Culturally Modified Trees of British Columbia

A Handbook for the Identification and Recording of Culturally Modified Trees

Prepared by

Archaeology Branch
B.C. Ministry of Small Business, Tourism and Culture

for the

Resources Inventory Committee

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This book is dedicated to the memory of Arne C. Carlson and Leslie Mitchell.

The CMT Recording Procedures outlined in this handbook have been endorsed by the B.C. Association of Professional Consulting Archaeologists

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- CMT Dating (revisions), Rick Howard, Consulting Archaeologist
- Interior CMT identification, Tony Hewer, I.R. Wilson Consultants Ltd.
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The Resources Inventory Committee consists of representatives from various ministries and agencies of the Canadian and the British Columbia governments as well as from First Nations peoples. RIC objectives are to develop a common set of standards and procedures for the provincial resources inventories, as recommended by the Forest Resources Commission in its report "The Future of our Forests."

For further information about the Resources Inventory Committee and its various Task Forces, please access the Resources Inventory Committee Website at: http://www.for.gov.bc.ca/ric.

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INTRODUCTION

About this Handbook

This handbook is an operational guide to the identification and recording of culturally modified trees (CMTs) in British Columbia. It is designed for resource managers and others interested in documenting these trees.

Definition of CMT

A CMT is a tree that has been altered by aboriginal people as part of their traditional use of the forest. Non-aboriginal people also have altered trees, and it is sometimes difficult to determine if an alteration (modification) is of aboriginal or non-aboriginal origin. There are no reasons why the term “CMT” could not be applied to a tree altered by non-aboriginal people. However, the term is commonly used to refer to trees modified by aboriginal people in the course of traditional tree utilization, and is used as such in this handbook.

There are many kinds of CMTs in British Columbia. Examples include trees with bark removed, stumps and felled logs, trees tested for soundness, trees chopped for pitch, trees with scars from plank removal, and trees delimbed for wood. Some kinds are common; others infrequent. This handbook is concerned with the most common kinds of CMTs — those most likely to be encountered in BC’s forests. The handbook focuses on both coastal and interior CMTs. There is considerable overlap of tree species and modifications between the coast and interior regions of the province. Investigators should be familiar with CMTs discussed for both regions, as the majority of CMT types are not exclusive to either geographic area. The handbook also provides background information on CMT dating, intrasite sampling of CMT sites and, CMT protection and significance as currently practised in British Columbia. Appendix I contains criteria for identifying cultural tapering bark–strip scars. Appendix II addresses natural bark scarring agents commonly found on lodgepole pine.

Cultural resource managers must be aware that any archaeological site containing physical evidence of human use or habitation prior to 1846 is potentially subject to provisions of the prevailing legislation, the *Heritage Conservation Act*. These sites may not be altered without a permit issued under this Act. Modified trees associated with the early non-aboriginal history of the province are excluded from the handbook by the above definition of CMTs, but are protected by the Act if they predate 1846.

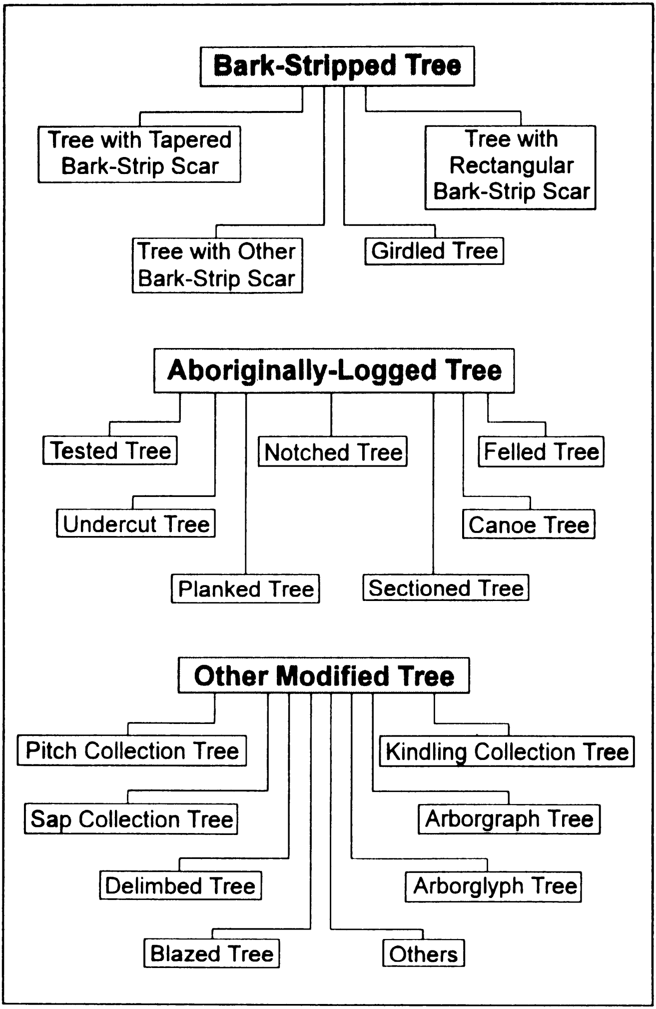
How the Handbook is Organized

The handbook consists of three main sections:
- identification of CMTs on the Coast
- identification of CMTs in the Interior
- the recording of CMTs both on the Coast and in the Interior.

The handbook also contains:
- a brief section on CMT dating
- intrasite sampling strategies
- an introduction to CMT protection, evaluation of significance, aboriginal rights and permits
- identifying cultural tapered bark-stripped scars
- a glossary
- suggested readings
- identifying cultural cambium scars on lodgepole pine

CMT Classification

There are many different kinds of CMTs in British Columbia, reflecting the traditional uses of tree products. In order to describe this diversity, archaeologists classify CMTs based on the kinds of modifications present on the trees. CMTs are first divided into three main groups or classes. Each class is then divided into a number of types. The chart on the next page shows the CMT classification used in this handbook. This classification can be used in all regions of British Columbia, though not all types are present everywhere. Each class and type of CMT is discussed later. There is a separate discussion for the Coast and Interior of the Province. Terms are defined at that time, as well as in the glossary.



Toolmarks

Cuts, striations, grooves and other marks produced by tool use are found on many types of CMTs. The presence of marks made by tools used traditionally by aboriginal people is usually convincing evidence that a tree is a CMT. These tools include steel axes, hatchets, knives; iron chisels and adzes; chisels of stone, bone and shell; wooden, bone and antler wedges; bone and antler bark peelers; bone sap scrapers; and others. Cutting tools made of steel were used in traditional activities throughout British Columbia in the 19th and 20th centuries; other kinds of tools were more restricted in the geographic extent of their use (for example, chisels with shell bits were used in some areas on the Coast only, and antler bark peelers were used in the Interior only). Toolmarks are discussed in the sections on Coast and Interior CMTs.

How to Identify a CMT

There is no simple method for identifying a CMT. Most identifications involve matching the observable characteristics of an altered tree suspected of being a CMT with those listed for the different types of CMTs. To help identify CMTs on the Coast, where many complex types of CMTs occur, a key is provided. The key provides a fast preliminary identification. The key indicates where in the handbook information about each type can be found. A final identification then can be made by consulting the detailed characteristics and illustrations for that type.

When a tree is confirmed as a CMT, the location (CMT site) is recorded. Two forms are used for recording CMT sites:

- Level I CMT Site Recording Form or;
- BC Archaeological Site Inventory Form.

The BC Archaeological Site Inventory Form was also formerly referred to as a Level II Site Recording Form.

