramble	RUBU	PED
Rubus ursinus	trailing blackberry	RUBU	URS
Salix artica	arctic willow	SALI	ARC
Salix cascadensis	Cascade willow	SALI	CAS
Salix polaris	polar willow	SALI	POL
Salix reticulata	netted willow	SALI	RET
Salix stolonifera	stoloniferous willow	SALI	STO
Saxifraga bronchialis	spotted saxifrage	SAXI	BRO
Saxifraga cespitosa	tufted saxifrage	SAXI	CES
Saxifraga flagellari	stoloniferous saxifrage	SAXI	FLA
Saxifraga oppositifolia	purple mountain saxifrage	SAXI	OPP
Saxifraga tricuspidata	three-toothed saxifrage	SAXI	TRI
Sibbaldia procumbens	sibbaldia	SIBB	PRO
Vaccinium caespitosum	dwarf blueberry	VACC	CAE
Vaccinium myrtillus	low bilberry	VACC	MYT
Vaccinium oxycoccus	bog cranberry	OXYC	OXY
Vaccinium scoparium	grouseberry	VACC	SCO
Vaccinium vitis-idaea	lingonberry	VACC	VIT

* VACCMYR is V. myrtilloides; V. myrtillus defaults to next letter, so code is VACCMYT

R2 Vegetation Resources Inventory 99/3

FS 505-R2 HRI 99/3

Figure B. 18— Field Guide R-2 Range Resources: Low Woody Species and Intermediate Life Forms.



Vegetation Resources Inventory - Random Number Table

FS 505-N1 HRI 00/03

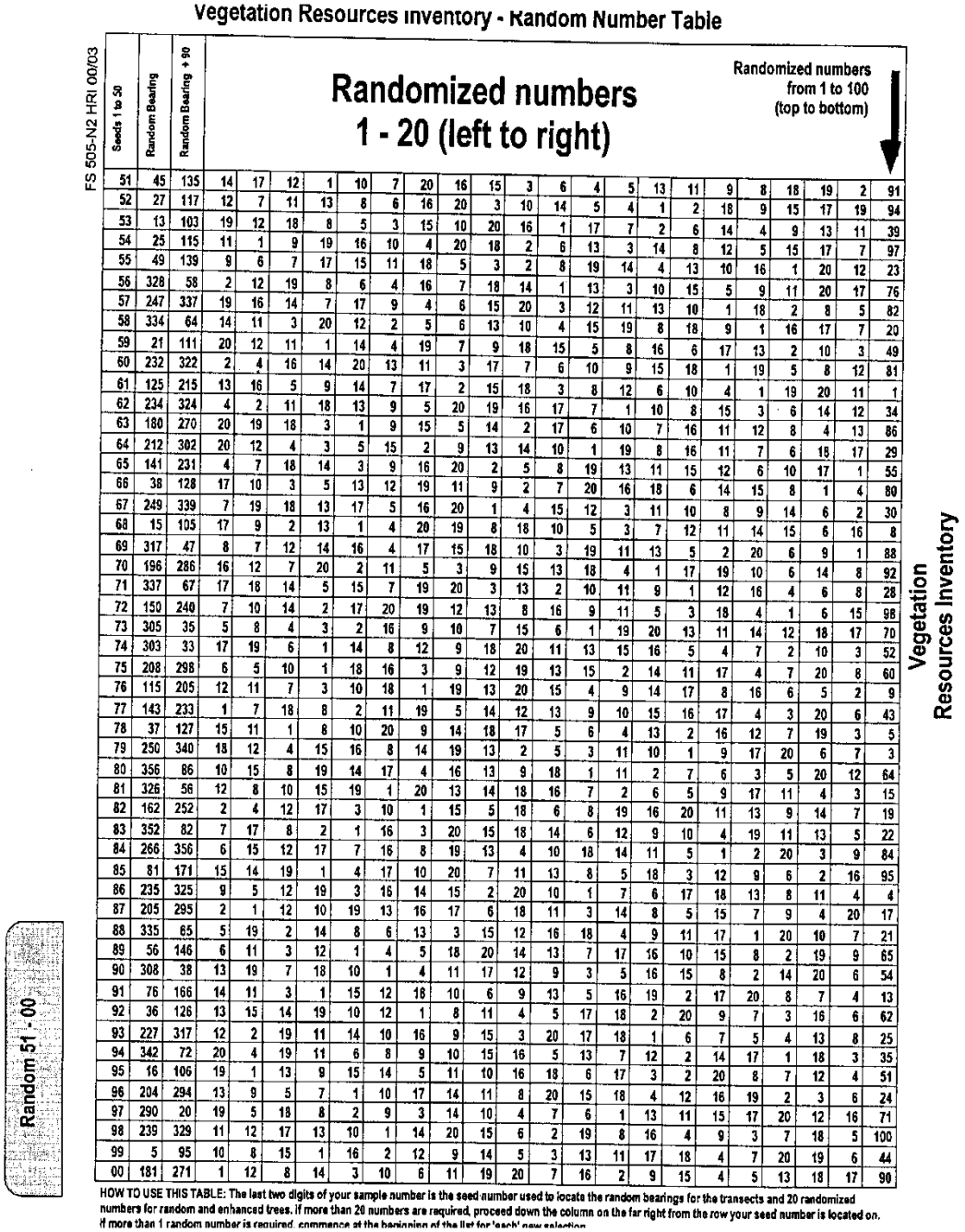
Vegetation Resources Inventory

Seeds 1 to 50	Random Bearing	Random Bearing + 90	Randomized numbers 1 - 20 (left to right)																				Randomized numbers from 1 to 100 (top to bottom)
01	23	113	14	12	18	8	20	7	19	3	10	15	11	13	16	5	1	17	6	2	9	4	58
02	155	245	1	11	17	13	16	8	5	20	9	2	14	6	12	15	10	4	19	7	3	18	7
03	350	80	4	5	7	19	17	20	2	9	11	14	18	3	6	10	1	8	12	13	15	16	38
04	296	26	1	7	4	15	6	10	20	13	2	17	12	18	19	5	16	14	3	9	8	11	85
05	8	98	17	1	5	19	8	11	9	15	4	13	6	12	10	7	3	18	20	2	16	14	36
06	304	34	18	7	2	1	14	3	5	4	11	15	8	9	20	17	10	12	19	16	6	13	33
07	351	81	10	6	1	13	9	8	11	17	19	3	16	20	5	4	15	18	2	12	7	14	53
08	158	248	19	4	16	20	2	11	10	8	5	13	12	1	14	15	9	6	17	18	7	3	78
09	139	229	14	11	5	2	18	7	19	16	13	1	20	3	4	6	9	17	12	10	8	15	40
10	33	123	17	15	14	18	5	1	7	19	2	6	3	8	9	4	10	20	13	16	12	11	56
11	264	354	15	3	11	20	1	10	19	4	12	5	16	7	18	6	14	2	17	8	9	13	32
12	278	8	5	8	16	6	7	17	11	9	15	14	19	20	10	3	2	12	4	13	18	1	87
13	137	227	2	10	5	15	12	20	17	4	1	13	14	18	9	16	19	8	11	3	6	7	83
14	243	333	14	5	3	4	1	10	15	13	19	20	2	12	11	7	16	6	8	18	17	9	67
15	176	266	15	7	19	11	9	6	8	3	12	10	14	1	2	4	18	5	16	13	17	20	18
16	267	357	19	16	3	7	17	1	20	2	12	15	18	8	11	9	4	14	6	13	10	5	31
17	214	304	6	7	12	14	3	16	8	13	1	20	19	2	5	9	10	15	18	11	4	17	75
18	229	319	13	8	12	18	14	10	15	3	5	20	4	11	1	17	16	6	9	2	19	7	79
19	257	347	17	5	19	12	8	18	3	2	15	16	4	6	20	14	9	10	13	11	7	1	89
20	324	54	14	8	15	4	6	19	16	1	12	2	17	3	10	11	20	5	9	13	18	7	96
21	98	188	10	16	19	15	1	8	18	14	9	11	4	2	12	7	13	17	5	6	20	3	12
22	70	160	15	19	14	1	6	18	12	4	2	5	9	17	20	16	3	10	11	7	13	8	14
23	161	251	9	10	14	18	17	15	4	2	11	16	7	12	6	8	20	1	19	13	5	3	6
24	199	289	5	4	12	1	7	10	20	14	19	9	15	11	16	18	3	13	8	2	17	6	72
25	329	59	14	9	7	3	17	15	18	1	4	16	6	10	12	20	19	2	5	8	13	11	63
26	110	200	20	11	9	13	15	6	2	8	7	10	4	14	19	12	3	17	18	16	1	5	45
27	127	217	5	4	9	15	18	2	19	16	17	11	1	20	8	13	3	12	10	6	7	14	41
28	253	343	3	2	10	14	15	19	6	13	18	5	4	20	8	1	9	16	7	12	17	11	69
29	314	44	5	3	18	14	1	6	2	13	10	20	4	8	15	9	16	19	11	17	12	7	66
30	285	15	20	10	11	14	15	18	17	9	2	7	1	3	5	19	8	13	16	4	12	6	48
31	87	177	5	6	13	7	12	1	20	4	2	14	11	15	9	3	16	17	19	8	18	10	27
32	277	7	2	1	8	14	18	9	7	12	20	15	19	4	6	3	5	17	16	10	11	13	47
33	109	199	14	5	20	2	10	4	18	15	13	9	16	19	1	11	3	17	12	6	7	8	26
34	332	62	7	13	10	9	18	16	11	2	3	6	5	4	20	14	15	8	1	12	17	19	99
35	67	157	3	10	11	15	2	14	7	8	19	18	16	5	17	13	12	6	1	4	20	9	74
36	74	164	2	10	13	6	14	1	5	7	12	19	18	3	17	11	4	15	8	20	16	9	73
37	283	13	16	13	19	14	1	15	12	18	6	7	5	20	9	17	2	3	4	8	10	11	10
38	32	122	18	16	20	10	17	5	12	4	15	14	11	9	7	1	2	3	6	13	8	19	59
39	270	0	5	12	19	20	11	7	10	2	15	3	14	17	4	6	8	16	13	9	18	1	77
40	339	69	13	3	15	2	18	10	11	12	17	16	7	14	4	20	19	9	6	1	5	8	46
41	300	30	10	16	1	12	17	4	19	8	15	20	5	18	14	13	6	7	3	2	11	9	57
42	17	107	16	2	4	1	3	8	9	7	5	12	17	15	19	20	11	6	10	13	14	18	93
43	144	234	6	2	20	19	17	15	12	5	3	18	14	4	9	8	16	1	13	7	11	10	16
44	271	1	16	4	7	1	10	19	8	14	17	13	6	9	11	20	18	5	15	12	2	3	61
45	248	338	20	13	19	5	15	2	10	16	6	12	18	1	3	14	17	8	11	4	7	9	68
46	77	167	2	3	13	20	15	11	17	1	4	7	18	5	6	19	14	9	8	16	12	10	42
47	43	133	11	2	14	12	10	17	18	20	13	15	5	8	4	7	19	3	9	1	16	6	37
48	223	313	7	16	4	20	15	3	2	18	6	11	19	13	1	8	10	12	9	17	5	14	2
49	122	212	10	1	5	7	9	3	16	18	8	13	11	17	19	12	15	20	2	6	14	4	50
50	66	156	19	2	5	17	16	12	8	15	4	14	18	1	11	20	13	3	7	6	9	10	11

HOW TO USE THIS TABLE: The last two digits of your sample number is the seed number used to locate the random bearings for the transects and 20 randomized numbers for random and enhanced trees. If more than 20 numbers are required, proceed down the column on the far right from the row your seed number is located on. If more than 1 random number is required, commence at the beginning of the list for 'each' new selection.

Random 1 - 50

Figure B. 19— Field Guide N-1 Random numbers for samples ending in 01–50.



