

7 COARSE WOODY DEBRIS

Contents

	<i>Page</i>
Coarse Woody Debris Form	2
Field Procedure	3
Definition of Coarse Woody Debris	4
Sampling Methods	4
Rules for Sampling	5
Completing the form	8
1. Plot Number	8
2. Date	8
3. Surveyor	8
4. Azimuth	8
5. Line Length	8
6. Species	8
7. Diameter	8
8. Class	8
9. Tilt Angle	10
10. Length	10
Measurement of stems from attached roots	11
Measurement of forked stems	12
Measurement of pieces that are crossed more than once on the transect	13
11. Height of End	14
12. Angle from Ground	14
13. Degree and Type of Piling	14

Appendix

7.1 Tree species codes	15
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Tables

7.1 Decay classes for coarse woody debris	9
7.2 Codes for size of interstitial spaces	14

Figures

7.1 Rules for sampling coarse woody debris	6
7.2 Tally only coarse woody debris that lies above the soil	7
7.3 Recording the tilt angle of coarse woody debris	10
7.4 Rules for measuring length of coarse woody debris ...	14

Field Procedure

Getting Started

1. The materials required for sampling coarse woody debris (CWD) are:
 - a compass, graduated in degrees;
 - a clinometer, in percent and degrees (the latter read through the side window);
 - slope correction tables or trigonometry formulas;
 - two measuring tapes (minimum of 30 m each);
 - a diameter tape and/or calipers;
 - notebook with forms, pencil.
2. Establish the first sampling line by following a random azimuth for that plot.
 - Measure out a 24-m line from the plot centre, correcting the slope distance to horizontal by using slope tables or trigonometry.
 - Anchor the tape at both ends of the line.
3. Establish the second sampling line at plus 90° from the first line by following the same procedures in (2) above.
4. Record the azimuth of each line.

Measure and Record

1. Note the length of each line sampled out of the total. The full length of one or both lines may not be sampled because of unsafe conditions or heavy accumulations of CWD. Otherwise they will be 24 out of 24 m.
2. Walk out along the first sampling line and select the pieces of CWD to be measured according to the sampling rules. Take care not to trample and crush the CWD as you walk along the line.

As each piece that fits the definition of CWD is encountered, note the following:

- tree species to the level that is reliable,
 - diameter,
 - decay class, based on the entire piece, by using the table of decay class indicators,
 - tilt angle of each piece, and
 - length of each piece, measured or estimated.
3. Where CWD pieces are suspended above the sampling line it may be necessary to estimate certain attributes (diameter and/or length).
 4. If odd-shaped pieces are encountered, record their equivalent diameter.
 5. Repeat steps 2, 3, and 4 for the second transect line.
 6. Check the form to ensure all the required information has been collected. Strike through any fields that were not assessed.

Definition of Coarse Woody Debris

Coarse woody debris (CWD) is dead woody material, in various stages of decomposition, located above the soil, larger than 7.5 cm in diameter (or equivalent cross-section) at the crossing point, which is not self-supporting. Trees and stumps (intact in ground) are considered self-supporting.

Pieces of coarse woody debris may be suspended on nearby live or dead trees, other pieces of coarse woody debris, stumps or other terrain features.

Coarse woody debris includes:

- downed horizontal or suspended (not self-supporting) dead tree boles with or without roots attached;
- fallen trees which still have green foliage if they no longer have roots attached (no living cambium) to the ground to keep them alive;
- woody pieces greater than 7.5 cm at the point where the sampling line crosses the piece;
- uprooted (not self-supporting) stumps greater than 7.5 cm in diameter at the crossing point and any of their exposed dead roots greater than 7.5 cm in diameter at the crossing point;
- fallen broken tree tops which may be horizontal or leaning, or large fallen branches; and,
- recently cut logs.

