FREP
FOREST AND RANGE EVALUATION PROGRAM
Scientifically Valid Evaluations of Forest Practices under the *Forest and Range Practices Act*

Protocol for

Identifying Stumps of B.C. Softwoods based on Bark Morphology & Macroscopic Features of Wood

For the most current version of this document, please consult the FREP web site Stump-Identification-Protocol-2007.pdf

For other FREP information, please go to http://www.for.gov.bc.ca/hfp/frep/

Version 1.0

October 10, 2007

BRITISH COLUMBIA

Ministry of Forests and Range
Ministry of Environment

Resource Stewardship Monitoring

Citation:

Les Jozsa, Research Scientist Emeritus, FPInnovations- Forintek, 2007 and Frank Barber, Ministry of Forests and Range.

Province of British Columbia. 2007. Protocol for Identifying Stumps of B.C. Softwoods, based on Bark Morphology & Macroscopic Features. Forest and Range Evaluation Program, B.C. Min. For. Range and B.C. Min. Env., Victoria, BC.

Prepared by:
MFR staff

Copies of this report may be obtained, depending on supply, from:
Government Publications
PO Box 9452, Stn Prov Gov't
Victoria BC V8W 9V7

In Victoria (250) 387-6409
Outside Victoria 1-800-663-6105

http://www.publications.gov.bc.ca

For more information on Forest Practices Branch publications, visit our web site at:
http://www.for.gov.bc.ca/hfp/pubs.htm

Foreword

To calculate the true value of a stand of trees after harvest can be daunting task. Detailed measurements are needed of stump-diameters for basal area calculations. In addition, each stump has to be identified for species composition, for assessing value. This paper presents two tree species identification protocols. The first protocol utilizes bark morphology. If, however, a stump were badly damaged during harvesting, with most of the bark abraded, then we suggest the second protocol, which utilizes the macroscopic features of wood.

Acknowledgements

We thank Dennis Araki of FPInnovations, FERIC, for his help in pointing out agencies and their representatives, for lining up potetial stump sampling sites on the Coast and in the Interior. We thank Mark Carter of The Teal-Jones Group, Mesachie Lake, BC, for taking me to recently logged areas, and helping with cutting stump-cookies. Special thanks go out to Rick Hanson, Rob Newfeld, and Doug Noren, Pope & Talbot, Midway, BC, for their excellent maps which led us good sampling sites, yielding a great variety of species for this project.

Table of Contents

List of Figures

Identifying Stumps of B.C. Softwoods Based on Bark Morphology

Introduction

Foresters are quite familiar with the appearance of bark on the stems of commercially important softwoods in B.C.

If bark is clearly visible, one should use it to identify the stump, because this method is the least labor intensive. Bark morphology is quite reliable for Douglas-fir, western larch, ponderosa pine, western redcedar, amabilis/subalpine fir, white pine, and western hemlock. The spruces and lodgepole pine can be difficult to identify because of their inherently thin barks. It is recommended that bark identification be done in situ, out in the field, so the potentially labor-intensive sample collection, labeling, and transport are eliminated.

Methods

In this paper, common terms are used to describe bark morphology. Bark includes all tissues outside the cambium of the main trunk of mature trees.

Inner bark includes the physiologically active region just outside the cambium to the last-formed cork-layer. The inner bark functions mainly as the transport corridor for the byproducts of photosynthesis from the crown to the fine root-hairs, but provides storage function as well.

Outer bark refers to the tissues from the last-formed cork-layer to the outside surface of the bark. Tissues of the outer bark are physiologically inactive, but they do provide physical protection to the tree, plus “prevents the tree from drying out”.

“Bark Statistics for Western Tree Species” gives a good proxy about the prominence of bark for BC softwoods. For example, “Bark volume as a % of Total Stem Volume”, shows that Coastal Douglas-fir has 22%, and Interior Douglas-fir has 23.3%-bark. ponderosa pine, also a thick-barked species, has 23.6%-bark. The barks on lodgepole pine, white pine, true firs, and the spruces are relatively thin, ranging from 9 to 13 % of total stem volume. Coastal and Interior western hemlock has 16 and 18% bark, respectively. Western redcedar has 14-15% bark on the Coast and in the Interior.

Results

The following descriptions and the dichotomous key (Appendix II) to species identification is based on field observation of stumps and their bark in logged over areas in the Interior, and on the Coast.

As a refresher, Figure 1 shows, left to right, western larch (note reddish blaze mark almost halfway up on the stem), western redcedar, white pine, Engelmann spruce, subalpine fir, and Douglas-fir. The deeply furrowed barks of western larch and Douglas-fir are easy to recognize. So are the long stringy bark of western redcedar, and the smooth resin-blistered subalpine fir. White pine, lodgepole pine, and Engelmann spruce can look very similar, although the spruce bark tends to have a loose structure, with the outer bark sloughing off in scales.