The Level I CMT Site Recording Form is included in the handbook. The BC Archaeological Site Inventory Forms are available through the Archaeology Branch website (www.archaeology.gov.bc.ca) or by directly contacting the Branch.

A third form, the CMT Feature Recording Form, assists in recording CMT features that form the site. This form is used with either the Level I or BC Archaeological Site Inventory Forms and is included in the handbook.

This handbook is organized so that it can be used in the field. Individual pages or sections can be removed from the binder and inserted into Duksbak-style field notebooks. The recording forms can be photocopied onto waterproof paper and inserted into a field notebook.

Protecting CMTs

People encountering CMTs are encouraged to make a record of their findings. However, care should be taken to not damage, move, or in any other way impact a CMT or CMT site which may be protected under provisions of the *Heritage Conservation Act* without the appropriate permit (see the section on CMT protection). This includes the coring of trees for dating purposes. Impacts may affect the physical, cultural and historical integrity of a CMT or CMT site.

Coastal British Columbia

Introduction

Coastal British Columbia consists of the Coast Mountains and the land and islands to the west. Tree use was a part of virtually every aspect of traditional aboriginal life on the Coast. More than a dozen species of trees were used, the most important of these being the western redcedar. The importance of trees and tree products in the traditional cultures of the Coast is well known and documented in a number of widely available sources.

CMT Classification

As discussed in the Introduction, CMT classification is based on the kinds of modification present on the trees. CMTs are first divided into three main groups (classes): bark-stripped trees, aboriginally-logged trees, and other modified trees. Each class is then divided into a number of types. The chart in the Introduction shows the most common types for each CMT class. The most common CMT types found on the Coast are discussed and defined below. Terms are also found in the glossary.

Toolmarks

Prior to European contact, people on the Coast used a variety of technologies and tools for felling trees, working wood, and collecting bark. The main tools used were chisels, wedges, hammers, and adzes. Chisels and adzes had bits made of stone, bone or shell. Cobbles and handmauls were used as hammers. Wedges were made of wood, bone and antler. Iron was available in some areas of the Coast by the 15th century (and perhaps earlier), and became the preferred material for chisel bits. Basic technologies did not change until the mid to late 19th century, when first the steel axe and knife were introduced, and later the crosscut saw and backcut-undercut felling method.

The careful documentation of these toolmarks can help us understand the techniques and diversity of aboriginal logging. Replication studies on the Northwest coast are limited (see bibliography) but toolmarks and wood chips have been studied in detail at Ozette and other wet sites.

Often, similar toolmarks can be distinguished by examining evidence for tool width, blade curvature and nature of the cut surface. These measures reflect that chisel blades are generally much narrower and more deeply curved than axe blades and that stone tools leave a much rougher surface than iron ones. Therefore, the blade width and curvature should be recorded whenever possible. (However width can only be recorded if both corners of the bit are visible.)

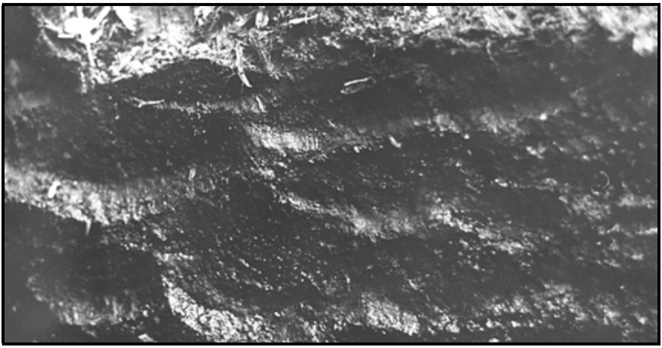
The context of the cutmarks may also be important. What initially appear to be axe marks might be found in a location inaccessible to a blade hafted as an axe or adze. In this case, an axe blade must have been hafted as a large chisel.

The surface nature of the cut can also help identify the tool. For instance, crosscut saw marks often are perfectly flat, soft and punky; seldom getting covered with a black substance termed lignin. In contrast, lignin is often found on iron chisel and axe marks, where the wood fibres have been cleanly sliced. This blackening may be confused with burning marks. The formation of lignin appears to require moisture and is seldom found on very protected dry surfaces. In contrast, non-iron tool bits, particularly stone chisels, always leave a rough surface and can leave a mass of jutting splinters. Intentional burning will leave clearly charred wood and charcoal on the worked surface.

Cuts, striations, and other marks produced by these tools are found on many types of CMTs. Examples of some of the toolmark found on CMTs on the Coast are illustrated below, along with additional description.

Axe marks

Axe marks are distinguished by a step in between bit marks where a large chip or chunk has been removed by twisting the axe handle. Axe marks, with age, may obtain thick lignin layers, which can leave rather roughened surfaces when decomposing.



Cut marks made by steel axe.

Iron chisel marks

Iron chisels leave narrow cutmarks with clean surfaces often blackened with lignin. Chisels widths of 2 to 5 cm are common. Occasionally, and especially on the North Coast, large bits 10–12 cm wide were hafted as chisels. These large chisels were probably re-hafted axe heads. Chisels sometimes have deeply curved bits, leaving markedly curved toolmarks. A chisel is held in one position and driven with a maul in a series of blows. This action sometimes leaves semi-continuous lines of marks that can be traced for 30 cm or more into the tree. Chisels are the only tool that can reach into a deep, narrow cavity. Iron chisels are used at a variety of angles, sometimes at an oblique angle to the wood being removed, and sometimes puncturing the grain at a 90-degree angle. At some locations, particularly on the west side of Vancouver Island, the gouge chisel was held at a reversed angle (and upside down), leaving a series of unusual sharp-edged ridged toolmarks. A double line of chisel or adze marks is often found at the top of rectangular bark-strips on redcedar trees. This is a result of removing a narrow strip of bark before prying off the large bark sheet, perhaps as an aid to inserting pry bars and wedges.

A series of cuts from a 2.5 cm wide iron chisel at the top end of a plank-strip. Even though there are many cut marks, only a few are complete enough to determine chisel width. The chisel has a deeply rounded curved bit. Note the formation of black lignin on the bottom portion of the scar.

Stone chisel marks

Stone chisel marks are particularly common in the North Coast and adjacent interior areas of the province. Stone toolmarks are relatively easy to identify where the preservation is good.

Large features made with stone tools often show a number of different toolmarks on one feature, suggesting the use of different types of tools as the hole was enlarged. At the outside edge of the features, in and near the sapwood, the tool is often clearly outlined by the toolmark, and the angle of attack is low (relatively parallel to the wood grain). Unlike iron toolmarks, however, the smooth surface is not ‘shiny smooth’, and the end-grains of wood show coarse shearing. These marks could be made either with a stone celt hafted as a chisel, elbow adze or splitting adze.

A testhole on a standing tree made using stone tools. Note wedge marks on split face.

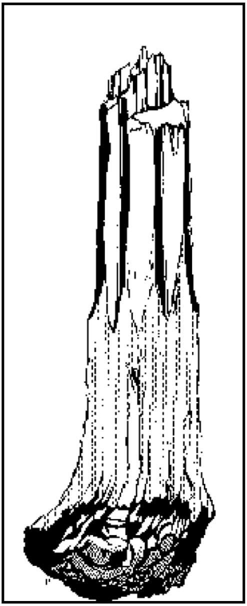
A 2 cm side stone chisel has been used to hack into the sapwood, leaving an extremely rough surface.

Further in the feature, the angle of attack becomes much steeper and individual toolmarks are often impossible to discern. The fibres are very coarsely shredded and hang in dense ridges. This is due to the inability of most stone tools to cut directly into cedar fibres.