Coarse woody debris does not include:

- dead branches still connected to standing trees;
- self-supporting (not overturned) stumps;
- exposed roots of self-supporting trees or stumps;
- material that is buried beneath organic or mineral soil layers or has decomposed enough to be part of the forest floor; and,
- live or dead trees (still rooted) which are self supporting.

Sampling Methods

Sample coarse woody debris along two 24 m (horizontal distance) lines. These should run from the plot centre, the first following a random azimuth and the second at plus 90° to the azimuth. Take the slope of each line and determine the slope distance required to produce a horizontal line of 24 m length. If for any reason all of the line cannot be sampled, note the distance

which was actually sampled out of the total distance (record in comments section why the portion was not measured).

If the line falls on *heavy* accumulations such as windthrow, felled and bucked timber, or logging debris and the random azimuth is odd, sample only the first and third quarters of the line (from 0 to 6 m and from 12 to 18 m). If the random azimuth is even, sample the second and fourth quarters of the line (from 6 to 12 m and from 18 to 24 m).

If the line falls on *very heavy* accumulations of windthrown, felled and bucked timber, or a debris pile, sample only the second quarter of the line (from 6 to 12 m) for even random azimuths and the third quarter (12 to 18 m) for odd random azimuths. An estimate should be made of the number of pieces and their diameters in heavy accumulations which can not be safely or accurately measured.

Coarse woody debris in the form of felled and bucked logs, or cold decks, is sampled even though this material will likely be removed.

When non-linear pieces are encountered, an equivalent diameter is recorded. This applies to chunks with odd configurations.

Rules for Sampling

If the transect crosses coarse woody debris, measure the amount above the soil at the crossing point. Some of the CWD may be suspended above the transect line. In such cases it might be necessary to estimate diameter and length measurements.

- Coarse woody debris must be greater than 7.5 cm in diameter (or equivalent) at the line intersect point (see 7.1a).

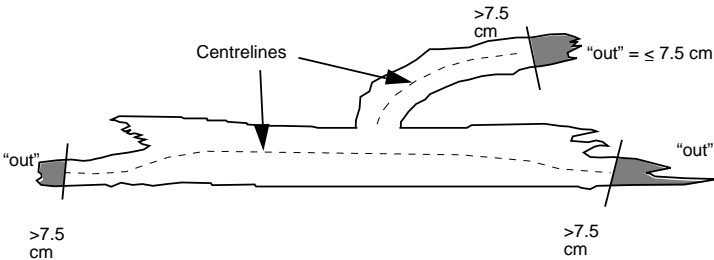
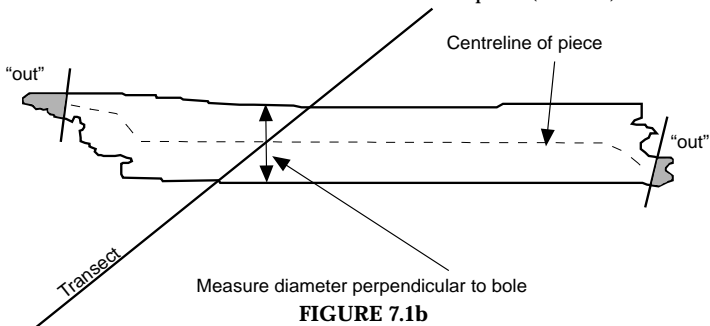
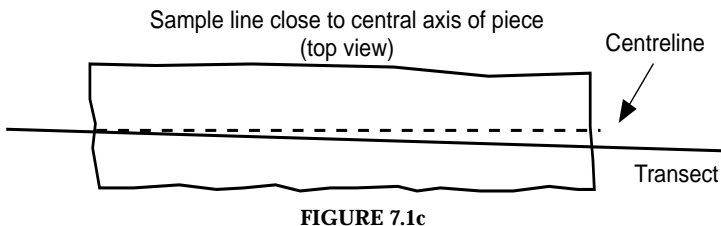


FIGURE 7.1a

- The transect must cross the central axis of the piece (see 7.1b).