Figure 2 shows again the easy to recognize western larch (if one cuts the outer-bark), Douglas-fir (deep furrows), subalpine fir (resin blisters), and Engelmann spruce (loose bark scales). These stem segments are about 2 meters long, however, if we were to cover most of the stems, and showed only a 10-20 cm stump segment, the quick and easy recognition would "evaporate". In addition, bark morphology seems to change as we get closer to the stem base. This is one of the challenges one faces with identifying stumps after logging. In addition, when we factor in logging damage and exposure to the elements, positive identification can be difficult.

By far the easiest bark to identify is on a **Douglas-fir** stump, because of the light-colored cork tissue layers (Figure 3). The beige-colored cork is in interlocking layers, "trapping lens-shaped brown islands", as can be seen in Figure 3 b) and c).

Western larch bark looks almost identical to Douglas-fir bark, but when it is freshly cut with an axe or a chainsaw, the outer dead bark turns beet-red-brown color (Figure 3c). It was noted that Interior-grown Douglas-fir tends to have a higher proportion of cork tissue, with thicker layers than the Coastal form.

Species	Identifying Characteristics
Ponderosa pine	bark has prominent cork tissue layers, but the individual layers are thinner than in Douglas-fir and western larch, and they resemble "stacked plates", as shown in Figure 4.
White pine	has very fine cork-tissue layers, but they are still visible by the unaided eye, provided that the cross-sectional surface is cut with a sharp knife (Figure 5). The outer dead bark is deeply fragmented both vertically and horizontally, giving the impression of paving stones.
Western hemlock	bark has dark cork layers, beet-red in color on freshly cut surfaces, as shown in Figure 6. The cross sections of western hemlock stumps are often irregular in shape, because of the tendency for heavy buttressing at the base of stem-wood (somewhat similar to western redcedar in this regard).

Figure 7 shows the relatively thin bark of lodgepole pine. Note the flaky and fragmented outer dead bark and its poorly developed cork tissue layers. Sometimes resin pockets are visible in the outer dead bark. Figure 7a shows an example of thick lodgepole pine bark, deeply furrowed, resembling white pine, but the cork tissue layers are not as well developed. Often the inner living bark almost disappears on the stumps, because of excessive shrinkage.

Figure 8 shows a western redcedar stump badly chewed up by logging damage, yet the long stringy outer bark is still visible. The relatively thick inner bark is very fibrous and fuzzy. The smell of this wood should not be overlooked when identification is attempted. Please note that yellow cedar bark looks very similar to western redcedar, but yellow cedar inner bark has resin ducts, oozing resin.

Figure 9 shows a subalpine fir stump, with its grayish smooth bark, pock-marked with resin blisters. On older stumps the bark tends to peel off in large segments, because the bark is not prone to be fragmented (like in spruce or lodgepole pine). The outer dead bark contains tangentially flattened resin pockets, as shown in Figure 9. Often, the cork-tissue layer is concentrated on the outermost surface, and it can be peeled off.

Figure 10 shows the thin and scaly nature of Engelmann spruce. Other spruces have a very similar structure. The stump at the upper left has rougher surface than the one at the upper right, even though these two trees were growing on the same cut-block, and they were the same age.

Appendix 1. List of Figures

Figure 1. The appearance of bark on the lower part of stem of 1) western larch, 2) western redcedar, 3) white pine, 4) Engelmann spruce, 5) subalpine fir, and 6) Douglas-fir.

Figure 2. The bark of 1) western larch, 2) Douglas-fir, 3) subalpine fir, and 4) spruce.

Figure 3. a) Freshly cut Douglas-fir stump, b) weathered surface of recently cut Douglas-fir (top) and western larch (bottom) stumps, c) fresh chainsaw-cut surface of Douglas-fir (top) and western larch (bottom) note: bright beet-red color.

Figure 4. Freshly cut surface of a ponderosa pine stump. Note: "stacked-plates-like" cork tissue layers.

Figure 5. *White pine stump showing coarse scaly bark surface structure, and fine thin lines of cork tissue layers in the outer dead bark.*

Figure 6. Western hemlock stumps and their dark beet-red cord tissue layers in the outer dead bark.