Puncture and associated splinter on the split face of a testhole. Note splintered fibres from stone tool use at top of photo.

Stone splitting-adze marks

The large, heavy stone adzes used in the northern part of the province removed big splintered slabs. Their use and remnant stumps were described by an archaeologist in the late 1940s (Leechman, 1950). The individual ‘woodchip’ slabs removed were described as about 4 cm wide, 6 mm thick, and 20–23 cm long (see drawing and photo on next page).



Stone splitting adze toolmarks on small-diameter spruce stump. Splintered wood slabs are about 20–25 cm long (reprinted from Leechman, 1950).

Angled heavy scoring on the split face of a testhole from a splitting adze.

On large cedar trees, it appears that the splitting-adze was used to remove chunks of wood isolated with chisels. The resulting marks show as gaping punctures, about 4 cm wide and several millimetres across, at apparently random orientations. Sometimes splintered wood is torn up at the puncture, and the use of heavy force is apparent. The punctures can be distinguished from iron chisels on the basis of the thickness of the tool: iron tools usually leave very narrow or closed punctures, stone tools are very much blunter and leave a gaping puncture.

Bone chisel marks

Bone chisel marks may be indistinguishable from stone if the chisels share the same form. However, bone chisels or antler cutting wedges have been identified when the tool had a round cross-section. This results from using an entire animal legbone or antler. These toolmarks show rough surfaces or heavy splintering similar to stone tools, but the tools left distinctive deep half-circular grooves.

Fire

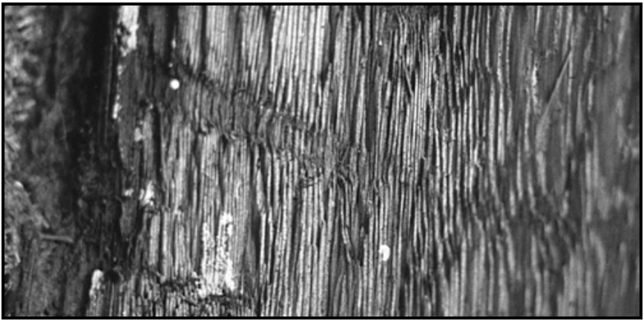
Fire was used to assist in making large notches in wood prior to the common availability of iron tools. Fire used as a tool can be difficult to identify because natural wildfires (including lightning strikes) can also cause inner surfaces to become charred. Pitch, lignin, and water staining can also mimic burning marks. Therefore, many CMTs with naturally burnt or otherwise blackened areas have been misidentified as intentional burning. Controlled burning should be associated with hearth features on the forest floor. Fire-altered rocks may be found on the ground or even within the feature.

Fire was very controlled, and it is unlikely that aboriginal logging with the aid of fire would lead to a hollow tree centre being extensively burnt. The burnt areas should be relatively small and clearly demarcated from light-coloured wood. Chisel marks will often be found in the charred wood, and will sometimes cut through the charcoal to expose light coloured unburnt wood behind the cut. In other cases, burnt notches will be connected with wedged out unburnt wood. In each of these cases, it is clear that the burning pre-dated the final woodworking.

Photo of a burnt testhole, partly obscured by fallen tree on upper left. There is a large healing lobe on right. The charred surfaces are confined to the chopped area, and the wood is clearly charcoal, not just blackened.

Wedge marks

Precontact aboriginal loggers carried bundles of specialized wooden wedges. The marks left by hammering in these wedges in order to split away chunks, slabs, and planks are common where the split face is well preserved. The width of the tool can often be measured, and sometimes the shape of the wedge tip is left in profile. These working ends are often markedly asymmetrical.



Striation marks made by wedge.

Cross-cut saw marks

Cross-cut saws leave perfectly flat cut surfaces, that seldom preserve well. They cannot reach into tight places and are often accompanied by axe cuts (from the undercut) on stumps.

Chainsaw marks

Chainsaw marks can form lignin and are seldom as flat as the marks left by cross-cut saw. Cut surfaces have characteristic non-parallel linear ridges and cutlines.

Major toolmark classes have been summarised in the table that follows (see next page).

The presence of marks made by tools used traditionally by aboriginal people is usually convincing evidence that a tree is a CMT (as defined by this handbook). For resource management purposes, trees with axe, knife, or crosscut sawmarks (which could have been made by non-aboriginal persons) may require other kinds of supporting evidence, such as the kind, context, or date of modification on the tree, to determine if the CMT is protected by provisions of the *Heritage Conservation Act*.

Toolmark Class	Description
1. Steel axe	Very clean cut, wide, deep, tangential orientation(s), cutting edge gentle arc, almost flat profile, horizontal angle of attack on stumps, quite oblique on log segments
2. Steel chisel	Very clean cut, narrower, deep, radial or perpendicular orientation, cutting edge rounded arc, almost flat profile, steep angle of attack, (near horizontal at bottom)
3. Iron axe	Clean cut, not so deep, rougher than steel, tangential orientation(s), cutting edge gentle arc, very rounded profile, horizontal angle of attack on stumps, quite oblique on log segments
4. Iron chisel	Clean cut, narrow (approx. 3–5 cm), not so deep, rougher than steel, radial or perpendicular orientation, cutting edge rounded arc, very rounded profile, steep angle of attack, (near horizontal at bottom)
5. Stone chisel	Shearing, some relatively clean cuts with well defined edges and pronounced ridges left by chipped edges, not so deep, irregular surfaces, cutting edge flat to rounded, flat to concave profile, steep angle of attack, no lignin
6. Bone chisel	Shearing, very narrow, not so deep, irregular surfaces, straight to semicircular cutting edge, deeply concave profile, steep angle of attack, no lignin
7. Shell chisel (experimental results)	Shearing, not deep at all, irregular surfaces, less pronounced ridges left by chipped edges, steep angle of attack, no lignin
8. Wedge (wood/antler)	Irregular depressions or grooves often in parallel series with sheared and splintered wood along the edges. Antler may leave a curved mark
9. Eroded/ unclassifiable	All variables uncertain due to erosion. May be older examples.
10. Other (knives etc.)	

Identification Key for Coastal CMTs

The insert that follows is a key that can be used to obtain a preliminary CMT identification. The insert is in landscape format so that the key can be presented in its entirety on the two sides of a single sheet of paper. The insert can be removed from the handbook and placed in a field notebook. Directions for use of the key are provided.

The key consists of 19 questions to be answered YES or NO. Each YES or NO answer either instructs the reader to proceed to another question, or offers a preliminary identification and a page in the handbook where that type is discussed. Start with question #1. Answer the questions in numerical order. The terms used in the questions are defined in the glossary and text below.

Identification Key for Coastal CMTS

Answer the following questions YES or NO. Follow the instructions for each YES or NO answer, until a preliminary identification is made. Start with question #1. Answer the questions in numerical order.