- If the transect coincides closely with the centreline, make the best decision as to whether the line crosses the centreline, and where (see 7.1c).



- If the transect intersects a curved or angular piece more than once, measure each intersection as a separate observation (see 7.1d).

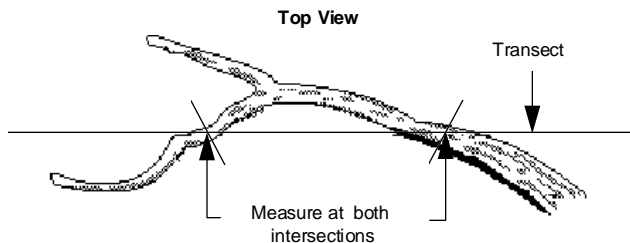


FIGURE 7.1. Rules for sampling coarse woody debris.

- If a log has split open, but is still partially held together, record the diameter as if the piece were whole. If a stem has shattered into a number of distinct, unconnected pieces, record each piece that is greater than 7.5 cm in diameter at the point of sampling.
- Do not tally undisturbed stumps. Tally uprooted stumps and their exposed dead roots if they meet the other criteria.
- Tally only the CWD that lies above the soil (see 7.2). A piece is no longer above the soil when it is entirely buried beneath a layer of surface organic matter (forest floor) and/or mineral soil. Estimate an “equivalent” diameter for the remaining portion of logs where part of the wood has decayed and become part of the soil layer.

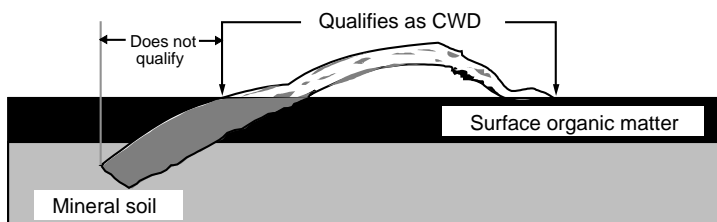


FIGURE 7.2. Tally only coarse woody debris that lies above the soil.

Completing the Form

Numbered items below refer to circled numbers on the Coarse Woody Debris (CWD) Form shown at the beginning of this section. A recommended sequence for completing the form is described in "Field Procedure."

1. Plot Number

Record the plot number and the project identification (Proj. id.) from the top of the Site Description Form.

2. Date

Enter the year (YY), month (MM), and day (DD).

3. Surveyor

Enter the first initial and last name of the person(s) collecting CWD data (Survyr).

4. Azimuth

Record the first azimuth (randomly selected) for Transect No. 1, and the second at plus 90° to Transect No. 2.

5. Line Length

Record the distance that was actually sampled (Sampled ___ of 24 m) out of the total distance, in the spaces provided.

6. Species

Record code for each piece, using tree species codes found in Appendix 7.1. If the species can not be determined put "X" for unknown, "Xh" for unknown hardwood, or "Xc" for unknown conifer.

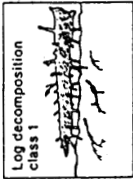
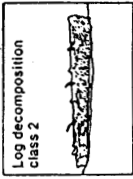
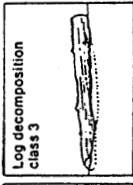

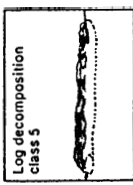
7. Diameter

Record the diameter of the piece perpendicular to the bole at the point where the sampling line is considered to intersect the central axis of the piece. Wrap a diameter tape around the bole, when possible, or use the reverse side of the tape to estimate the diameter. Calipers may also be used, and are often easier when coarse woody debris is in several layers. Measure diameter to the closest 0.1 cm. If the CWD is hollow, estimate the diameter equivalent required to approximate the volume of the remaining wood.