Vegetation Resources Inventory - Random Number Table

FS 505-N2 HRI 00/03

Seeds 1 to 50	Random Bearing	Random Bearing + 90	Randomized numbers 1 - 20 (left to right)																				Randomized numbers from 1 to 100 (top to bottom)
51	45	135	14	17	12	1	10	7	20	16	15	3	6	4	5	13	11	9	8	18	19	2	91
52	27	117	12	7	11	13	8	6	16	20	3	10	14	5	4	1	2	18	9	15	17	19	94
53	13	103	19	12	18	8	5	3	15	10	20	16	1	17	7	2	6	14	4	9	13	11	39
54	25	115	11	1	9	19	16	10	4	20	18	2	6	13	3	14	8	12	5	15	17	7	97
55	49	139	9	6	7	17	15	11	18	5	3	2	8	19	14	4	13	10	16	1	20	12	23
56	328	58	2	12	19	8	6	4	16	7	18	14	1	13	3	10	15	5	9	11	20	17	76
57	247	337	19	16	14	7	17	9	4	6	15	20	3	12	11	13	10	1	18	2	8	5	82
58	334	64	14	11	3	20	12	2	5	6	13	10	4	15	19	8	18	9	1	16	17	7	20
59	21	111	20	12	11	1	14	4	19	7	9	18	15	5	8	16	6	17	13	2	10	3	49
60	232	322	2	4	16	14	20	13	11	3	17	7	6	10	9	15	18	1	19	5	8	12	81
61	125	215	13	16	5	9	14	7	17	2	15	18	3	8	12	6	10	4	1	19	20	11	1
62	234	324	4	2	11	18	13	9	5	20	19	16	17	7	1	10	8	15	3	6	14	12	34
63	180	270	20	19	18	3	1	9	15	5	14	2	17	6	10	7	16	11	12	8	4	13	86
64	212	302	20	12	4	3	5	15	2	9	13	14	10	1	19	8	16	11	7	6	18	17	29
65	141	231	4	7	18	14	3	9	16	20	2	5	8	19	13	11	15	12	6	10	17	1	55
66	38	128	17	10	3	5	13	12	19	11	9	2	7	20	16	18	6	14	15	8	1	4	80
67	249	339	7	19	18	13	17	5	16	20	1	4	15	12	3	11	10	8	9	14	6	2	30
68	15	105	17	9	2	13	1	4	20	19	8	18	10	5	3	7	12	11	14	15	6	16	8
69	317	47	8	7	12	14	16	4	17	15	18	10	3	19	11	13	5	2	20	6	9	1	88
70	196	286	16	12	7	20	2	11	5	3	9	15	13	18	4	1	17	19	10	6	14	8	92
71	337	67	17	18	14	5	15	7	19	20	3	13	2	10	11	9	1	12	16	4	6	8	28
72	150	240	7	10	14	2	17	20	19	12	13	8	16	9	11	5	3	18	4	1	6	15	98
73	305	35	5	8	4	3	2	16	9	10	7	15	6	1	19	20	13	11	14	12	18	17	70
74	303	33	17	19	6	1	14	8	12	9	18	20	11	13	15	16	5	4	7	2	10	3	52
75	208	298	6	5	10	1	18	16	3	9	12	19	13	15	2	14	11	17	4	7	20	8	60
76	115	205	12	11	7	3	10	18	1	19	13	20	15	4	9	14	17	8	16	6	5	2	9
77	143	233	1	7	18	8	2	11	19	5	14	12	13	9	10	15	16	17	4	3	20	6	43
78	37	127	15	11	1	8	10	20	9	14	18	17	5	6	4	13	2	16	12	7	19	3	5
79	250	340	18	12	4	15	16	8	14	19	13	2	5	3	11	10	1	9	17	20	6	7	3
80	356	86	10	15	8	19	14	17	4	16	13	9	18	1	11	2	7	6	3	5	20	12	64
81	326	56	12	8	10	15	19	1	20	13	14	18	16	7	2	6	5	9	17	11	4	3	15
82	162	252	2	4	12	17	3	10	1	15	5	18	6	8	19	16	20	11	13	9	14	7	19
83	352	82	7	17	8	2	1	16	3	20	15	18	14	6	12	9	10	4	19	11	13	5	22
84	266	356	6	15	12	17	7	16	8	19	13	4	10	18	14	11	5	1	2	20	3	9	84
85	81	171	15	14	19	1	4	17	10	20	7	11	13	8	5	18	3	12	9	6	2	16	95
86	235	325	9	5	12	19	3	16	14	15	2	20	10	1	7	6	17	18	13	8	11	4	4
87	205	295	2	1	12	10	19	13	16	17	6	18	11	3	14	8	5	15	7	9	4	20	17
88	335	65	5	19	2	14	8	6	13	3	15	12	16	18	4	9	11	17	1	20	10	7	21
89	56	146	6	11	3	12	1	4	5	18	20	14	13	7	17	16	10	15	8	2	19	9	65
90	308	38	13	19	7	18	10	1	4	11	17	12	9	3	5	16	15	8	2	14	20	6	54
91	76	166	14	11	3	1	15	12	18	10	6	9	13	5	16	19	2	17	20	8	7	4	13
92	36	126	13	15	14	19	10	12	1	8	11	4	5	17	18	2	20	9	7	3	16	6	62
93	227	317	12	2	19	11	14	10	16	9	15	3	20	17	18	1	6	7	5	4	13	8	25
94	342	72	20	4	19	11	6	8	9	10	15	16	5	13	7	12	2	14	17	1	18	3	35
95	16	106	19	1	13	9	15	14	5	11	10	16	18	6	17	3	2	20	8	7	12	4	51
96	204	294	13	9	5	7	1	10	17	14	11	8	20	15	18	4	12	16	19	2	3	6	24
97	290	20	19	5	18	8	2	9	3	14	10	4	7	6	1	13	11	15	17	20	12	16	71
98	239	329	11	12	17	13	10	1	14	20	15	6	2	19	8	16	4	9	3	7	18	5	100
99	5	95	10	8	15	1	16	2	12	9	14	5	3	13	11	17	18	4	7	20	19	6	44
00	181	271	1	12	8	14	3	10	6	11	19	20	7	16	2	9	15	4	5	13	18	17	90

HOW TO USE THIS TABLE: The last two digits of your sample number is the seed number used to locate the random bearings for the transects and 20 randomized numbers for random and enhanced trees. If more than 20 numbers are required, proceed down the column on the far right from the row your seed number is located on. If more than 1 random number is required, commence at the beginning of the list for 'each' new selection

Vegetation Resources Inventory

Random 51 - 00

Figure B. 20— Field Guide N-2 Random numbers for samples ending in 51–100.

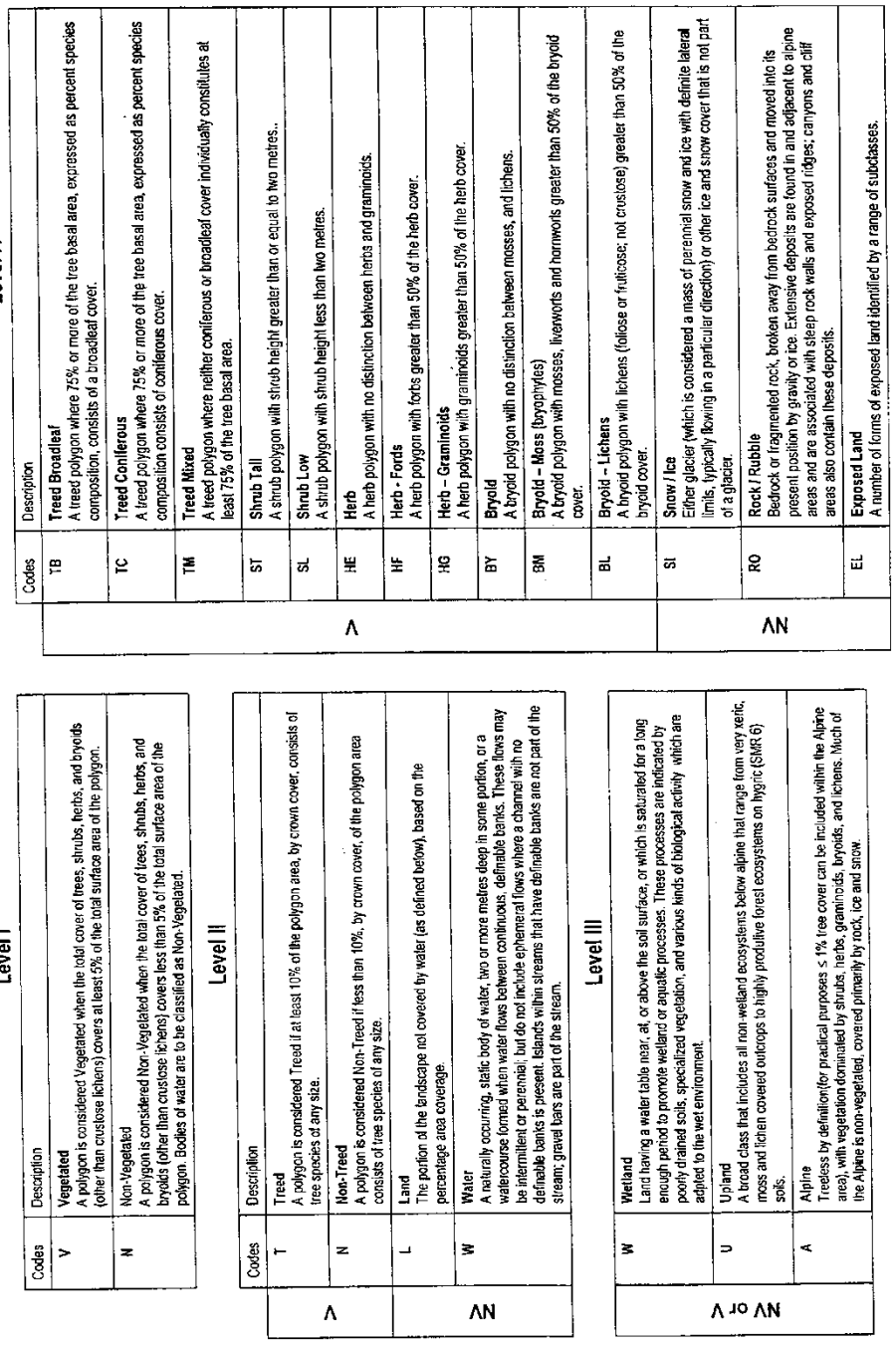


Figure B. 21— Field Guide E-1 B.C. Land Cover Classification Scheme Codes – Levels I to IV.

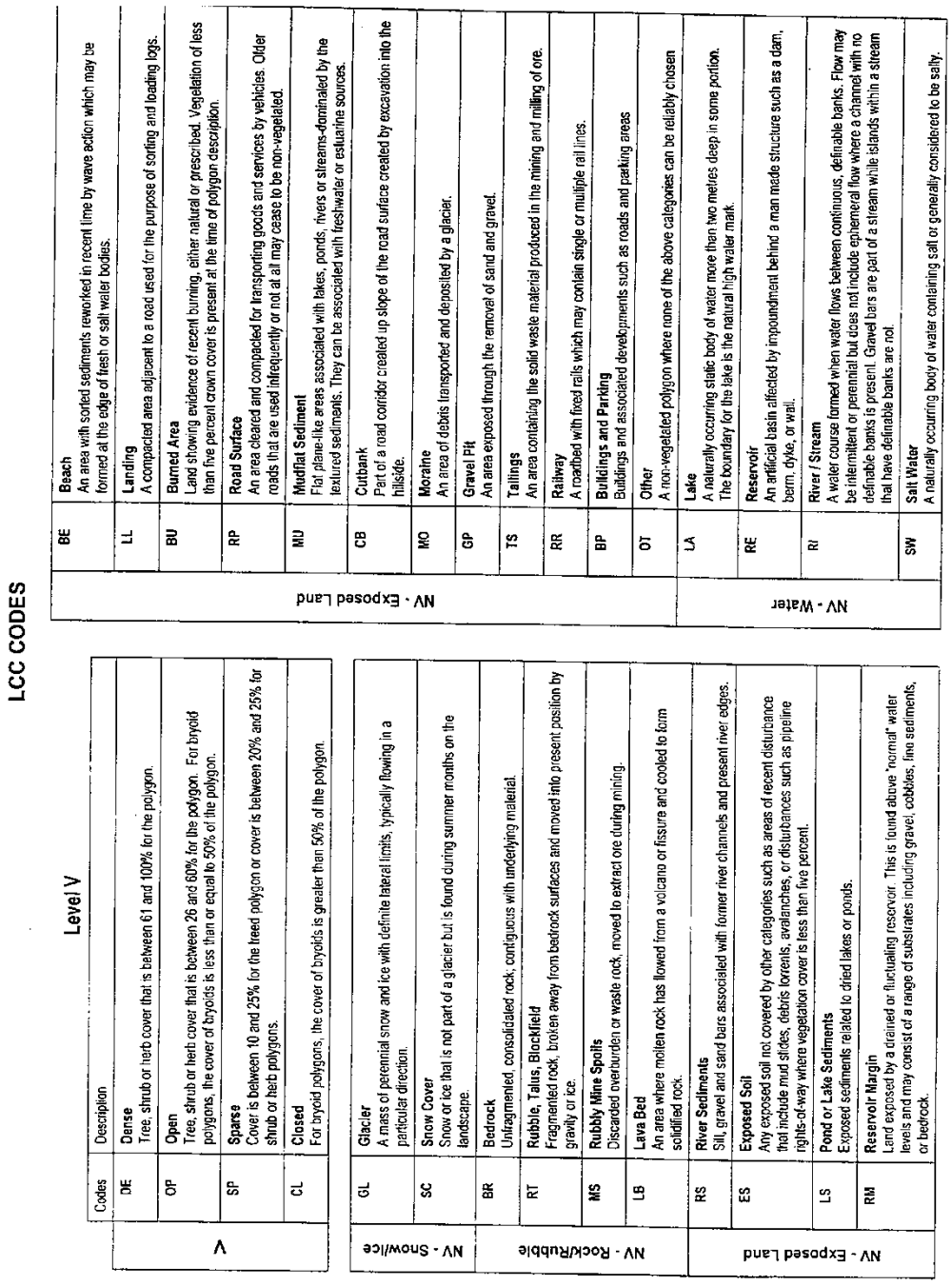


Figure B. 22— Field Guide E-2 B.C. Land Cover Classification Scheme Codes – Level V.