Key for Identifying Major CMT Types on Coastal British Columbia

#	Question	If NO	If YES
1	Is the tree standing?	Go to Question 12	Go to Question 2
2	Does the tree have one or more bark scars?	Go to Question 6	Go to Question 3
3	Is the tree western red or yellow cedar?	Other bark-strip scar (Page 33)	Go to Question 4
4	Is the scar long and tapered (triangular)?	Go to Question 5	Tapered bark-strip scar (Page 23)
5	Is the scar large and rectangular?	Other bark- strip scar (Page 33)	Rectangular bark-strip scar (Page 29)
6	Does the tree have a test hole?	Go to Question 7	Tested tree (Page 38)
7	Does the tree have an undercut scar?	Go to Question 8	Undercut tree (Page 41)
8	Does the tree have one or more notches and no plank scars?	Go to Question 9	Notched tree (Page 51)
9	Does the tree have one or more plank scars?	Go to Question 10	Planked tree (Page 52)

Key for Identifying Major CMT Types on Coastal British Columbia (Page 2 of 2)

#	Question	If NO	If YES
10	Does bark have many cut marks in one spot?	Go to Question 11	Pitch collection tree (Page 59)
11	Does the tree show evidence for removal of small pieces of wood?	Other modified tree (Page 58)	Kindling collection tree (Page 60)
12	Is the tree wind fallen?	Go to Question 13	Go to Question 16
13	Does the tree consist of or include a stump?	Go to Question 15	Go to Question 14
14	Does the tree consist of a stump only?	Go to Question 15	Felled tree (Page 43)
15	Does the tree consist of or include a log?	Other modified tree (Page 58)	Go to Question 16
16	Has the log or windfallen tree been shaped into an unfinished canoe?	Go to Question 17	Canoe tree (Page 56)
17	Does the log or windfallen tree have one or more plank scars?	Go to Question 18	Planked tree (Page 52)
18	Does the log or windfallen tree have one or more notches?	Go to Question 19	Notched tree (Page 51)
19	Does the log or windfallen tree consist of two or more sections?	Other modified tree (Page 58)	Sectioned tree (Page 49)

Identifying Bark-stripped Trees

A bark-stripped tree is a tree from which bark has been partially removed by aboriginal people. Bark was collected from different tree species and for a variety of purposes. These trees are characterized by the presence of one or more areas of removed bark and exposed wood commonly referred to as bark scars. A bark scar resulting from human stripping is called a *bark-strip scar*, whereas the more general term *bark scar* refers to any scar, whether of natural or human (cultural) origin.

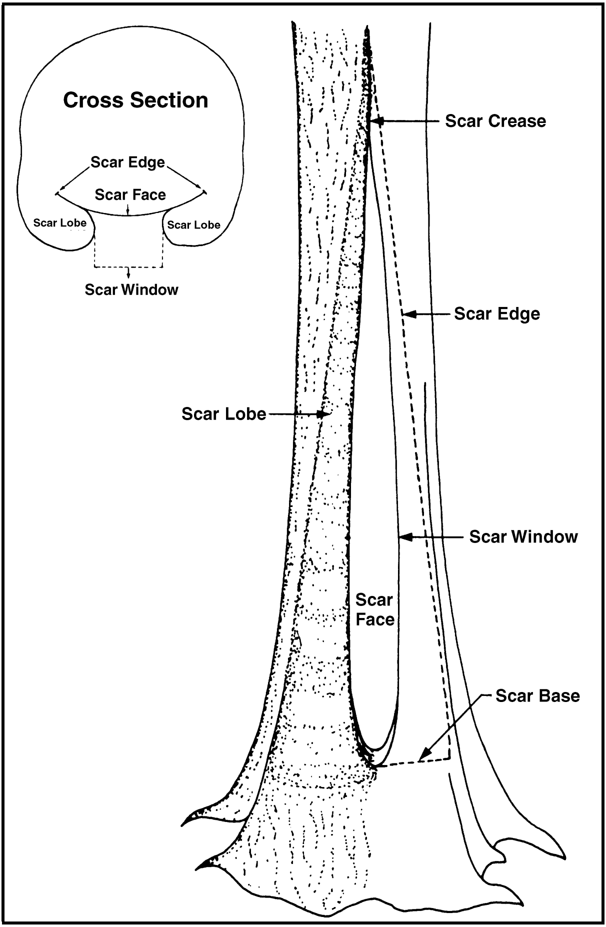
Key terms

In addition to bark scar and bark-strip scar, key terms for discussing bark-stripped trees are:

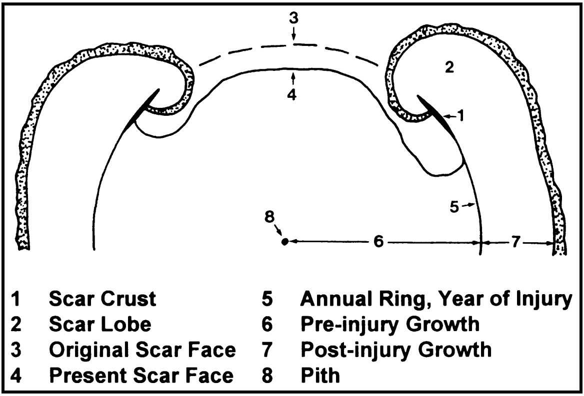
- *scar face:* the wood surface exposed by bark removal.
- *scar lobe:* the vertical ridge of wood tissue formed on both sides of a scar face. In response to bark removal, a tree attempts to heal itself by growing over the dead wood of the scar face, which results in the development of vertical ridges of wood tissue called scar lobes, callus lobes or healing lobes.
- *scar crust:* a hard black or dark brown layer formed on the inner side of a healthy scar lobe where it grows against the smooth surface of an uneroded scar face. This crust continues to extend in a curve parallel to the face with each new year of growth until the face begins to decay. The scar crust is an important characteristic in identifying tapered bark-strip scars.
- *scar window:* the opening created by the lobes growing on both sides of a scar. As lobes grow, they join together above a scar, as well as below the scar if the scar does not extend to the ground, thereby obscuring the edges of the scar and forming a lenticular (lens-like) or triangular opening (the scar window) over the scar.
- *internal scar:* a scar inside a tree. As scar lobes continue to grow, they can in some cases eventually cover the entire bark-strip scar, thereby closing the scar window, and creating an internal scar. These scars appear as narrow vertical creases

in the bark, or lie completely buried inside the tree and cannot be seen from outside.

These terms are illustrated in the next figures.



Key terms for bark-stripped tree with tapered bark-strip scar.



Partial cross-section through cultural bark-strip scar.

Types of bark-stripped trees

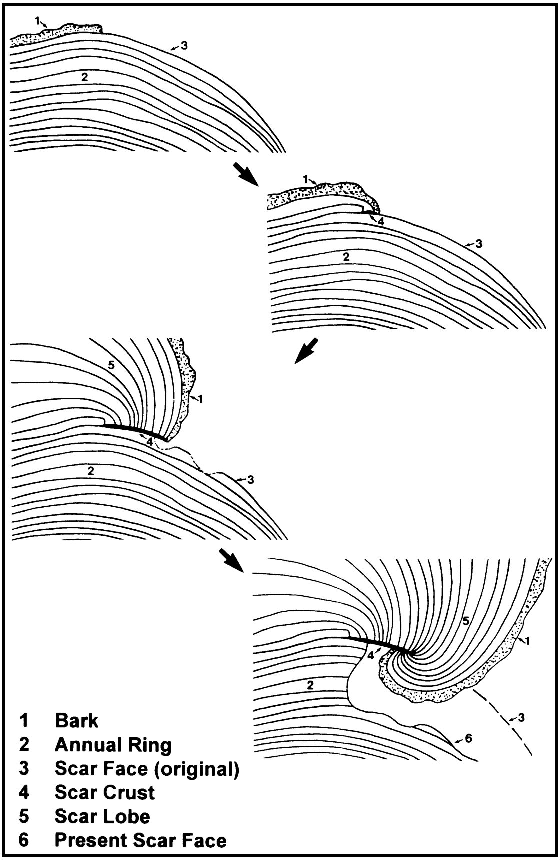
Bark-stripped trees are classified according to the type of bark-strip scar(s) present. Bark-strip scars found on the Coast are of four types:

- long tapered (triangular) scars (BST)
- rectangular scars (BSR)
- girdled
- other scars

Although trees often have more than one scar, a tree seldom has scars of more than one type.