8. Class

Assign a decay class (1 to 5) based on the majority condition of the entire piece. The five classes used to describe the condition of coarse woody debris are based primarily upon wood texture, and secondarily on other characteristics. See Table 7.1 for descriptions of classes.

TABLE 7.1. Decay classes for coarse woody debris

					
	Class 1	Class 2	Class 3	Class 4	Class 5
Wood Texture	Intact, hard	Intact, hard to partly decaying	Hard, large pieces, partly decaying	Small, blocky pieces	Many small pieces, soft portions
Portion on Ground	Elevated on support points	Elevated but sagging slightly	Sagging near ground, or broken	All of log on ground, sinking	All of log on ground, partly sunken
Twigs < 3 cm (if originally present)	Present	Absent	Absent	Absent	Absent
Bark	Intact	Intact or partly missing	Trace	Absent	Absent
Shape	Round	Round	Round	Round to oval	Oval
Invading Roots	None	None	In sapwood	In heartwood	In heartwood

9. Tilt Angle

Refers to the tilt of the individual log away from the horizontal, regardless of the slope of the ground. A clinometer is placed on the surface of the piece at the point of the intercept measurement and the angle from the horizontal (in degrees) is recorded (see FIGURE 7.3).

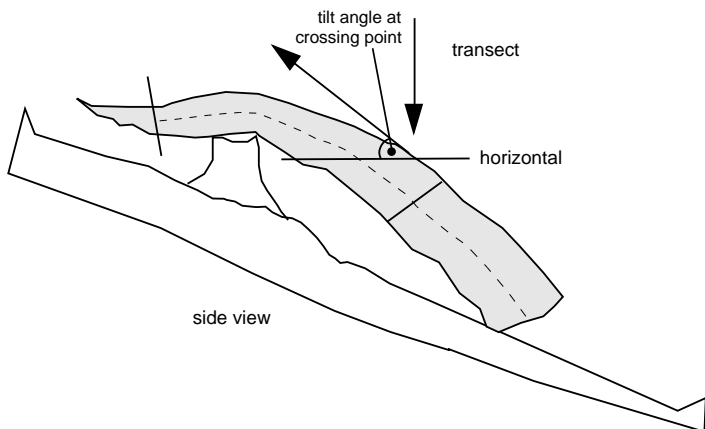


FIGURE 7.3. Recording the tilt angle of coarse woody debris.

10. Length

Record the length of each piece to the nearest 0.1 m (see 7.4a).

- If a log has broken lengthwise but is still partially held together, record the equivalent length as if the piece were whole.
- If the end(s) of the piece are broken, visually fold in the broken sections to compensate for the missing parts.
- Piece length is from the largest end down to the 7.5 cm diameter limit.

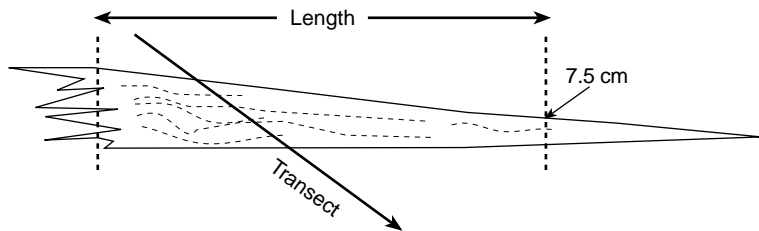


FIGURE 7.4a

Measurement of stems from attached roots:

- For main boles with exposed roots, piece length is measured only down to the root collar (see 7.4b).

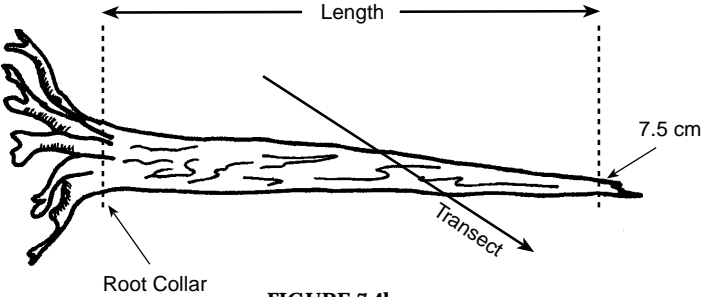


FIGURE 7.4b

- If a root mass is transected, piece length for individual roots (larger than the minimum diameter) is measured only up to the root collar (see 7.4c).