Appendix C: Damage Agent Codes

Source: "Pest Species Codes" Version June 9, 2009 [updated 2012/13]

Data Custodian: Director, Forest Practices Branch,

B.C. Ministry of Forests, Lands & Natural Resource Operations

This section lists the damage agents which affect B.C. trees, with codes used in the VRI and monitoring (CMI, NFI & YSM) data gathering. This list of VRI Damage Agents is an updated list provided by the data custodian and is approved by the data custodian.

Damage Agent Codes				
Field Codes			**Description**	
O	NO detectable abiotic or biotic damage			
U	UNKNOWN (Damage evident but causal agent unknown)			
		UBT	Unknown Broken Top	
		UCR	Unknown Crook	
	UF		Unknown Fork Damage	
		USW	Unknown Sweep	
N	NON-BIOLOGICAL (ABIOTIC) INJURIES			
		NAV	Avalanche or Snow Slide	
*	NB		Fire	
		NBP	Post Burn Mortality	
		NCA	Aspen (At) Decline	
		NCB	Birch (E) Decline	
		NCY	Yellow cedar (Yc) Decline	
*	ND		Drought	
	NF		Flooding	
*	NG		Frost	
*		NGC	Frost Crack	
		NGH	Frost Heaved	
		NGK	Shoot/Bud Frost Kill	
	NH		Hail	
	NK		Fumekill	
	NL		Lightning	
	NN		Road Salt	
	NR		Redbelt	
	NS		Slide	
*	NW		Windthrow	
		NWS	Windthrow - Soil Failure	
		NWT	Windthrow - Treatment or Harvest-related	
*	NX		Wind scarring or rubbing	
	NY		Snow or Ice (includes snow press)	
*	NZ		Sunscald	
D	DISEASES			
	DB		Broom Rusts	
		DBF	Fir Broom Rust	*(Melampsorella caryophyllacearum)*
		DBS	Spruce Broom Rust	*(Chrysomyxa arctostaphyli)*
*	DD**		Stem Decay	
		DDA	White Mottled Rot	*(Ganoderma applanatum)*
*		DDB	Birch Trunk Rot	*(Fomes fomentarius)*

		DDC	Brown Cubical Rot of Birch	*(Piptoporus betulinus)*
*		DDD	Sulfur Fungus	*(Laetiporus sulphureus)*
*		DDE	Rust Red Stringy Rot	*(Echindontium tinctorium)*
*		DDF	Brown Crumbly Rot	*(Fomitopsis pinicola)*
		DDG	Sterile Conk Trunk Rot of Birch	*(Inonotus obliquus)*
*		DDH	Hardwood Trunk Rot	*(Phellinus ignarius)*
*		DDO	Cedar Brown Pocket Rot	*(Poria sericeomollis)*
*		DDP	Red Ring Rot	*(Phellinus pini)*
*		DDQ	Quinine Conk Rot	*(Fomitopsis officinalis)*
*		DDT	Aspen Trunk Rot	*(Phellinus tremulae)*

** NOTE: Schweinitzii Butt Rot is no longer treated as a stem decay, it is now treated as a root disease (DRS).

*	DF		Foliage Diseases	
		DFA	Western pine Aster Rust	*(Coleosporium asterum)*
		DFB	Delphinella Tip Blight	*(Delphinella* spp.*)*
		DFC	Large-spore Spruce-Labrador tea Rust	*(Chrysomyxa ledicola)*
		DFD	Spruce Needle Cast	*(Lirula macrospora)*
		DFE	Elytroderma Needle Cast	*(Elytroderma deformans)*
		DFF	Marssonina Leaf Blights	*(Marssonina* spp.*)*
		DFG	Cottonwood Leaf Rust	*(Melampsora occidentalis)*
		DFH	Larch Needle Blight	*(Hypodermella laricis)*
		DFI	Linospora Leaf Blotch	*(Linospora tetraspora)*
		DFJ	Phaeoseptoria Needle Cast	*(Phaeoseptoria contortae)*
		DFK	Septoria Leaf Spot	*(Septoria populicola)*
		DFL	Pine Needle Cast	*(Lophodermella concolor)*
		DFM	Larch Needle Cast	*(Meria laricis)*
		DFN	Leptomelanconium Needle Blight	*(Leptomelanconium pinicola)*
		DFO	Lophodermium Needle Cast	*(Lophodermium seditiosum)*
		DFP	Fir Fireweed Rust	*(Pucciniastrum epilobi)*
		DFQ	Alpine Fir Needle Cast	*(Isthmiella quadrispora)*
		DFR	Douglas-fir needle cast	*(Rhabdocline pseudotsugae)*
		DFS	Dothistroma Needle Blight	*(Dothistroma septosporum)*
		DFT	Sirococcus Tip Blight	*(Sirococcus conigenus)*
		DFU	Cedar Leaf Blight	*(Didymascella thujina)*
		DFW	Swiss Needle Cast	*(Phaeocryptopus gaumanni)*
		DFX	Brown Felt Blight	*(Herpotrichia* spp.*)*
		DFY	Hendersonia Needle Cast	*(Hendersonia pinicola)*
		DFZ	Rhizosphaera Needle Cast	*(Rhizosphaera kalkhoffii)*
	DL		Disease Caused Dieback	
		DLD	Dermea Canker	*(Dermea pseudotsugae)*
		DLF	Red Flag Disease	*(Potebniamyces balsamicola)*
		DLK	Conifer Cytospora Canker	*(Leucostoma kunzei)*
		DLP	Phomopsis Canker	*(Phomopsis lokoyae)*
		DLS	Sydowia (Sclerophoma) Tip Dieback	*(Sclerophoma pithyophila)*
		DLV	Aspen-Poplar Twig Blight	*(Venturia* spp.*)*
	DM		Dwarf Mistletoe	
		DMF	Douglas-fir Dwarf Mistletoe	*(Arceuthobium douglasii)*
		DMH	Hemlock Dwarf Mistletoe	*(Arceuthobium tsugense)*
		DML	Larch Dwarf Mistletoe	*(Arceuthobium laricis)*
		DMP	Lodgepole pine Dwarf Mistletoe	*(Arceuthobium americanum)*
	DR		Root Disease	
		DRA	Armillaria Root Disease	*(Armillaria ostoyae)*
		DRB	Black Stain Root Disease	*(Leptographium wageneri)*
		DRC	Laminated Root Rot (cedar strain)	*(Phellinus weirii)*
		DRL	Laminated Root Rot (Fd form)	*(Inonotus sulphurascens)*

		DRN	Annosus Root Disease	*(Heterobasidion annosum)*
		DRR	Rhizina Root Disease	*(Rhizina undulata)*
	**	DRS	Schweinitzii Butt Rot	*(Phaeolus schweinitzii)*
		DRT	Tomentosus Root Rot	*(Inonotus tomentosus)*

** NOTE: **Schweinitzii Butt Rot** was formerly (pre-2009) treated as a stem decay, it is now treated as a **root disease (D**

	DS		Stem Diseases (Cankers and Rusts)	
		DSA	Atropellis Canker (Lodgepole pine)	*(Atropellis piniphila)*
		DSB	White pine Blister Rust	*(Cronartium ribicola)*
		DSC	Comandra Blister Rust	*(Cronartium comandrae)*
		DSE	Sooty Bark Canker	*(Encoelia pruinosa)*
		DSG	Western Gall Rust	*(Endocronartium harknessii)*
		DSH	Hypoxylon Canker	*(Entoleuca (Hypoxylon) mammatum)*
		DSP	Cryptosphaeria Canker	*(Cryptosphaeria populina)*
		DSR	Ceratocystis Canker	*(Ceratocystis fimbriata)*
		DSS	Stalactiform Blister Rust	*(Cronartium coleosporioides)*
		DST	Target Canker	*(Nectria galligena)*
		DSY	Cytospora Canker	*(Cytospora chrysosperma)*
I	INSECTS			
	IA		Aphids	
		IAB	Balsam Woolly Adelgid	*(Adelges piceae)*
		IAC	Giant Conifer Aphid	*(Cinara* spp.*)*
		IAG	Cooley Spruce Gall Adelgid	*(Adelges cooleyi)*
		IAL	Larch (Lw) Cone Woolly Aphid	*(Adelges lariciatus)*
		IAS	Green Spruce Aphid	*(Elatobium abietinum)*
	IB		Bark Beetles	
		IBB	Western Balsam Bark Beetle	*(Dryocoetes confusus)*
		IBD	Douglas-fir Beetle	*(Dendroctonus pseudotsugae)*
		IBE	Silver Fir Beetle	*(Pseudohylesinus sericeus)*
		IBF	Fir Engraver Beetle	*(Scolytus ventralis)*
		IBH	Hylurgops Beetle	*(Hylurgops rugipennis)*
		IBI	Engraver Beetles	*(Ips* spp.*)*
		IBL	Lodgepole Pine Beetle	*(Dendroctonus murryanae)*
		IBM	Mountain Pine Beetle	*(Dendroctonus ponderosae)*
		IBP	Twig Beetles	*(Pityogenes, Pityophthorus* spp.*)*
		IBR	Fir Root Bark Beetle	*(Pseudohylesinus granulatus)*
		IBS	Spruce Beetle	*(Dendroctonus rufipennis)*
		IBT	Red Turpentine Beetle	*(Dendroctonus valens)*
		IBW	Western Pine Beetle	*(Dendroctonus brevicomis)*
	ID		Defoliators	
		ID1	Leaf Beetles	*(Chrysomela* spp.*)*
		ID2	Bruce Spanworm	*(Operophtera bruceata)*
		ID3	Winter Moth	*(Operophtera brumata)*
		ID4	Cottonwood Sawfly	*(Nematus currani)*
		ID5	Fall Webworm	*(Hyphantria cunea)*
		ID6	Aspen Leaf Miner	*(Phyllocristis populiella)*
		ID7	Woolly Alder Sawfly	*(Eriocampa ovata)*
		ID8	Aspen Leaf Roller	*(Pseudexentera oregonana)*
		ID9	Birch Leaf Skeletonizer	*(Buccalatrix* spp.*)*
		IDA	Black Army Cutworm	*(Actebia fennica)*
		IDB	Two-year Budworm	*(Choristoneura biennis)*
		IDC	Larch Casebearer	*(Coleophora laricella)*
		IDD	Western Winter Moth	*(Erranis tiliaria vancouverensis)*
		IDE	Eastern Spruce Budworm	*(Choristoneura fumiferana)*
		IDF	Forest Tent Caterpillar	*(Malacosoma disstria)*