Long tapered bark-strip scars (BST)

Long tapered bark-strip scars are also called *triangular scars* or *tapered scars*. These are relatively long and narrow scars found on two tree species: western redcedar and yellow cedar, although they are far more common on the former. Tapered bark scars are the result of the procurement of the soft, pliant inner bark used to make clothing, mats, blankets, basketry, ropes, diapers, towelling, and so on.



Development of scar crust.

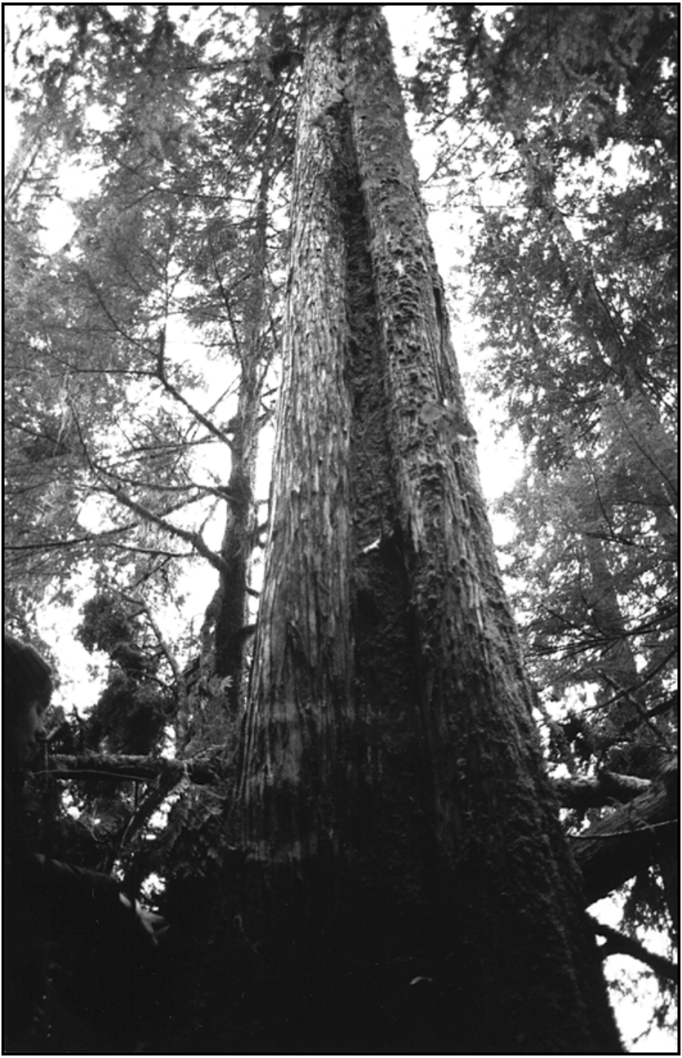
Bark was usually stripped from young trees that were relatively straight and free of large branches. A horizontal cut was made in the bark (usually above the root flare, and often on the upslope side if the tree was on a hill). Loosened bark was pulled away from the tree until the upper end tapered to a point and broke away. Inner bark was then separated from outer bark, bundled, and taken away for processing. In some cases bark was removed in several adjacent narrow strips, sometimes leaving two pointed upper ends.

Identifying tapered bark-strip scars: When assessing whether or not a tapered bark scar is cultural, consideration should be given to the characteristics of both the scar and the scarred tree. The characteristics listed below can be used to make such an assessment. The correct identification of a tapered bark-strip scar sometimes is very difficult because:

- natural forces or agents can produce bark scars that resemble cultural tapered bark scars
- lobe growth and scar face deterioration can obscure some of the key characteristics of a cultural scar, to the point where the bark scar itself is completely hidden by lobe growth or completely deteriorated.

Correct identification of tapered bark-strip scars is undoubtedly one of the most difficult aspects of CMT work. A brief discussion follows. Readers wanting more information about this topic should consult Appendix I.

Two small bark-stripped cedars with tapered bark-strip scar: on left with intact base formed into U shape by lobe growth; on right with scar extending to ground as a result of bark falling off tree below original scar base.



Bark-stripped western redcedar with old tapered bark-strip scar covered with moss, and large scar lobes on both sides of scar.

Characteristics of Tapered Bark-strip Scars

- cultural tapered bark scars not obscured by lobe growth are typically long and narrow, with straight tapered sides
- bark is absent on cultural tapered bark scars
- cultural tapered bark scars on a tree that was healthy at the time of stripping produces a scar crust that is smooth and follows the curve of the wood exposed by stripping
- the presence of toolmarks on the scar face usually indicates that the scar is cultural
- large branches are not present on cultural tapered bark scars
- cultural tapered bark scars usually are found on the uphill and lateral sides of a tree located on a slope; cultural scars are seldom found on the downhill side of a tree
- cultural tapered bark scars have distinctive annual ring characteristics that can be observed when a sample of wood is cut from the scar

Characteristics of Trees with Tapered Bark-strip Scars

- trees with cultural tapered bark scars are relatively straight-grained and free of large branches on the side of the tree that has been stripped
- western redcedar with cultural tapered bark scars usually had a diameter at breast height of about 60 cm or less at the time of stripping
- a young tree with more than one tapered bark scar probably was stripped by people
- the presence of other trees in the vicinity with tapered bark scars increases the likelihood that the scars are cultural
- the presence of multiple bark scars of similar age on one tree or on adjacent trees increases the probability that the scars are cultural

In addition to scar and tree characteristics, other kinds of evidence for possible natural scarring should be sought out and considered when assessing a tapered scar. Such evidence includes the presence of large rocks, large branches, and windfallen trees at the base of a scarred tree; proximity to avalanche tracks; grizzly bear claw marks at the base of a bark scar; and the presence of a poor growing site (standing water or minimal soil development).

It is not always possible to determine in the field if a tapered bark scar is cultural. This is particularly so for scars that are extensively overgrown by healing lobes, or where scar face deterioration has removed much of the scar.

When it is not possible to determine in the field if a tapered scar is cultural, a microscopic examination of a prepared wood sample taken from a tapered scar can determine if the scar is cultural based on the characteristics of the annual rings. Both wedge and disc samples can be cut for this purpose (see section on CMT dating for further discussion of samples). However, it is not always possible or desirable to collect such samples since they involve cutting of the tree.

Rectangular bark-strip scars (BSR)

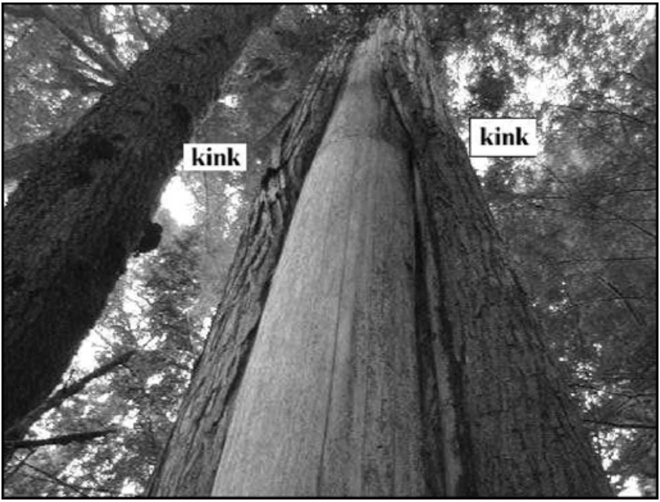
Large rectangular bark-strip scars are found on western redcedar, particularly those in the northern part of the Coast. They result from the removal of large slabs of outer bark (sometimes called bark planks or bark boards) used as raw material for baskets and clothes and roofing material for temporary shelters and over canoes under construction in the forest. In removing the bark, a knife, chisel or adze was first used to make a series of horizontal cuts through the thick outer bark at the bottom and top of the desired length. The bark slab was then pried off the tree. Sometimes a third cut was made about midway between the top and bottom cuts. Sometimes a narrow band of bark was first removed at the top of the slab to help with the removal of the bark.