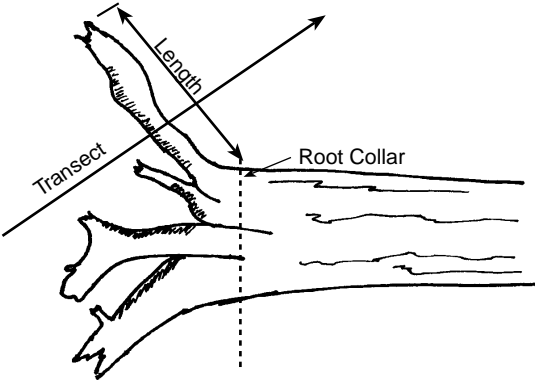


FIGURE 7.4c

Measurement of forked stems

- Where one of the forks transected is determined (by largest diameter) to be a continuation of the main bole then the length will be measured to the ends of the main piece (see 7.4d).

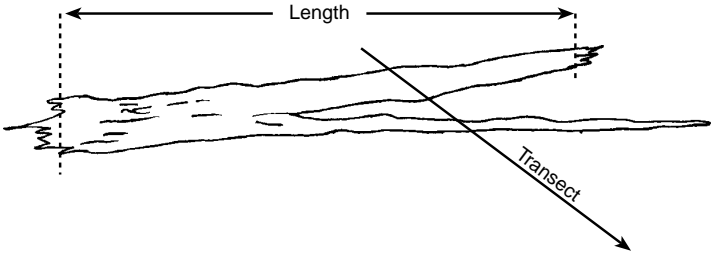


FIGURE 7.4d

- The piece length of the smaller stem(s) (smaller diameter) will be measured only to the junction with the main bole (see 7.4e).

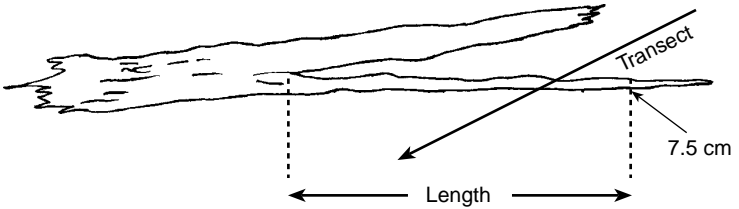


FIGURE 7.4e

- For forks of near equal stature make a determination as above and measure accordingly.

Measurement of pieces that are crossed more than once on the transect:

- Pieces broken but still physically attached are measured as one piece at each transect point. The length measurement is taken along the central axis of the piece (see 7.4f).

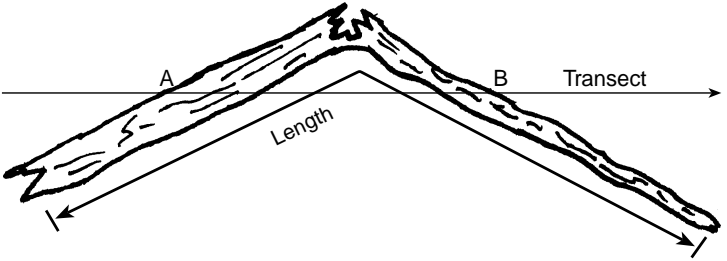


FIGURE 7.4f

- The full piece length of curved/crooked pieces is measured at both crossings (see 7.4g).