		IDG	Greenstriped Forest Looper	*(Melanolophia imitata)*
		IDH	Western Blackheaded Budworm	*(Acleris gloverana)*
		IDI	Pine Needle Sheath Miner	*(Zellaria haimbachi)*
		IDJ	Gray Forest Looper	*(Caripeta divista)*
		IDK	Northern Tent Caterpillar	*(Malacosoma californicum)*
		IDL	Western Hemlock Looper	*(Lambdina fiscellaria lugubrosa)*
		IDM	Gypsy Moth	*(Lymantria dispar)*
		IDN	Birch Leaf Miner	*(Fenusa pusilla)*
		IDO	Filament Bearer	*(Nematocampa fiamentaria)*
		IDP	Larch Sawfly	*(Pristophora erichsoni)*
		IDQ	Hemlock Needle Miner	*(Epinotia tsugana)*
		IDR	Alder Sawfly	*(Eriocampa ovata)*
		IDS	Balsam Fir Sawfly	*(Neodiprion abietis)*
		IDT	Douglas-fir Tussock Moth	*(Orgyia pseudotsugata)*
		IDU	Satin Moth	*(Leucoma salicis)*
		IDV	Variegated Cutworm	*(Peridroma saucia)*
		IDW	Western Spruce Budworm	*(Choristoneura occidentalis)*
		IDX	Large Aspen Tortrix	*(Choristoneura conflictana)*
		IDY	Birch-Aspen Leafroller	*(Epinotia solandriana* (Linnaeus)*)*
		IDZ	Western False Hemlock Looper	*(Nepytia freemani)*
		IEA	Unidentified Aspen Defoliation	
		IEB	Hemlock Sawfly	*(Neodiprion tsugae)*
		IEC	Larch Budmoth	*(Zairaphera improbana)*
		IED	Larch Looper	*(Semiothis sexmaculata)*
		IEF	Cottonwood Leaf Skeletonizer	*(Phyllonorycytes apparella)*
		IEG	Lodgepole pine Sawfly	*(Neodiprion burkei)*
		IEH	Phantom Hemlock Looper	*(Nepytia phantasmaria)*
		IEI	Saddleback Looper	*(Ectropis crepuscularia)*
		IEJ	Willow Leafminer	*(Micrurapteryx salicifoliella)*
		IEK	Rusty Tussock Moth	*(Orgyia antiqua)*
	IS		Shoot Insects	
		ISA	Bronze Birch Borer	*(Agrilus anxius)*
		ISB	Western Cedar Borer	*(Trachykele blondeli)*
		ISC	Poplar Borer	*(Saperda calcarata)*
		ISE	European Pine Shoot Moth	*(Rhyacionia buoliana)*
		ISG	Gouty Pitch Midge	*(Cecidomyia piniinopsis)*
		ISP	Pitch Nodule Moths	*(Petrova* spp.*)*
		ISQ	Sequoia Pitch Moth	*(Vespamima sequoiae)*
		ISS	Western Pine Shoot Borer	*(Eucosma sonomana)*
		ISW	Poplar and Willow Borer	*(Cryptorhynchus lapathi)*
	IW		Weevils	
		IWC	Conifer Seedling Weevil	*(Steremnius carinatus)*
		IWM	Magdalis Species	*(Magdalis* spp.*)*
		IWP	Lodgepole pine Terminal Weevil	*(Pissodes terminalis)*
		IWS	White pine Weevil (on Spruce)	*(Pissodes strobi)*
		IWW	Warren's Root Collar Weevil	*(Hylobius warreni)*
		IWY	Cylindrocopturus Weevil	*(Cylindrocopturus* spp.*)*
		IWZ	Yosemite Bark Weevil	*(Pissodes schwartzii)*
M	MITE DAMAGE			*(Trisetacus* spp.*)*

P	CONE and SEEDLING PATHOGENS			
		PAX	*Alternaria* spp.	*(Alternaria* spp.*)*
		PBC	Gray Mould	*(Botrytris cinerea)*
		PCD	*Neonectria radicicola*	*(Neonectria radicicola)*

		PCF	Seed or Cold Fungus	*(Caloscypha fulgens)*
		PCP	Inland Spruce Cone Rust	*(Chrysomyxa pirolata)*
		PDT	Cedar Leaf Blight	*(Didymascella thujina*)
		PFX	*Fusarium* spp.	*(Fusarium* spp.*)*
		PPG	Damping-off Disease	*(Phoma glomerata)*
		PPX	*Penicillium* spp.	*(Penicillium* spp.*)*
		PSS	Sirococcus Blight	*(Sirococcus strobilinus*)
		PTX	*Trichothecium* spp.	*(Trichothecium* spp.*)*
C	CONE and SEED INSECTS			
		CAH	Cone Resin Midge	*(Asynapta hopkinsi)*
		CBC	Fir (Fd) Cone Moth	*(Barbara colfaxiana)*
		CBX	Fir Cone Moth	*(Barbara* spp.*)*
		CCP	Douglas-fir Cone Scale Midge	*(Camptomyia pseudotsugae)*
		CDC	Spruce (Sx) Cone Gall Midge	*(Kaltenbachiola (Dasineura) canadensis)*
		CDD	Fir Seed Midge	*(Kaltenbachiola (Dasineura) abiesemia)*
		CDR	Spruce (Sx) Cone Axis Midge	*(Kaltenbachiola(Dasineura) rachiphaga)*
		CDX	Kaltenbachiola (Dasineura) Midges	*(Kaltenbachiola (Dasineura)* spp.*)*
		CEA	Fir Seed Maggot	*(Earomyia abietum)*
		CEB	Spruce Cone Maggot	*(Earomyia barbara)*
		CEQ	*Earomyia aquilonia*	*(Earomyia aquilonia)*
		CEX	Earomyia Maggots	*(Earomyia* spp.*)*
		CFP	Fir (Fd) Cone Beetle	*(Ernobius punctulatus)*
		CHX	Budworms	*(Choristoneura spp.)*
		CIA	Fir Coneworm	*(Dioryctria abietivorella)*
		CIP	Fir (Fd) Coneworm	*(Dioryctria pseudotsugella)*
		CIR	Spruce (Sx) Coneworm	*(Dioryctria reniculelloides)*
		CIS	Pine (Py) Coneworm	*(Dioryctria rossi)*
		CIV	Ponderosa pine (Py) Coneworm	*(Dioryctria auranticella)*
		CIX	Coneworms	*(Dioryctria* spp.*)*
		CLO	Western Conifer Seed Bug	*(Leptoglossus occidentalis)*
		CMA	Ponderosa pine (Py) Seed Chalcid	*(Megastigmus albifrons)*
		CMC	Spruce (Sx) Seed Chalcid	*(Megastigmus piceae)*
		CML	Subalpine fir (Bl) Seed Chalcid	*(Megastigmus lasiocarpae)*
		CMP	Fir Seed Chalcid	*(Megastigmus pinus)*
		CMR	*Megastigmus rafni*	*(Megastigmus rafni)*
		CMS	Fir (Fd) Seed Chalcid	*(Megastigmus spermotrophus)*
		CMT	Hemlock Seed Chalcid	*(Megastigmus tsugae)*
		CMX	Seed Chalcids	*(Megastigmus tsugae)*
		CNP	Pine Cone Beetle	*(Conophthorus ponderosae)*
		CPS	Spruce Gall Adelgid	*(Pineus similis)*
		CRX	Cone Scale Midges	*(Resseliella* spp.*)*
		CSN	Spiral Spruce Cone Borer	*(Strobilomyia neanthracina)*
		CTO	Fir (Fd) Cone Gall Midge	*(Contarinia oregonensis)*
		CTW	Fir (Fd) Cone Scale Midge	*(Contarinia washingtonensis)*
		CVP	White pine (Pw) Cone Borer	*(Eucosma ponderosa)*
		CVR	Lodgepole pine (Pl) Cone Borer	*(Eucosma recissoriana)*
		CYC	Spruce (Sx) Seed Midge	*(Mayetiola carpophaga)*
		CYP	Ponderosa pine (Py) Seedworm	*(Cydia piperana)*
		CYS	Spruce (Sx) Seedworm	*(Cydia strobilella)*
		CYT	Cedar (Cw) Cone Midge	*(Mayetiola thujae)*
		CYX	Seedworms	*(Cydia* spp.*)*
T	TREATMENT INJURIES			
	TC		Chemical Injury	
	TL		Logging Wounds	

	TM		Other Mechanical Damage (non-logging)	
	TP		Planting (incorrectly planted)	
		TPM	Planting (poor microsite)	
	TR		Pruning Wound	
	TT		Thinning or Spacing Wound	
A	ANIMAL DAMAGE			
	AB		Bear	
	AC		Cattle	
	AD		Deer	
	AE		Elk	
	AH		Hare or Rabbit	
	AM		Moose	
	AO		Pika	*(Ochotona* spp.)
	AP		Porcupine	
	AS		Squirrel	
	AV		Vole	
	AX		Birds	
	AZ		Beaver	
V	PROBLEM VEGETATION			
	VH		Herbaceous Competition	
	VP		Vegetation Press	
	VS		Shrub Competition	
	VT		Tree Competition	

Appendix D: Damage Severity and Mortality Condition Codes and Standards

This section lists the damage severity and mortality condition standards for individual trees in the Vegetation Inventory Samples (also used on growth and yield permanent sample plots) with codes and description.

Damage Severity and Mortality Condition Codes and Standards		
Damage/condition or agent	**Severity code**	**Code description and classification[1]**
Mortality conditions for all agents (nominal)	SR	Standing — Recent dead
	SO	Standing — Old dead
	WR	Windthrow — Root and butt rot
	WS	Windthrow — Soil failure
	WA	Windthrow- Management/soil related
	BD	Breakage — Stem decay (stubs and snags)
	BS	Breakage — Stem shear
Bark beetles (nominal)	FA	Failed Attack
	GR	Current (Green) attack
	RA	Red Attack
	GY	Grey Attack
Defoliators, needle rusts and blights (general use) (total crown rating scale; past and present attack) (continuous)	Record % defoliated, discoloured, or infected	Enter % (100% = – –)
Defoliators – Western Spruce Budworm (current foliage only) (continuous)	Record % of current year's foliage defoliated	Enter % (100% = – –) (100% is a shell of missing foliage [all of the current year's foliage] on the outside of the tree)
Defoliators – Elytroderma needle cast (ordinal) (data collected 2014 onward)	Enter one: 1, 2, 3, 4, 5, 6	Hawksworth's 6-class rating system
Terminal weevils (nominal) (data collected 2014 onward)	Record: C	Current attack only (no previous attack)

[1] For detailed diagrams refer to *Minimum Standards for the Establishment and Remeasurement of Permanent Sample Plots in British Columbia*, Forest Productivity Councils of British Columbia, September 1995.

Damage Severity and Mortality Condition Codes and Standards		
Damage/condition or agent	**Severity code**	**Code description and classification[1]**
	O	Old attack (may also be current attack)
	and:	(for 'O' only; if 'C', no further code allowed)
	M	Major crook
	N	Minor crook
	F	Forking
	S	Staghead
Terminal weevils (nominal) (data collected pre-2014)	Record: # of years of attacks (1-9) and :	1 to 9 attacks and
	M	Major crook
	N	Minor crook
	F	Forking
	S	Staghead
Stem rusts (nominal)	BC	Branch Canker(s)
	SC	Stem Canker(s)
	TK	Top-Kill
Root Rots (nominal) (data collected 2014 onward)	SC	Crown symptoms
	BR	Basal reinosis
	CS	Confirmatory symptoms (stain, decay, mycelia, rhizomorphs, or sporophores)
Root Rots (nominal) (data collected pre-2014)	W5	Within 5 m of *A. Ostoyae* infection source
	LC	Light Crown symptoms
	SC	Severe Crown symptoms
	RL	Basal resinosis (Light) ≤ 50% circumference
	RS	Basal resinosis (Severe) > 50% circumference
	BR	Butt Rot
	CS	Confirmatory Symptoms; stain, decay, mycelia, rhizomorphs, or sporophores
Dwarf Mistletoes (branch infection) (for all species) (ordinal)	Enter one 1, 2, 3, 4, 5, 6	Hawksworth's 6-class rating system
For coastal western hemlock Stem swelling defect classes (nominal)	N M	≥ minor stem swelling per tree ≥ major stem swelling per tree
Mammals, birds, and root collar weevil (girdlers) (continuous)	Record % girdled	enter % 100% = (– –-)

Appendix E: Low Woody Species and Intermediate Life Forms

List of low woody species and species of doubtful lifeform assigned to the herb (C) layer.