Characteristics of Large Rectangular Bark-strip Scars

- scars have more or less parallel sides, with healing lobes along both sides
- scars have a horizontal base and top, resulting in indicators that the original shape was rectangular
- very old scars may have paired kinked lobes at the original upper cut line (see photo, p. 31)
- scars are usually between 3 and 7 m in length, and between 40 and 70 cm in width
- scars are usually quite close to the ground, with bases often less than 50 cm above the ground
- scars are seldom completely obscured by lobe growth because of the large size of the scars
- the scar face at the bottom of the scar (above the original scar base) often is more deteriorated (eroded) than the rest of the scar face
- toolmarks in the form of horizontal cut marks are often present on these scars, though deterioration of the scar face may eventually remove these marks (the marks at the top generally preserve better than those at the bottom)

Scars sometimes have peaked rather than straight tops because the bark between the contracting lobes above the scar has died and dropped off the tree, leaving a triangle of exposed but less weathered wood above the original scar (see photo, p. 31).

Some large rectangular bark-strip scars may be the result of stripping for inner bark rather than bark slabs. The bark would be cut at the top and bottom when a specific length of material was wanted, such as for skirts or mats. These rectangular bark scars are found on cedars that were younger and smaller at the time of stripping.



Paired kinked lobes on old bark-strip scar.

Bark-stripped western redcedar with large rectangular bark-strip scar. Note erosion of scar base and some bark loss at top of scar.

Other bark-strip scars

This category consists of all other bark-strip scars. As some of these are studied better than others, it may be useful to identify them as separate types. This category consists mainly of small rectangular scars that often heal to oval or lenticular shapes (scar windows).

Species on which these scars are found include western hemlock, Sitka spruce, Douglas-fir, spruce, western yew, and some deciduous species, such as cottonwood, red alder, cascara, wild crabapple, and wild cherry. Bark from these species was used extensively for such diverse purposes as food, medicine, dye, fuel, binding material and, in some cases, small emergency canoes. In some cases, the bark may have been removed for the collection of pitch. At one time, CMTs left from these activities must have been very common, but it is not likely that many are still alive.

Hemlock is less resistant to infection following scarring than is cedar, and most of the other species have much shorter life spans. In addition, some trees were girdled or felled in order to obtain large quantities of bark.

These bark-strip scars are generally narrow relative to their length, though a few examples of almost square scars have been reported. They are typically between 40 and 150 cm in length, depending on the species, and between 50 and 75 cm in width, although scars as narrow as 10 cm have been recorded. Hemlock bark-strip scars typically measure between 100 and 150 cm in length and 50 to 75 cm in width, with bases between 50 and 150 cm above ground. Sometimes the bases are up to 300 cm above ground. The exposed hemlock wood can deteriorate quickly, removing the scar face and leaving just an oval hole formed by the scar window. Bark-strip scars on spruce are virtually identical to those on western hemlock.

Bark-stripped western hemlock.

Many of the criteria listed above for identifying cultural tapered scars on cedars can be used to determine whether or not rectangular scars on species such as hemlock, spruce and Douglas-fir are cultural in origin. However, it should be noted that cultural scars on Douglas-firs may have bark on the scar face. In contrast to most other species, which try to heal a scar by covering it with scar lobes, Douglas-fir trees appear to be able to regenerate bark over the entire scar. The previously stripped area is distinguished by bark that is smoother and often darker than the original bark. In order to identify these scars as cultural, regular scar shapes or toolmarks must be visible, since the trees also can lose bark as a result of fires and other natural agents.

Another difference is found on culturally stripped hemlock trees where growth rings that develop after stripping are suppressed rather than expanded, as they are on cedar trees.

Birch bark was stripped by only a few groups on the coast. Birch bark scars are discussed in the section on Interior British Columbia.

Identifying Aboriginally-logged Trees

Aboriginally-logged trees are trees which have been tested, felled, cut, or otherwise modified by aboriginal people as part of the traditional procurement of logs, posts, planks and other pieces of wood. These trees were modified using traditional tools and the techniques typical of the 18th and 19th centuries, which included the use of chisels made of trade iron. In some cases, aboriginally-logged trees (or, more simply, logged trees) display evidence of more recent Eurocanadian logging tools (axes, crosscut saws, springboards) and techniques (especially the undercut/backcut technique still used today for the felling of large trees). These trees are CMTs if they were modified to obtain wood and other products for traditional aboriginal use, rather than for commercial purposes as part of the Eurocanadian market economy.

Features and types of aboriginally-logged trees

There are seven major types of aboriginally-logged trees based on the kinds of features present. A feature is a modification produced by wood or bark removal. Common features on aboriginally logged trees are test holes, undercut scars, plank scars, stumps, logs, log sections, notches, and canoe blanks. The tree itself, whether standing or felled, also is treated as a feature. Less common features include platform notches, logging detritus, and lofting logs. These terms are defined in the glossary and in the text below.

Major Types of Aboriginally-logged Trees

- tested tree — has test hole or holes
- undercut tree — has undercut scar
- felled tree — has stump and/or log
- sectioned tree — has log sections
- notched tree — has notch or notches
- planked tree — has plank scar or scars
- canoe tree — has canoe blank

The key to classifying aboriginally-logged trees is to remember that, when more than one kind of feature is present on a tree, the feature presumed last in the modification sequence is used to describe the CMT type, since it represents most closely the intended use of the tree. For example, a CMT with a notch and a plank scar is described as a planked tree rather than a notched tree since notching usually precedes removal of a plank. The seven types named above are listed in the order of precedence, with a canoe tree the most advanced form of modification.

Note on the Usage of "Tree"

Use of the term "tree" does not necessarily mean that the CMT is standing. Some kinds of modified trees are standing (tested and undercut CMTs (unless wind fallen), whereas other kinds of modified trees (felled, sectioned and canoe CMTs) are non-standing. Notched and planked trees can be either standing or non-standing.

Criteria for identifying aboriginally-logged trees

Large cedar stumps with even-height (flat-top) surfaces are almost certainly a result of cultural modification, because cedar trees tend to blow down or shatter into long splinters rather than snapping cleanly across at a height of 1 to 3 m above ground. Toolmarks are often lacking when the surface of the stump has deteriorated; when present, they may be completely obscured by the roots of large nursing trees [see photo, p. 48].

The presence of toolmarks on standing trees, stumps, cut logs, or windfalls is a clear indication of cultural modification, but additional criteria are necessary to distinguish the results of aboriginal logging from those of non-aboriginal commercial logging.

Logged trees are considered aboriginal when:

- a stump shows a single massive undercut resulting in a barberchair spire, or a continuous girdling of the tree
- a plank-strip scar is present on a standing tree. Such scars on felled trees or windfalls are probably aboriginal. If two parallel narrow slots are present at one end of the scar and other parallel slots or an open-angled horizontal notch are present at the other end, the logging is aboriginal
- chisel or adze marks (cutmarks 2 to 5 cm wide) are present or wedge striations are visible on the split faces
- a small rectangular hole is chiselled into the tree to test the heartwood (not to be confused with holes made by pileated woodpeckers)
- nursing trees on the feature predate commercial logging in the local area.