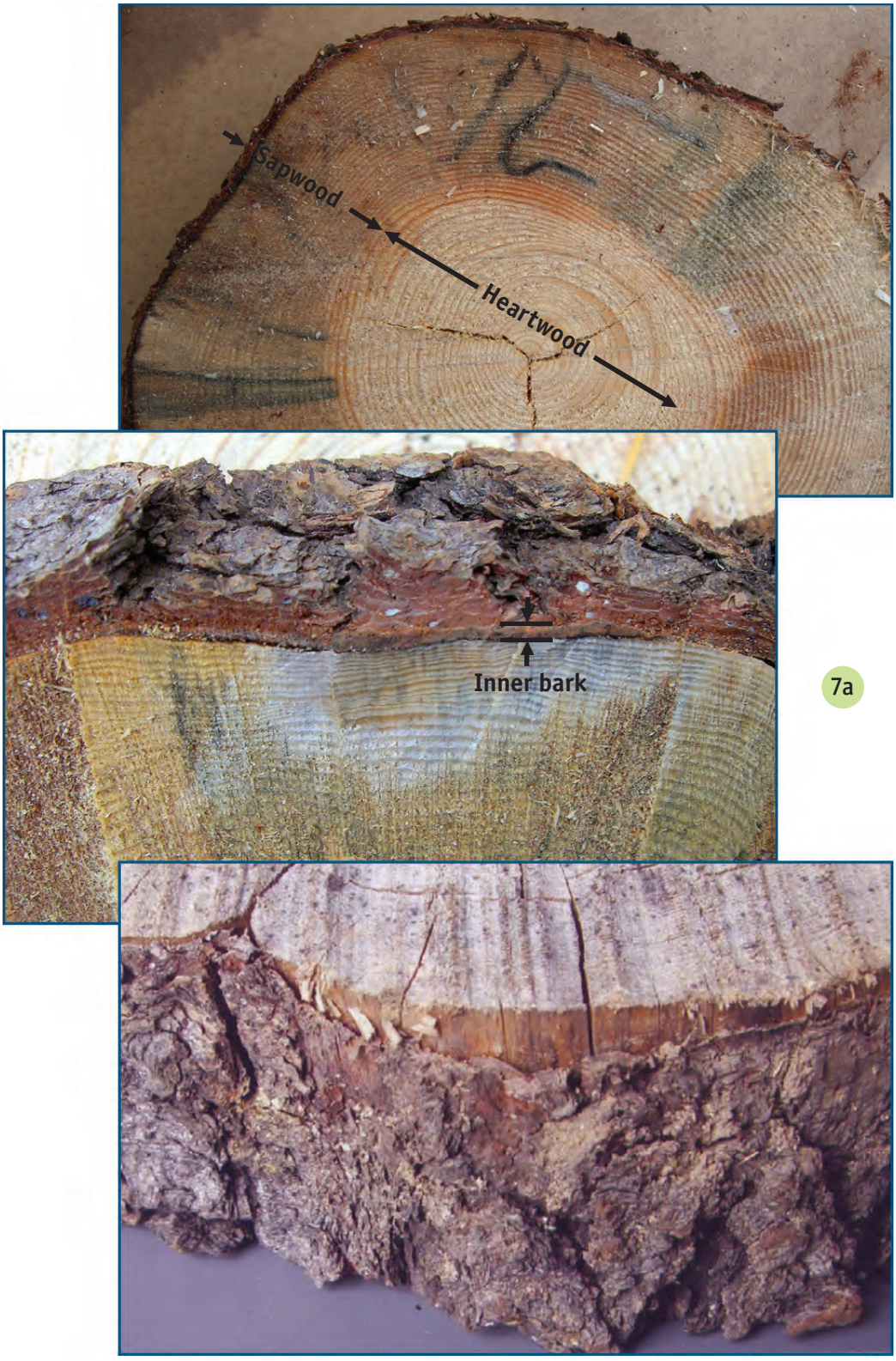

Figure 7. *Relatively thin lodgepole pine bark, showing poorly developed cork tissue layers. 7a show thicker bark, resembling white pine, but cork tissue is not as well developed.*

Figure 8. Western redcedar stump with its fibrous bark, in long vertical interlocking strips. Insert shows yellow cedar inner bark with resin ducts.

Figure 9. Subalpine fir stump and smooth, grey and resinous bark. Note: the bark is not fragmented on stump. See resin pockets at bottom of the picture.

Figure 10. Englemann spruce stumps with bark still in place. Note: the fragmented nature of thin bark, as bark scales tend to slough off.

Appendix 2. Dichotomous Key for Identifying Stumps of B.C. Softwoods, based on Bark Morphology

Note; bark features described are visible on surface topography and on cross-sectional surfaces. Thick bark is where bark thickness is more than 2-cm, thin bark is where bark thickness is less than 1-cm.

Step		Go To Step
1	a) Thick bark, with prominent cork tissue (easy to see)	2
	b) Thin bark without well developed cork tissue	4
2	a) Cork tissue in arching lenses	3
	b) Cork tissue in straight lines, like stacked plates	Ponderosa pine
3	a) Bark brown when cross-cut, beige cork plates	Douglas-fir
	b) Bark turns beet-red when cross-cut (axe or saw)	Western larch
4	a) Thin bark is fragmented with ridges or scales	5
	b) Thin smooth bark, not fragmented even on old stumps	8
5	a) Bark turns beet-red when cut	Western hemlock
	b) Bark does not turn beet-red color when cut	6
6	a) Bark fragmented like paving stones, cork tissue visible	White pine
	b) Bark is fragmented, cork tissue thin and hard to see	7
7	a) Bark in thin loose scales	Spruce
	b) Bark has resin pockets, cork tissue undeveloped	Lodgepole pine
8	a) Grey bark with evidence of resin blisters	Amabilis fir Grand fir, Subalpine fir
	b) Fibrous bark in long vertical interlocking strips	Western redcedar Yellow cedar