Scientific Name	Common Name	Genus Code	Species Code
Andromeda polifolia	bog-rosemary	ANDR	POL
Anemone multifida	cut-leaved anemone	ANEM	MUL
Apocynum androsaemifolium	spreading dogbane	APOC	AND
Apocynum cannabinum	hemp dogbane	APOC	CAN
Apocynum sibiricum	clasping-leaved dogbane	APOC	SIB
Arctostaphylos alpina	alpine bearberry	ARCT	ALP
Arctostaphylos rubra	red bearberry	ARCT	RUB
Arctostaphylos uva-ursi	kinnikinnick	ARCT	UVA
Aruncus dioicus	goatsbeard	ARUN	DIO
Asclepias ovalifolia	oak-leaf milkweed	ASCL	OVA
Asclepias speciosus	showy milkweed	ASCL	SPE
Cassiope lycopodioides	club-moss mountain-heather	CASS	LYC
Cassiope mertensiana	white mountain-heather	CASS	MER
Cassiope stelleriana	Alaskan mountain-heather	CASS	STE
Cassiope tetragona	four-angled mountain-heather	CASS	TET
Chamaerhodos erecta	chamaerhodos	CHAM	ERE
Chimaphila menziesii	Menzies' pipsissewa	CHIM	MEN
Chimaphila umbellata	prince's pine	CHIM	UMB
Comandra umbellata	pale comandra	COMA	UMB
Cornus canadensis	bunchberry	CORN	CAN
Cornus suecica	bog bunchberry	CORN	SUE
Cornus unalaschkensis	cordilleran bunchberry	CORN	UNA

Scientific Name	Common Name	Genus Code	Species Code
Draba spp.	draba	DRABA	
Dryas drummondii	yellow mountain-avens	DRYA	DRU
Dryas integrifolia	entire-leaved mountain-avens	DRYA	INT
Dryas octopetala	white mountain-avens	DRYA	OCT
Empetrum nigrum	crowberry	EMPE	NIG
Eriogonum androscaceum	androscace buckwheat	ERIO	AND
Eriogonum flavum	yellow buckwheat	ERIO	FLA
Eriogonum heracleoides	parsnip-flowered buckwheat	ERIO	HER
Eriogonum niveum	snow buckwheat	ERIO	NIV
Eriogonum ovalifolium	cushion buckwheat	ERIO	OVA
Eriogonum pauciflorum	few-flowered buckwheat	ERIO	PAU
Eriogonum umbellatum	sulfur buckwheat	ERIO	UMB
Fragaria chiloensis	coastal strawberry	FRAG	CHI
Fragana vesca	wood strawberry	FRAG	VES
Fragaria virginiana	wild strawberry	FRAG	VIR
Galium boreale	northern bedstraw	GALI	BOR
Gaultheria humifusa	alpine wintergreen	GAUL	HUM
Gaultheria hispidula	creeping snowberry	GAUL	HIS
Gaultheria ovatifolia	western tea-berry	GAUL	OVA
Geocaulon lividum	bastard toad-flax	GEOC	LIV
Kalmia microphylla	alpine bog-laurel	KALM	MIC
Linnaea borealis	twinflower	LINN	BOR
Lithospermum incisum	yellow gromwell	LITH	INC
Lithospermum ruderale	lemonweed	LITH	RUD
Loiseleuria procumbens	alpine-azalea	LOIS	PRO

Scientific Name	Common Name	Genus Code	Species Code
Luetkea pectinata	partridgefoot	LUET	PEC
Orthilia secunda	one-sided wintergreen	ORTH	SEC
Penstemon davidsonii	Davidson's penstemon	PENS	DAV
Penstemon ellipticus	oval-leaved penstemon	PENS	ELL
Phlox caespitosa	tufted phlox	PHLO	CAE
Phyllodoce empetriformis	pink mountain-heather	PHYL	EMP
Phyllodoce glanduliflora	yellow mountain-heather	PHYL	GLA
Polygonum cuspidatum	Japanese knotweed	POLY	CUS
Polygonum paronychia	beach knotweed	POLY	PAR
Polygonum polystachyum	Himalayan knotweed	POLY	POL
Polygonum sachalinense	giant knotweed	POLY	SAC
Pyrola spp.	wintergreens	PYROLA	
Rhododendron lapponicum	lapland rosebay	RHOD	LAP
Rubus arcticus	dwarf nagoonberry	RUBU	ARC
Rubus chamaemorus	cloudberry	RUBU	CHA
Rubus lasiococcus	dwarf bramble	RUBU	LAS
Rubus nivalis	snow bramble	RUBU	NIV
Rubus pedatus	five-leaved bramble	RUBU	PED
Rubus ursinus	trailing blackberry	RUBU	URS
Salix artica	arctic willow	SALI	ARC
Salix cascadensis	Cascade willow	SALI	CAS
Salix polaris	polar willow	SALI	POL
Salix reticulata	netted willow	SALI	RET
Salix stolonifera	stoloniferous willow	SALI	STO
Saxifraga bronchialis	spotted saxifrage	SAXI	BRO

Scientific Name	Common Name	Genus Code	Species Code
Saxifraga cespitosa	tufted saxifrage	SAXI	CES
Saxifraga flagellaris	stoloniferous saxifrage	SAXI	FLA
Saxifraga oppositifolia	purple mountain saxifrage	SAXI	OPP
Saxifraga tricuspidata	three-toothed saxifrage	SAXI	TRI
Sibbaldia procumbens	sibbaldia	SIBB	PRO
Vaccinium caespitosum	dwarf blueberry	VACC	CAE
Vaccinium myrtillus	low bilberry	VACC	MYT*
Vaccinium oxycoccus = *Oxycoccus oxycoccos*	bog cranberry	OXYC	OXY
Vaccinium scoparium	grouseberry	VACC	SCO
Vaccinium vitis-idaea	lingonberry	VACC	VIT

* VACCMYR is *V. myrtilloides*; *V. myrtillus* defaults to next letter, so code is VACCMYT

Appendix F: Modifications to Ground Sample Marking Procedures for "Hidden" Ground Samples

Introduction:

The Phase II ground sampling procedures include extensive requirements for sample layout. These procedures may need to be modified in instances where samples or the access route fall within special management areas such as parks and recreation sites, private lands, or areas that are in high use by the public. The custodian of the lands in question (be they the Ministry of Environment, Lands and Parks, the private landowner, etc) should always be contacted to determine their specific requirements and to obtain permission to locate the sample. Consultation with the custodian will also help determine which of the modifications below need to be used. All samples located on private land or special areas of interest must:

a. have a signed agreement with the land owner on file

b. have a description of the agreed upon plot marking procedures signed and on file

The following document is intended to be used by project managers, when planning sampling projects, as a guide on how to modify the sample marking procedures on such samples and how to go about relocating them for audits or other uses. In general, the modifications should not significantly affect the time it takes to establish a sample.

Modifications to marking procedures:

These modifications are intended to make the sample as “invisible” to a casual observer at the sample as possible. Some items such as soil pits are going to be somewhat visible regardless of procedure modifications.

1. Do not ribbon, spray paint, blaze or limb any tree on the sample, including the tie point or reference tree. Crews may wish to temporarily hang a ribbon on trees in the sample cluster to aid in measurement and reduce confusion, but they must be removed prior to leaving the sample.
2. The route from Tie Point Tree to Reference Point location should not to be ribboned, and there must not be any ribbon at the IPC. Crews may place ribbon for use while at the plot (for example, to aid in estimating cover for ecological plots), but all ribbon must be removed prior to leaving the site.
3. The full length of all plot stakes is to be inserted into the ground, including the reference tree pin, the IPC pin and the auxiliary plot pins. The crews may wish to cut the pins in half to ensure that it’s entire length can be inserted into the ground or crews may want to carry a pipe cutter or hacksaw to custom cut the stakes to length on site. To assist relocation with a metal detector place a large iron nail inside the aluminium pipe (ensure the nail head is large enough to prevent the nail from sliding to the bottom of the stake). If appropriate a small cairn of rocks can be placed around the location of the stake.
4. CWD intersections are not to be painted or otherwise marked, but a stick or branch should be pushed into the ground at the end of each transect.
5. Additional effort to collect GPS positions in the field should be expended for the IPC and the Tie point.

6. At least one tree in each auxiliary plot must be stem mapped to aid in re-locating the auxiliary plot center pin. The stem map information on the auxiliary plots will be recorded in the comments section of the TA card.
7. Crews need to take a minimum of one picture (in addition to the regular VRI requirements) at the reference pin facing towards the IPC to aid in relocating the IPC. Any additional pictures that would aid in re-locating the IPC should be taken.
8. The Reference tree tag and the tie point tag should still be placed where allowed. These are not highly visible unless someone is specifically looking for it. The tags should be placed at or near ground level, possibly covered by loose rocks or woody debris.
9. Record in the comments section of the CH cards that the sample is a "hidden" sample, and briefly list the modifications to procedures. This will aid future crews to the sample in planning how to re-locate the IPC.
10. The windows cut to measure bark thickness may not be allowed. It is expected that increment boring should be allowed on nearly all sites.

Suggested methods for re-locating the IPC and Auxiliary plot pins for audit or other uses

Planning before leaving for the field will significantly reduce the time it takes to re-locate a hidden sample. The procedures listed below have been tested and the extra time to re-locate a hidden sample can be quite minimal given proper planning.

On some samples the tie point will be very distinct and the tie line from the tie point to the IPC will be short. On samples such as these, conventional chaining methods could be used to re-locate the general area for the IPC pin. A real-time corrected GPS unit is an asset to confirm the location.

Samples where the tie point is indistinct and/or the tie line is long may require the use of real-time corrected GPS. The crew re-visiting the sample should obtain the corrected co-ordinates for the sample before leaving for the field. Using the real-time GPS unit, the crew can navigate to the approximate location of the IPC pin, or offset as applicable. Real-time GPS is necessary on long tie lines as even a small change in bearing when re-chaining the line can result in the revisit crew being far enough away from the original IPC location that re-locating it could be impossible.

Once in the general area of the IPC, the re-visit crew should keep and eye out for the reference tree tag, soil pit, and plot center pins (where allowed) which are the most visible signs of being near the IPC plot center. If the reference tag is found, the crew should be able to find the reference pin using the reference tree details on the original Compass Card. The soil pit will indicate that the plot center is near, and may have been drawn on the Integrated Plot Details of the CL card. Other clues to look for are the species in the area (such as, a lone spruce in the plot where the rest of the trees are pine), or an overly large tree in the plot. The crew can take the diameter of one of these trees to see if it matches on the original cards. If it does the stem map can be used to further refine the IPC pin location. Bark windows or increment borer holes on trees are another sign that you are in the vicinity of the IPC, and will be visible if the time between establishment and re-visit is not great enough to allow the scars to heal. The windows in general will all face towards the IPC pin.

In situations where the plot center stake has been buried, it may require the use of a metal detector to determine the exact location of the plot center. The metal detector can be used in a systematic way to cover the general area where the plot center pin is located. Crews should

ensure that they use a metal detector capable of identifying aluminium, as some are capable of identifying ferro-magnetic materials (iron) only. The user manual for a detector will tell what materials it can detect.

Once the IPC pin has been found, the Auxiliary plots can be located by chaining the 50m in the appropriate direction. If the pin has been buried, use the prism to determine which trees are probably in the plot, finding the stem mapped tree in the auxiliary plot, and use this to locate the approximate pin location. The auditing crew may find it easier to proceed directly to using a metal detector to find the plot center pin, as the distance from the IPC is so short that the search area for the pin should be relatively small.