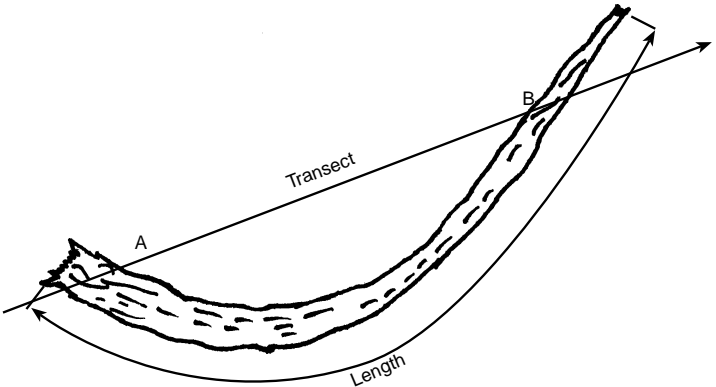


FIGURE 7.4g

FIGURE 7.4. Rules for measuring length of coarse woody debris.

In the same manner as above, record the full piece length twice where the same piece is crossed by two transects at right angles to each other.

11. Height of Lowest End

This is the height above ground of the central axis of the lowest end of each piece of CWD, measured to the nearest cm. The lowest end is defined as the end of the piece that is in closest contact with the ground, not necessarily the end that is at the lowest altitude.

12. Angle of Ground

At the transect crossing measure and record the angle of the ground, following the same procedure for determining CWD piece tilt. It may be necessary to measure the ground angle over a 1 to 2 m (or more) distance if the surface is irregular.

Record this angle to the nearest degree and indicate whether it is positive or negative (e.g. -07, +12). When measuring the angle of the ground, face in the direction that gives a positive tilt angle for the piece of CWD. The angle of ground measured by sighting in that direction may be positive or negative.

13. Degree and Type of Piling

Piles of CWD are important for many wildlife species. Use of the pile is dependent upon interstitial spaces as well as the diameter of pieces and the size of the pile.

Size of pile:

Record the estimated length, width, and height to nearest 0.1 m.

Diameter:

Record, to nearest cm, the average diameter of pieces of CWD composing the pile.

Interstitial Spaces:

Using the codes in Table 7.2, estimate of the size of interstitial spaces. This not intended to indicate which species will use the pile.

TABLE 7.5. Codes for size of interstitial spaces.

Code	Class	Description
s	small	Most interstitial spaces are the size of, or smaller than, a squirrel
m	medium	Most interstitial spaces are the size of a lynx
l	large	Most interstitial spaces are the size of, or larger than, the average black bear

APPENDIX 7.1 Tree Species Codes¹

Conifers

Common name	Species	Code
Cedar	<i>Thuja</i>	
western redcedar	<i>T. plicata</i>	Cw
Cypress	<i>Chamaecyparis</i>	
yellow-cedar	<i>C. nootkatensis</i>	Yc
Douglas-fir	<i>Pseudotsuga</i>	
Douglas-fir	<i>P. menziesii</i>	Fd
interior Douglas-fir	<i>P. menziesii</i> var. <i>glauca</i>	Fdi
coast Douglas-fir	<i>P. menziesii</i> var. <i>menziesii</i>	Fdc
Fir (Balsam)	<i>Abies</i>	
amabilis fir	<i>A. amabilis</i>	Ba
grand fir	<i>A. grandis</i>	Bg
subalpine fir	<i>A. lasiocarpa</i>	Bl
Hemlock	<i>Tsuga</i>	
mountain hemlock	<i>T. mertensiana</i>	Hm
western hemlock	<i>T. heterophylla</i>	Hw
mountain x western hemlock hybrid	<i>T. mertensiana</i> x <i>heterophylla</i>	Hxm
Juniper	<i>Juniperus</i>	
Rocky Mountain juniper	<i>J. scopulorum</i>	Jr
Larch	<i>Larix</i>	
alpine larch	<i>L. lyallii</i>	La
tamarack	<i>L. laricina</i>	Lt
western larch	<i>L. occidentalis</i>	Lw
Pine	<i>Pinus</i>	
whitebark pine	<i>P. albicaulis</i>	Pa
limber pine	<i>P. flexilis</i>	Pf
jack pine	<i>P. banksiana</i>	Pj
lodgepole pine	<i>P. contorta</i>	Pl
lodgepole x jack pine hybrid	<i>P. x murraybanksiana</i>	Pxj
shore pine	<i>P. contorta</i> var. <i>contorta</i>	Plc
lodgepole pine	<i>P. contorta</i> var. <i>latifolia</i>	Pli
western white pine	<i>P. monticola</i>	Pw
ponderosa pine	<i>P. ponderosa</i>	Py
Spruce	<i>Picea</i>	
black spruce	<i>P. mariana</i>	Sb
Engelmann spruce	<i>P. engelmannii</i>	Se
white spruce	<i>P. glauca</i>	Sw
Sitka spruce	<i>P. sitchensis</i>	Ss
spruce hybrid	<i>Picea</i> cross	Sx
Engelmann x white	<i>P. engelmannii</i> x <i>glauca</i>	Sxw