Logged trees are considered not to be aboriginal when:

- a stump has springboard notches (unless it is associated with a clearly aboriginal feature such as a partly finished canoe or a log with a missing section)
- a stump has chainsaw cuts
- a stump has an axed undercut combined with a sawn back-cut, a stepped-top, and widely scattered logging debris displaying cross-cut saw marks.

Stumps displaying these characteristics are most likely the result of non-aboriginal commercial logging. However, it should be stressed that modern felling techniques can still result in a CMT if the purpose is a traditional use of the tree.

Distinguishing Aboriginally-logged Trees in the Field

Field inventory conditions (dense undergrowth, rugged terrain, poor weather) are not always the best for the recognition of aboriginally-logged CMTs such as logs, log sections, and low stumps which are often not evident from any distance. All cedar logs, windfalls and stumps of a size suitable for aboriginal logging should be examined carefully for evidence of use during a field survey. Moss, salal and other plants growing on logs and stumps may have to be removed in order to determine if toolmarks are present.

Stumps with springboard-like notches should be examined for toolmarks and the presence of a log or log sections, and not be automatically dismissed as commercial in origin.

Tested trees

A tested tree is a standing tree with one or more rectangular holes chopped into its trunk. These holes are commonly called "test holes" though the term "alcove" also has been used. It is thought that these holes were made to determine the soundness of the heartwood of the tree, a consideration that was particularly important when looking for a tree suitable for a canoe or planks.

Features always present on a tested tree are:
- the tree itself — usually a large western redcedar
- test hole — see below

Other features which can be present are:
- logging detritus — see below
- platform notch — see below
- notch — see below

Test hole: A test hole is a four-sided alcove cut into a standing tree, usually deep into the heartwood. Two very different kinds of four-sided holes have been called test holes. The first is found most commonly on the Queen Charlotte Islands (Haida Gwaii) and elsewhere on the north Coast. They consist of relatively large holes that start at the outer surface (bark) of the tree. These test holes are usually rectangular when viewed from the front of the tree, although some more or less square examples have been reported. The long axis of the hole is usually horizontal rather than vertical. Usually, the hole has a flat bottom and a flat or "stepped" top that slopes down into the hole to form the back of the hole. Unlike undercut scars which they resemble (see below), a test hole will have cut or split left and right sides. Wedge or splitting-adze marks may be found. Healing lobes normally will be present along the edges of the hole, but the sides of the hole are not formed by these lobes. Axe, adze or chisel cut marks are usually present inside the hole.

These test holes are of variable size, with lengths and widths commonly in excess of 50 cm. The holes can be of varying heights above ground, from about 0.5 m to over 4.0 m. Bark often sloughs off the tree both above and below the test hole. A tree may have more than one test hole, including trees with test holes above one another and examples of test holes on opposite sides of the tree (but at different heights). Test holes have been reported on stumps.

Little is known about these holes. In addition to possible use as tests of wood soundness, it has been suggested that they could be notches for felling or planking the tree, or alcoves for holding trapsets. However, trapping alcoves differ from test holes in that they are generally smaller and lower on the tree, and occur on trees other than western redcedar and yellow cedar.

A second kind of test hole is considerably smaller, and has been identified so far on the Queen Charlotte Islands, central coast and northeast Vancouver Island. They are holes cut to test the soundness of the heartwood after a flaw had been detected while cutting a large notch. Presumably the notch was the first step in felling the tree or removing a plank. These small test holes are cut into the back of the notch, and are smaller than the notch. These holes typically do not exceed 50 cm in width or height, and taper into the tree.

Western redcedar with large test hole.

Platform notch: A feature found on some trees and stumps are notches and grooves that held parts of ladders, platforms and other means of providing a firm footing for the aboriginal loggers close to the tree but above the forest floor. Some of these notches could have been toe holds. Commonly called platform notches, these features include round, square and L-shaped notches; rectangular notches (with four sides); and rectangular channels (with two sides). Aboriginal notches tend to be smaller than the springboard notches used in early commercial logging.

Logging detritus: Logging detritus refers to the waste chips, chunks and slabs produced as by-products of aboriginal logging. Detritus can vary in size from small to large, and in quantity from a few pieces to a large number of pieces. Discarded wood chips from the chopping of the test hole may be present at the base of the tree, or deeply buried under moss and organic layers.

Undercut trees

An undercut tree is a standing tree which has an area of missing wood and bark that was removed as part of the initial stage of felling the tree. The area of missing wood and bark is called the undercut scar. As with test holes, scar lobes form over the vertical sides of the chopped area, reducing the original width of the hole.

Undercut cedar with test hole-like undercut. Scale in 10 cm intervals.

Undercut western redcedar with square platform notch below undercut.

This sometimes makes it difficult to distinguish between an undercut scar and a test hole.

An undercut tree — usually a large, mature standing western redcedar or yellow cedar — is characterized by the presence of an undercut scar.

Other features may include:
- logging detritus

Undercut scar: These features resemble test holes, but generally are somewhat larger in size. Unlike test holes, undercut scars do not have cut sides. Instead, they have sides formed by healing lobes. These sides formed a considerable time after the undercut scar was made. Toolmarks are present on the top and bottom of the undercut scar, but absent from the sides. Burn marks may exist in or around the undercut scar.

Felled trees

These are trees of usually large diameter that were completely felled, using traditional felling techniques. Notched or planked trees fallen by wind are not recorded as felled trees. Nearly all are western redcedar, though a few examples of western hemlock, western yew and white pine have been reported. One traditional felling technique involved the complete girdling of the tree with chisels or axes. A second technique involved a massive unidirectional undercut, probably by notching with long-handled chisels, cut deep into the tree at a relatively steep angle to produce a flat-bottomed hole with a sloping top. Presumably, the tree was then left to fall of its own volition, leaving a spire of sheared wood along that part of the trunk that was not cut.

A felled tree is characterized by the presence of a stump and/or a log and may include:

- platform notch(es) on stump
- logging detritus

Stump: Stumps may be present by themselves, or in association with a log. When found by themselves (the felled tree has been removed), stumps should be recorded as felled trees unless the stump has a notch or the lower end of a plank scar in which case the stump would be recorded as a notched or planked tree respectively.

Stumps are of five kinds:

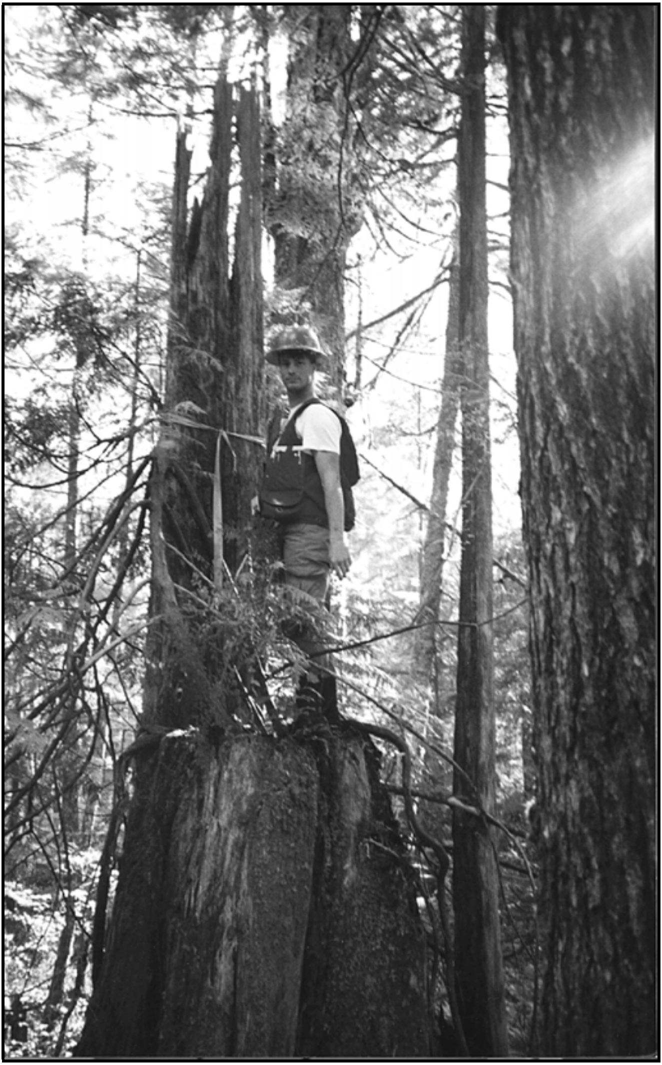
- **flat:** characterized by a level or sloping top on a single plane (see photo, p. 44).
- **barberchair:** characterized by a distinctive spire of wood on one side of the stump [see photo, p. 46].
- **step:** characterized by a level top on two planes separated by a vertical step.