Appendix G: Calculation of Basal Area

Field Calculation of Basal Area by Species

[Live, non-residual trees only]

Field Dot Tally

DBH Range	Species ___	Species ___	Species ___	Species ___	Species ___	Species ___
4.0 – 8.9cm						
9.0 – 14.9						
15.0 – 19.9						
20.0 – 24.9						
25.0 – 29.9						
30.0 – 34.9						
35.0 – 39.9						
40.0 – 44.9						
45.0 – 49.9						
50.0 – 59.9						
60.0 – 69.9						
70.0 – 79.9						
80.0 – 89.9						
90.0 – 99.9						
100.0 – 109.9						
110.0 – 119.9						
120.0 – 129.9						
130.0 – 139.9						
140.0 – 149.9						
150.0 – 199.9						
200.0 – 249.9						
Totals						

Table J1: Field Calculation of Basal Area by Species (live trees only) - Field Dot Tally

Field Calculation of Basal Area per Hectare by Species

Sample No.	

Used for determining Leading, Second and Other species for sample tree selection

11.28m radius*, Live trees, no residuals

DBH Range	DBH Class (midpoint)	Tree Count by Species (Enter Tree Species Below)						Weighted Basal Area by Tree	Basal Area per Ha by Species (Enter Tree Species Below)					
4.0 – 8.9cm	6.5							0.33 *						
9.0 – 14.9	12.0							0.28						
15.0 – 19.9	17.5							0.60						
20.0 – 24.9	22.5							0.99						
25.0 – 29.9	27.5							1.48						
30.0 – 34.9	32.5							2.07						
35.0 – 39.9	37.5							2.76						
40.0 – 44.9	42.5							3.55						
45.0 – 49.9	47.5							4.43						
50.0 – 59.9	55.0							5.94						
60.0 – 69.9	65.0							8.30						
70.0 – 79.9	75.0							11.04						
80.0 – 89.9	85.0							14.19						
90.0 – 99.9	95.0							17.72						
100.0 – 109.9	105.0							21.65						
110.0 – 119.9	115.0							25.97						
120.0 – 129.9	125.0							30.68						
130.0 – 139.9	135.0							35.78						
140.0 – 149.9	145.0							41.28						
150.0 – 199.9	175.0							60.13						
200.0 – 249.9	225.0							99.40						

* The 4-8.9cm class is only measured on the 5.64m plot thus the proportionately higher BA/ tree

Tree count totals by species								Basal Area total by Spp						
Total Trees								All Spp total Basal Area						
								Percentage						

Instructions: 1) Enter Sample number, 2) enter tree species on both the left and right hand columns of the sheet, 3) enter tree count by diameter classes, 4) sum the tree count at the bottom of the sheet to confirm that no trees were missed, 5) Multiply the tree count for each species / dbh class combination by the weighted basal area for that dbh class and enter the result in the right hand columns of the spreadsheet, 6) total the basal area for each species, 7) summarize the total basal area for all species and record the number in all of the "All spp total Basal Area" columns, 8) record the percentage Basal Area for each species.

Table J2: Field Calculation of Basal Area per Hectare by Species for NFI plots only

Appendix H: Field Orientation and Navigation (Pre-2015)

Introduction

This section outlines the steps needed to traverse from a geographically located feature (the tie point) to the Integrated Plot Centre. The field crew is responsible for selecting suitable tie points, navigating to the reference point and integrated sample plot centre, and recording the information on the field cards. The route must be suitably marked to locate the plot centre and to aid revisitation in the near future.

Objectives

1. To locate the Integrated Plot Centre within the polygon of interest (in the position indicated on the document photo/orthophoto).
2. To mark and document the cluster location and navigation points to allow for short and long-term sample relocation.

General Procedures

Office Preparation

1. Prepare and become familiar with polygon characteristics, Integrated Plot Centre, and access prior to field visitation.
   - Identify the location of the Integrated Plot Centre on the photo.
   - Identify the location of the Integrated Plot Centre on the map.
   - Determine the relative accuracy of the map:photo relationship.
2. Locate a potential tie point and alternatives on the map and photograph.

Field Location

1. Locate and confirm a tie point in the field and mark the Tie Point reference.
2. Navigate to the reference point.
3. Ensure you are in the correct ground position as indicated on the photo/orthophoto.
4. Drive the Reference Pin in the ground.
5. Paint and tag the Reference Tree and measure the bearing and distance to the Reference Pin.
6. Measure the final 15.00 m to the Integrated Plot Centre.
7. Drive a pin in the ground. This is the Integrated Plot Centre.

A simple illustration of the components of field orientation and navigation is contained in Figure 2.1.

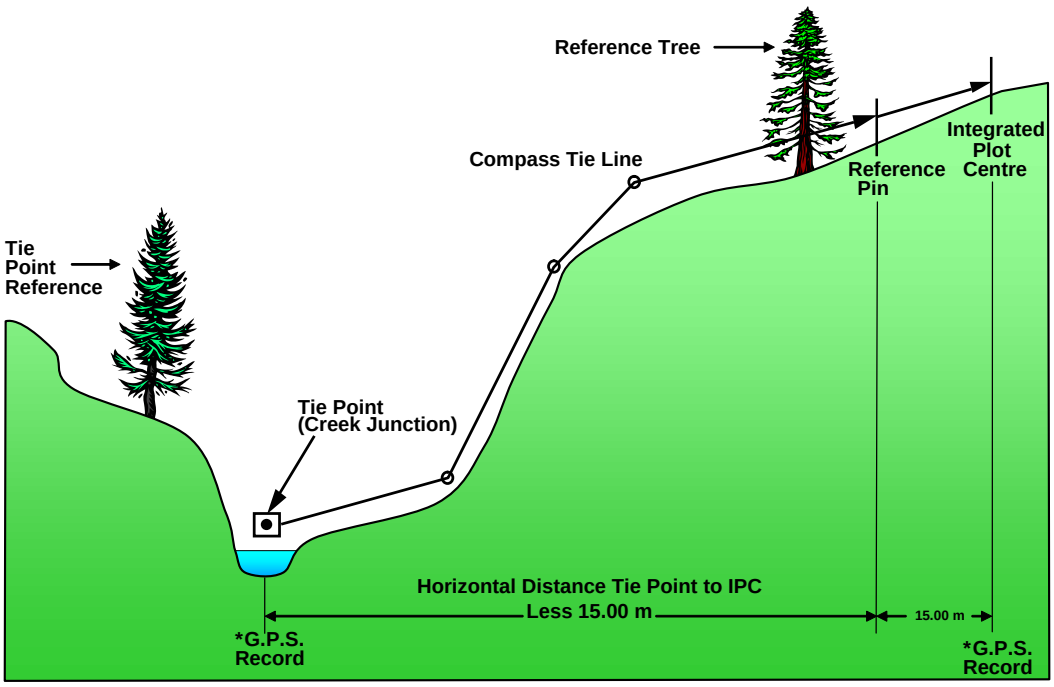


Figure 0.1 -Components of Field Orientation and Navigation

Field Cards for this Section

Header Card (CH) (Appendix A, Figures A.1 and A.2)
polygon ID, project ID, sample plot, date, crew, general notes and access details.

Compass Card (CP) (Appendix A, Figures A.3 and A.4)
Tie Point Tree, Reference Pin Location, Reference Tree, GPS, location, field survey notes.

Cluster Layout (CL) (Appendix A, Figures A.5 and A.6)
Integrated plot details, sample cluster details.

Detailed Procedures

Standard procedures of location, marking, and recording must be followed so that sample plots are easy to relocate for quality control and other purposes. The following procedures are designed to be used with current field survey tools, such as compass, clinometer, and distance-measuring equipment. Traditional survey methods should still be used as the primary method of plot location with GPS used to assist in confirming the location.

Now that the selective availability of GPS has been turned off, the use of GPS to locate sample plot locations is another tool that can be used. It is recommended that the use of GPS only be used up to the location of the reference point. It is important to remember there is still error in GPS readings, especially in dense timber and on steep slopes. The crew will still need to confirm that the sample is in the correct location.

The VRI contractor and project manager must be aware of the history and methodologies used to create the photo interpreted inventory on a given project area or mapsheet prior to the decision to use GPS for navigation purposes. Occasionally using a GPS to navigate to a map derived coordinate will result in the crew establishing the sample in the incorrect polygon. This is not due to GPS errors, but is due to map production errors. Contact the regional MFLNRO representative for examples and to determine history for each mapsheet.

GPS data will be recorded at the access point (if required), tie point, and the Integrated Plot Centre. Detailed standards and procedures for GPS data collection can be found in the document: "*GPS Data Collection Procedures for Georeferencing Vegetation Resources Inventory and National Forest Inventory Field Sample Plots (January 2004).*" This document is available on the MFLNRO Vegetation Resources Inventory website.

2.1 Locating and Marking the Tie Point

A tie point is selected and marked to ensure it can be found again with reasonable effort using the field crew's documentation.

Office Preparation

1. **Locate the tie point:**
   - The field crew is responsible for the selection of a suitable tie point. A tie point should have the following characteristics:
     - must be locatable on the ground
     - should be locatable on the appropriate mid-scale aerial photo/orthophoto
     - preferably should be locatable on the appropriate Phase I polygon map should permit efficient access to the sample
   - Some possible locations are:
     - major road junction (use the intersection of the road centrelines)
     - pre-located, corrected GPS coordinates
     - bridge on a stream crossing (on small creeks use the centreline of the bridge at the middle of the creek; on larger streams specify which edge of the stream was used)
     - definite timber boundary features on the photo (use caution when using cutblock edges as there may have been additional harvesting, or the map placement may be inaccurate)

- singular tree or small clump of trees
- major creek junctions
- well-defined swamps, ponds, or lake edges

2. Locate the sample:

- The sample location will be marked on the map and photo/orthophoto by the project manager(s) prior to sampling.
- Observe the sample location and potential tie point locations on the photo in stereo. Select primary and secondary tie point locations.

Field Location

1. Describe the access point:

- The back of the Header field card provides space for the crew to record access notes to aid in relocation of the sample. The notes should include a narration of the route traveled from a known location (for example the junction of a highway and a secondary road) to the tie point, in enough detail to aid relocation by a different crew.

Note: An increasing number of samples are being visited by various field crews, which may or may not have GPS capability or GPS data was not available at the site. Extra effort should be made in providing detailed access notes for future visitation.

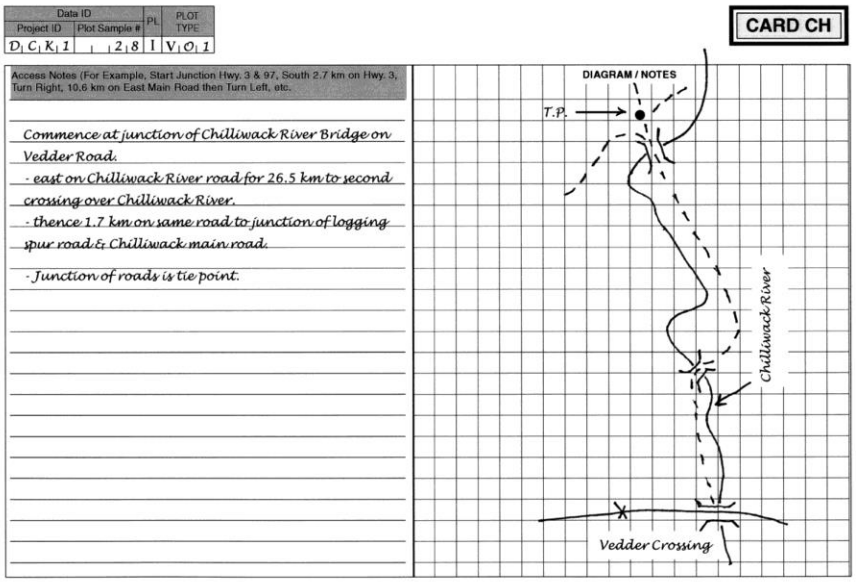


Figure 0.2 – Example of completed access notes.

In some instances the tie point will not be directly accessible. For example, the crew may need to land at a helispot in a swamp and navigate to the tie point using rough bearings and distances; or the crew may walk to the corner of a "cutblock" and then traverse from this point. At this point record the following:

Record GPS file number in the field for 'GPS Access Point.'

Describe the location. If more detail is required, use the Comments section on the CP field card.

Note the bearing(s) and distance(s) from the access point to the tie point in the Comments section.