Conifers (continued)

Common name	Species	Code
Sitka x white	<i>P. x lutzii</i>	Sxl
Sitka x unknown	<i>P. sitchensis</i> x ?	Sxs
Yew	<i>Taxus</i>	
western yew	<i>T. brevifolia</i>	Tw

Hardwoods

Common name	Species	Code
Alder	<i>Alnus</i>	
red alder	<i>A. rubra</i>	Dr
Apple	<i>Malus</i>	
Pacific crab apple	<i>Malus fusca</i>	Up
Aspen, Cottonwood, Poplar	<i>Populus</i>	
poplar	<i>P. balsamifera</i>	Ac
balsam poplar	<i>P. b. ssp. balsamifera</i>	Acb
cottonwood	<i>P. b. ssp. trichocarpa</i>	Act
hybrid poplar	<i>P. spp.</i>	Ax
trembling aspen	<i>P. tremuloides</i>	At
Arbutus	<i>Arbutus</i>	
arbutus	<i>A. menziesii</i>	Ra
Birch	<i>Betula</i>	
Alaska paper birch	<i>B. neoalaskana</i>	Ea
Alaska x paper birch hybrid	<i>B. x winteri</i>	Exp
paper birch	<i>B. papyrifera</i>	Ep
water birch	<i>B. occidentalis</i>	Ew
Cascara	<i>Rhamnus</i>	
cascara	<i>R. purshiana</i>	Kc
Cherry	<i>Prunus</i>	
bitter cherry	<i>P. emarginata</i>	Vb
pin cherry	<i>P. pensylvanica</i>	Vp
choke cherry	<i>P. virginiana</i>	Vv
Dogwood	<i>Cornus</i>	
western flowering dogwood	<i>C. nuttallii</i>	Gp
Maple	<i>Acer</i>	
bigleaf maple	<i>A. macrophyllum</i>	Mb
vine maple	<i>A. circinatum</i>	Mv
Oak	<i>Quercus</i>	
Garry oak	<i>Q. garryana</i>	Qg

Hardwoods (continued)

Common name	Species	Code
Willow	<i>Salix</i>	
peach-leaf willow	<i>S. amygdaloides</i>	Wa
Bebb's willow	<i>S. bebbiana</i>	Wb
pussy willow	<i>S. discolor</i>	Wd
Pacific willow	<i>S. lucida</i>	Wp
Scouler's willow	<i>S. scouleriana</i>	Ws
Sitka willow	<i>S. sitchensis</i>	Wt

Others

Common name	Species	Code
Unknown		
Unknown conifer		Xc
Unknown hardwood		Xh
Other tree, not on list		
Other conifer		Zc
Other hardwood		Zh

¹Additional codes for exotic tree species available from B.C. Ministry of Forests, Research Branch. Also noted in Appendix 4.1