2. **Establish the tie point in the field:**
   - Confirm the tie point location or select an alternative.
   - Select a Tie Point Tree or stump of suitable size (20+ cm) so that the stem will be present for a number of years (not beside a road where it may be removed during road maintenance).
   - Where no suitable trees or stumps are available, use another feature, such as a rock cut, boulder, and so on. A small rock cairn can aid relocation

3. **Mark the tie point tree for relocation of the samples in the short term (up to 5 years):**
   - Make the tie point visible to a field crew conducting surveys, but not overly visible to the general public. For example:
     – if available the tree should be greater than 20 cm in diameter
     – choose conifers over deciduous, cedars over other conifers
     – limb the complete stem to shoulder height
     – remove understory vegetation around the tree, if practical
     – paint the tree on 4 sides
     – ribbon the tree bole

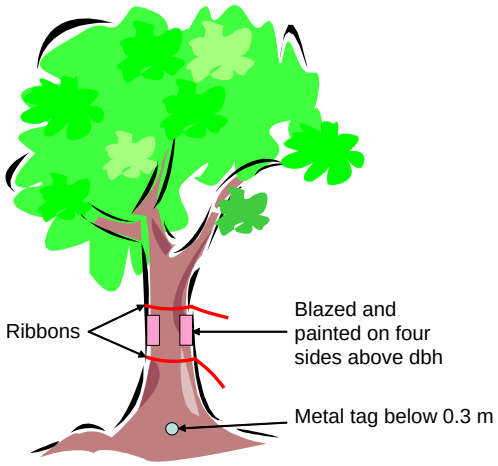


Figure 0.3 - Marking the Tie Point Tree

   – Record the species, diameter, azimuth and distance from the Tie Point Tree to the tie point on the Compass Card (CP). (Completing the Compass Card is discussed in Section 3.5.)
   – Measure the bearing and horizontal distance from the face of the Tie Point reference to the tie point. Where the tie point is a singular tree this Must be painted. The bearing is recorded as “000” and the distance is 0.0 m.

– Securely nail the aluminum identification tag with aluminum nails (Figure 2.4) at the base of the tree below potential felling height (0.3 m) as shown in Figure 2.3. If practical, the tag should face the tie point location. Record the number on the compass card (CP).

Note: Tree marking and ribboning must be coordinated with the appropriate land manager or owner.

Figure 0.4 - Example of Tag for the Reference Tree

4. Mark the field photo and field map (Figure 2.5):

- Locate the selected tie point and pin-prick the location on the field photo/orthophoto.
- Record the following information on the back of the photo/orthophoto: project identity; plot sample number; azimuth directions and distances from tie point to Integrated Plot Centre.
- Locate and mark the tie point and the ground sample point on the field map.
- Record the same information as above on the map.

Note: The tie point must be placed in its relative position on the map. It is not enough to specify a road junction on both the photo and map without making sure that the map is accurate in its relative placement of that road junction.

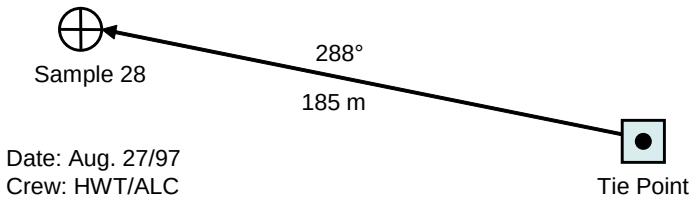


Figure 0.5 - Marking the Aerial Photo and Ground Sample Point

5. Collect GPS data at the tie point location and record the file ID:

When GPS data cannot be collected, move to an area where data can be collected (such as an opening). Measure the distance and bearing from the point where GPS data was gathered back to the tie point and record in the appropriate section on the Compass Card.

2.2 Navigating to the Reference Point

From the Tie Point navigate to the Reference Point location.

Procedures

1. Locate the Reference Point using appropriate methods (for example, nylon survey chain).
2. Use offsets to traverse around unsafe or difficult situations.
3. Correct all measured distances to the horizontal.
4. Flag the tie line well enough to be easily followed. Flagging is to aid in short-term relocation of the Integrated Plot Centre (within one field season).
5. Evaluate the location. When you find that the air photo/orthophoto and ground location agree, proceed with establishing the Reference Point and Reference Tree. When you arrive at the Reference Point and find that the air photo/orthophoto and ground location do not agree, evaluate the problems and find the correct sample location. The objective is to find the **correct ground location** of the sample point (as indicated on a photo), **not the map position**. You will not be "moving" the plot location if there is a conflict, you will be "finding" it. The map, GPS, and other tools are aids in finding the correct location.
   - There are a number of possible sources of error:

     wrong starting point

     incorrect bearing

     wrong compass declination. (A magnetic declination calculator can be found at the Natural Resources Canada – Geomagnetism website: http://geomag.nrcan.gc.ca/apps/mdcal-eng.php)

     significant local magnetic attraction

     error in base map
   - Some possible solutions are:

     Return to the tie point and re-run the tie line.

     Select another tie point and traverse from this point to the sample.

     If the original calculations are in error you may be able to establish the location relative to known features near you and calculate the distance and bearing to the correct location.

     Navigate to the reference point intended UTM coordinates using GPS (refer to comments on use of GPS at the beginning of this section)

2.3 Establishing the Reference Point and Reference Tree

The purpose of establishing a Reference Point is to eliminate potential small-scale bias for the Integrated Plot Centre location. The Reference Point will also help in relocating the Integrated Plot Centre.

Procedures

1. Measure from the Tie Point along the predetermined azimuth direction towards the location of the Integrated Plot Centre, using appropriate field methods.
2. Stop 15.00 m short of the full distance. Establish the Reference Pin at this point. For example, if the Integrated Plot Centre location is 380 m from the tie point, establish the Reference Pin at 365 m from the tie point.
3. Drive the pin firmly into the ground.
4. Choose a suitable Reference Tree (greater than 20 cm in diameter, if possible). The Reference Tree should be reasonably close, in relatively good health, with a high probability of survival, and with particular distinguishing features when possible (such as a forked tree, aspen in spruce stand, veteran in immature stand). The Reference Tree should not be a tree in the sample plots.
5. Measure the bearing and distance from the tag on the Reference Tree to the Reference Pin.
6. Record the Reference Tree details on the Compass Card (discussed in Section 3.5).
7. Mark the tree with flagging tape and paint on four sides above DBH. Nail a pre-numbered metal tag with aluminum nails to the base of the tree below where the tree would be cut if it was harvested, and facing the Reference Pin. If site conditions make this impossible, the tag location is at the discretion of the crew. The tag is scribed as shown in Figure 2.4. Record the tag number on the Header Card (CH).

2.4 Establishing the Integrated Plot Centre

From the Reference Point, measure to the Integrated Plot Centre.

Procedures

1. Accurately measure the remaining 15.00 m along the correct bearing to the Integrated Plot Centre to eliminate any possible small-scale bias in placing the centre (Figure 2.6).

   This point becomes the Integrated Plot Centre regardless of the site or conditions. The plot centre may be in an open forest, a rocky area, a road, a creek, or inside a standing tree.

   Note: If you feel that the site is unsafe or poses an undue hazard, the plot cluster or portion of a plot cluster may be dropped (see Section 2.5). The project supervisor will review other means of completing all or some of these hazardous plots.

2. Drive a pin firmly into the ground at the Integrated Plot Centre. If site conditions make it impossible or inappropriate to imbed the aluminum pin at the Integrated Plot Centre, place it as close as possible to the plot centre, and record the offset distance and bearing from the pin to the plot centre on the Cluster Layout (CL) card (Figure A.5).

3. Collect GPS data at the Integrated Plot Centre. When GPS data cannot be collected at the plot centre, move to an area where data can be collected, such as an opening. Measure the distance and bearing from the point where data was collected back to the Integrated Plot Centre. Record these measurements in the appropriate section on the Cluster Layout card. If coordinates can not be collected in the field, the intended coordinates must be recorded using “Intended” as the GPS file ID and the intended coordinates entered in the “corrected UTM field” on the CL card.

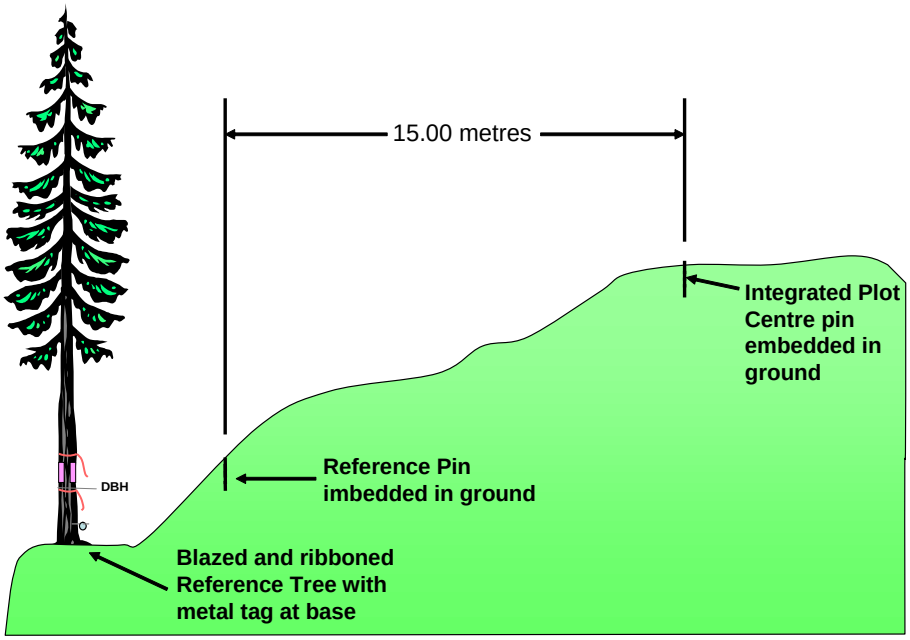


Figure 0.6 - Layout of Reference Pin and Integrated Plot Centre

2.5 When the sample is inaccessible

In some instances, the complete sample or some part will not be accessible because of factors such as dangerous slopes, denied access, or physical safety concerns. It may be readily apparent from the tie point or earlier that the area is inaccessible, or only as the sample location is approached. In some cases, small unmapped local features such as beaver ponds and water bodies may be encountered. The field crew is not expected to sample beyond what is considered reasonable and safe. For example, if the water level is above the "boot tops," then estimate the attributes if possible or drop the plot if reasonable estimates cannot be made.

The safety of the field crew is the first priority.

Complete as much information as possible on the field cards, maps, and photos to the point where field work was terminated. It is appropriate to estimate the portion of a sample not physically accessible [for example if the last few metres of a line transect is inaccessible but it can be seen that no pieces or a few pieces have to be estimated it is preferable to record the estimate(s) rather than recording the line portion as not sampled]. In another example, if ½ of the large tree plot is accessible and ½ is not accessible but can be estimated it is preferable to estimate the inaccessible portion.

When all or part of a sample is dropped, complete the CH card and return it to the project manager. Specify why the cluster or plots cannot be established, for example:

- access to plot is too dangerous
- plot would be located in an unsafe area
- plot would be located in a river or lake
- permission denied to access private land

Provide detailed comments as required.

2.6 When the sample is in a harvested site

In some instances, recent harvesting has not have been captured in the inventory files and the harvested polygon may have been selected for VRI ground sampling. The establishment of a VRI ground sample will depend on the nature of the harvesting. Clearcut portions of the polygon would be, by their nature, non forested or vegetated and may be outside of the population of interest, whereas selectively logged sites may still be considered to forested and within the population.

Project Planning: The project manager who prepares the sample plan (VPIP) and sample packages will obtain the most current satellite image of the area to check to see if any of the proposed samples have been clearcut. If it obvious at this stage that the sample has been clearcut and is outside the population of interest, the sample will be dropped and replaced with another one. The sample will be kept if it is unclear whether it has been clearcut.

Field Procedures: The VRI field crew will establish all points in the VRI cluster according to the polygon boundaries shown in the inventory, unless it is clear that the Integrated Plot Centre (IPC) has been clearcut. A clearcut would be an area that is estimated to be greater than 1 hectare in size. All other cases will require that the sample be established. These include samples that fall in partially (selective) harvested blocks or samples where one or more of the auxiliary plots have been logged. The stand disturbance portion of Section 3.4 provides instructions on the recording of details around the disturbance type and estimates of volume loss in the comments section of the field card. A decision as to whether these samples should be kept in for analysis purposes will be made on an individual sample basis by the Ministry in conjunction with the Analysis contractor.

Glossary

This section provides a glossary of the terms used in the manual. Where available, the source is provided. FPCode = the Glossary for the Forest Practices Code; SRM = Society for Range Management. For specific definitions of attributes measured in this inventory, refer to the index, which will direct you to a detailed definition.

AUM — animal unit month	the amount of forage required for one month by an average animal of the genus *Bos* (cow) aged 6 months or older. (FPCode) See also Forage Production.
Auxiliary Sampling Plots	for purposes of this inventory, four plots set at 50 m in the cardinal directions from the Integrated Plot Centre, to enhance the information collected at the centre point.
azimuth	the horizontal angle or bearing of a point measured from the true (astronomic) north. Used to refer to a compass on which the movable dial (used to read direction) is numbered in 360°. (FPCode)
basal area per hectare	the area of the cross-section of tree stems near their base, generally at breast height and including bark, measured over 1 ha of land (FPCode). For purposes of this inventory, the cross-sectional area (in square metres) of all living trees 4.0 cm DBH or greater, expressed as a per hectare value for the entire polygon.
browse	shrubs, trees, and herbs that provide food for wildlife. (FPCode) See also Forage.
bryoids	formerly referred to as non-vascular cryptogams; includes mosses, liverworts, hornworts, and non-crustose lichens.
call grading	the process used to assign one of the Vegetation Resources Inventory grades (modified coastal log grades) to standing and fallen trees
canopy	the forest cover of branches and foliage formed by tree crowns. (FPCode)
check	a separation of the wood, at right angles to the annular rings, which runs toward or through the heart of the log.
clearcut	an area of forest land from which all merchantable trees have recently been harvested. (FPCode)
clinometer	a simple instrument for measuring vertical angles or slopes. In forestry, used to measure distance and tree heights. (FPCode)
coarse woody debris	see CWD

conk — a hard, fruiting body containing spores of a wood-decaying fungus. (FPCode)

crown — the live branches and foliage of a tree. (FPCode)

crown classes

Codes	Description
D	**Dominant** Trees with crowns that extend above the general level of the trees immediately around the measured trees. They are somewhat taller than the codominant trees, and have well-developed crowns, which may be somewhat crowded on the sides, receiving full light from above and partly from the side.
C	**Codominant** Trees with crowns forming the general level of the trees immediately around the measured trees. The crown is generally smaller than those of the dominant trees and is usually more crowded on the sides, receiving full light from above and little from the sides.
I	**Intermediate** Trees with crowns below, but extending into, the general level of the trees immediately around the measured trees. The crowns are usually small and quite crowded on the sides, receiving little direct light from above but none from the sides.
S	**Suppressed** Trees with crowns entirely below the general level of the trees around the measured trees, receiving no direct light either from above or from the sides.

crown closure — the percentage of ground area covered by the vertically projected crowns of shrubs or trees.

CWD — coarse woody debris — sound and rotting logs and uprooted stumps that provide habitat for plants, animals, and insects, and a source of nutrients for soil development. (FPCode). For purposes of this inventory — dead, woody material in various stages of decomposition, located above the soil; pieces larger than 7.5 cm in diameter (or equivalent cross-section), and not self-supporting (such as trees or stumps).

DBH — diameter at breast height — the stem diameter outside bark of a tree measured at breast height, 1.3 metres above the ground. (FPCode)

declination (magnetic)	the angle between true (geographic) north and magnetic north (direction of the compass needle). Declination varies from place to place and can be 'set' on a compass for a particular location. (FPCode)
diameter tape	a graduated tape based on the relationship of circumference to diameter which provides direct measure of tree diameter when stretched around the outside of the tree, usually at breast height. (FPCode)
DIB — diameter inside bark	the diameter of a tree or log excluding bark thickness. (FPCode)
downgraded logs	logs that otherwise would qualify for a specific grade but have a lumber loss deduction exceeding the requirements of that grade which will qualify for a lower grade.
field card	for this inventory, a set of cards provided to the field crew for recording the attributes measured on the ground.
foliar cover	the percentage of ground covered by the vertical projection of the aerial portion of plants. Small openings in the canopy and intraspecific overlap are excluded. Foliar cover is always less than canopy cover; either may exceed 100% (S.R.M. 1989).
forage	grasses, herbs and small shrubs that can be used as feed for livestock or wildlife. (FPCode)
forage production	the weight of forage produced within a designated period on a given area. The weight may be expressed as either green, air-dry, or oven-dry. The term may also be modified as to time of production such as annual, current year's, or seasonal forage production (S.R.M. 1989). Production can also be expressed as animal unit months (AUMs), which is the amount of dry forage required by one animal unit for one month, based on a forage allowance of 26 pounds (11.7 kg) per day.
forage utilization	the proportion of current year's forage production consumed or destroyed by grazing animals. May refer either to a single species or to the vegetation as a whole (S.R.M. 1989). For purposes of this inventory, utilization refers to the percentage of plant weight removed, not the percentage of plant height removed.
forbs	any broad-leafed herbaceous plants except Gramineae (or Poaceae), Cyperaceae and Juncaceae families (S.R.M. 1989) and, for forage measurement purposes, includes ferns and fern allies, club mosses and horsetails.

free-growing	young trees that are as high or higher than competing brush vegetation with one metre of free-growing space surrounding their leaders. As defined by legislation, a free growing crop means a crop of trees, the growth of which is not impeded by competition from plants, shrubs or other trees. Silviculture regulations further define the exact parameters that a crop of trees must meet, such as species, density and size, to be considered free growing. (FPCode)
GIS — geographic information system	a computer system designed to allow users to collect, manage and analyze large volumes of spatially referenced information and associated attribute data. (FPCode)
grading	classifying timber, lumber or logs according to quality or end-use. (FPCode)
graminoids	grass or grass-like plants (sedges and rushes) such as *Poa, Carex,* and *Juncus* species (S.R.M. 1989).
gross scale	the volume of log inside bark, including unsound wood and holes in the log.
herb	a vascular plant without a woody stem; includes ferns, fern-allies, some low woody plants, grasses, and grass-like plants.
Integrated Plot Centre	for purposes of this inventory, the location around which the detailed sample information is collected on the ground for all disciplines. All attributes are attached to the centre point.
intermediate life forms and low woody species	low shrub, generally unable to exceed 15 cm in height. In B.C., these are included in the herb layer for data collection purposes.
low woody species and intermediate life forms	low shrub, generally unable to exceed 15 cm in height. In B.C., these are included in the herb layer for data collection purposes.
leading species	tree species with the largest basal area per hectare based on all living trees equal to or greater than 4.0 centimetres D.B.H. tallied for a sample cluster. Residual trees from a previous stand are not included in the tally.
merchantable lumber	good strong, general purpose lumber graded as better than utility or number 3, and not less than 2.6 m long.
merchantable volume	the amount of sound wood in a single tree or stand that is suitable for marketing under given economic conditions. (FPCode)

meso slope	the relative position of the area of interest within a catchment area.
mineral soil	soil consisting predominately of, and having its properties determined by, inorganic matter. Usually contains less than 20 per cent organic matter. (FPCode)
net factoring	a process used to estimate the net volume of sound wood (gross volume less decay) of an assigned log length.
OLK — occasional larger knots	in call grading, all sawlog grades can have occasional larger knots. OLKs are allowed to the extent of one per 3 m of log length and must be located where knot sizes for portions of logs are specified.
old growth	old growth is a forest that contains live and dead trees of various sizes, species, composition, and age class structure. Old-growth forests, as part of a slowly changing but dynamic ecosystem, include climax forests but not sub-climax or mid-seral forests. The age and structure of old growth varies significantly by forest type and from one biogeoclimatic zone to another. (FPCode)
organic soil	soil containing a high proportion (greater than 20 or 30 percent) of organic matter. (FPCode)
peeler block	a segment (usually 2.6 m) of a log's length suitable for the manufacturing of veneer on a rotary lathe.
pencil bucking	the imaginary sectioning of a portion of a tree
phenology	the study of periodic biological phenomena which are recurrent, such as flowering or seeding, especially as related to climate (S.R.M. 1989).
polygon	a portion of land area delineated on mid-scale aerial photography of "like" or uniform land cover appropriate for applying land cover descriptions.
polygon number	a unique number assigned to each polygon as it is delineated.
powder worm	borings of the larva of the Western Cedar Borer causes a serious defect in cedar, and is not allowed in specific grades of cedar. There is no volume loss.
prism	an optical instrument used as an angle gauge, consisting of a thin wedge of glass which establishes a fixed (critical) angle of projection in a point sample. (Forest Practices Code)

residual	a living remnant of a former stand; in even-aged stands, the occasional (< 25 per ha) large stem of an older age class than the stand as a whole. Typically these trees may have larger diameters, a higher incidence or indications of decay, thicker bark, larger branching and "ragged" or flat tops.
ring shake	a separation of the wood following the circumference, or part of the circumference, of an annular ring.
second leading species	the tree species with the second largest basal area per hectare based on all living trees equal to or greater than 4.0 centimetres D.B.H. tallied for a sample cluster. Residual trees from a previous stand are not included in the tally.
seral stage	any stage of development of an ecosystem from a disturbed, unvegetated state to a climax plant community. (FPCode)
shrub	a plant that has persistent woody stems and a relatively low growth habit and that generally produces several basal shoots instead of a bole. It differs from a tree by its low stature (generally less than 10 m) and non-treelike form (Ministry of Forests 1994).
site index	an expression of the forest site quality of a stand, at a specified age, based either on the site height, or on the top height, which is a more objective measure. (FPCode)
site productivity	the inherent capabilities of a site to produce or provide the commodities or values for which the area will be managed in accordance with Section 4 of the Ministry of Forests Act, that is, timber, forage, recreation, fisheries, wildlife, and water. (FPCode)
small tree grades	for purposes of this inventory, includes trees that do not meet the minimum log sizes for Vegetation Resources Inventory log grades are assigned a small-tree grade developed for use in the Inventory.
SMR — soil moisture regime	the average amount of soil water annually available for evapotranspiration by vascular plants, averaged over several years.
snag frequency	the number of standing dead trees greater than 4 cm DBH ; expressed as a per hectare value.
SNR — soil nutrient regime	the amount of essential nutrients, particularly nitrogen, available to vascular plants over a period of several years.

soil pit	an excavation into the mineral soil of sufficient depth to allow assessment of variability in soil physical properties within a defined area of land. (FPCode)
stand	a community of trees sufficiently uniform in species composition, age, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity. (FPCode)
stolon	a horizontal stem which grows along the surface of the soil and roots at the nodes (S.R.M. 1989). A stoloniferous plant is a plant that has stolons.
stump	for purposes of this inventory, a stem less than 1.3 m in length with roots.
succession	the gradual supplanting of one community of plants by another, the sequence of communities being termed a sere and each stage seral. (FPCode)
surface clear	clear means free of knots or knot indicators. This material is highly valued for speciality products. Typical log grade criteria are shown as "90% surface clear, 66% surface clear, etc."
top height	top height is the height of the largest diameter tree on a 0.01 ha plot, providing the tree is suitable. Suitable trees are trees which provide heights and ages that can be validly used to estimate site index. This means that the top height tree must be healthy, not have a broken or damaged top, and not have its height growth affected by a competitor. The tree should not be a residual left from previous logging. If the largest diameter tree does not meet these criteria, then no top height sample is taken (a "null" plot). The largest diameter tree is selected regardless of species. (Forest Productivity Council, June 30, 1998)
tree	a woody plant, usually with a single main stem, capable of exceeding 10 m in height. For the purposes of this inventory, a tree is defined as a species listed in Appendix B: Vegetation Resources Inventory Tree Code List; longer than 1.3 m with the roots attached to the bole; larger than 4.0 cm DBH.
twist	as it grows a tree may twist around on its axis with the result that the grain is no longer straight. Lumber cut from the tree has a slope to the grain which lowers the quality.
variable area plot sampling method	a method of timber cruising commonly used for industrial timber cruising in which sampling area (plot size) varies with tree diameter. (FPCode)

variable length call grading	recognizes only a minimum length and allows the cruiser to pencil buck at grade changes rather than at predetermined log lengths.
wildlife	raptors, threatened species, endangered species, game, and other species of vertebrates prescribed as wildlife by regulation. (FPCode)
wildlife tree	dead, decaying, deteriorating, or other designated trees that provide present or future habitat for the maintenance or enhancement of wildlife. (FPCode)

Index