- **basin:** characterized by a concave top with sides that slope down gradually from the outside circumference of the tree towards the centre of the tree. A basin stump can be confused with a stump where deterioration of the centre has resulted in a concavity.
- **unclassifiable:** stumps that cannot be assigned to one of the above kinds because their top surfaces are badly deteriorated or obscured by nursing trees.

Cultural cedar stumps are generally high, with their tops often 1.5 to 2.0 m above ground surface. However, on some parts of the Coast, low stumps are common [see photo below]. Cedars were usually cut above root flare, though sometimes they were cut low, with the flare left on the log or cut off the log in the form of a butt section.

Low cultural flat stump.

Cultural flat stump with nursing hemlock growing against (not on) stump.



Cultural barberchair stump with tall barberchair.

Tall cultural flat stump.

Cultural stump almost completely overgrown by large nursing tree.

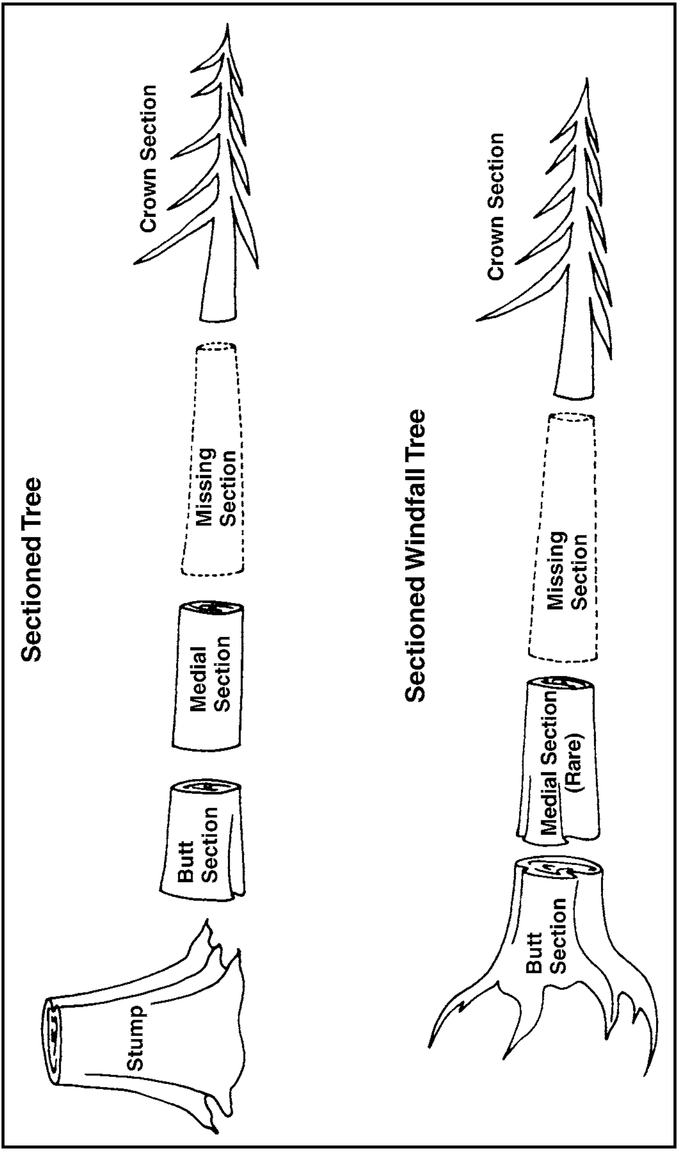
Natural cedar stumps are infrequent because most cedars will fall over with roots attached to the stem rather than break when struck by strong winds or a falling tree. When cedar does break, it usually shatters high up the stem, resulting in very high stumps with "spiked" tops and without toolmarks. Cultural cedar stumps lack spiked tops, and are usually much lower than natural stumps. Toolmarks are usually present on the tops of cultural stumps, sometimes hidden beneath a nursing tree, or the salal and moss that grow on stumps. In some cases, only small areas with toolmarks remain. Cultural stumps with extensively deteriorated tops usually lack toolmarks.

Log: As used in CMT studies, a log is a tree stem that has been cut from a stump but is otherwise unmodified. The term "unmodified log" is sometimes used instead of simply log. If the log is further modified, then the appropriate modifier should be used (e.g., sectioned log or notched log) and the CMT is not classified as a felled tree. Logs are commonly associated with a stump, but in some cases the stump cannot be found, or the log has been moved to another location before it is abandoned.

Sectioned trees

These are trees where the stem (log) has been cut into two or more sections. The log sections show no signs of further modification though some sections might have been removed. The log could have an associated stump if the tree is intentionally felled, or it could be a complete tree with roots if the tree is windfallen. If no sections are missing, then the tree modification presumably is not finished, with one or more of the sections probably intended for use as a canoe, a post, a source of planks, etc. The modification probably is completed if there is a missing section, as at least one of the sections is removed from the logging site.

A sectioned tree is characterized by the presence of two or more log sections. Other features may include:
- stump
- logging detritus


Sectioned Tree
Stump
Butt Section
Medial Section
Missing Section
Crown Section
Sectioned Windfall Tree
Butt Section
Medial Section (Rare)
Missing Section
Crown Section

Log section: Several kinds of log sections have been defined:
- butt section: that section of the log closest to the stump
- medial section: the middle section(s) of a log cut into three (or more) sections
- crown section: that section of the log farthest from the stump
- missing section: a log section that has been removed

Butt sections were usually cut to remove root flare not left on the stump. Butt sections are most often found when low stumps were cut. For sectioned windfallen trees, the butt section includes the roots. The crown section includes the branches of the tree. A log can include more than one medial section. The presence of a missing section is indicated by (i) a gap in the log, and differences in the size (diameter or width) of the two logs at the ends of the gap, or (ii) a gap between the stump and the medial or crown sections of the log.

Notched trees

These are either standing, windfallen, or felled trees into which one or more notches have been chopped. Notches represent the first stage of wood (usually plank) removal, though large notches could be the first stage in felling a tree. Notches have been recorded only on western redcedar.

Features always present on a notched tree are:
- the standing or non-standing tree
- one or more notches

Other features may include:
- stump — if the notch is chopped into a felled or sectioned log
- butt, medial, crown or missing sections — if the notch is chopped into a sectioned log
- logging detritus
- test hole

Notch: These features are usually rectangular in shape and often occur in pairs. They have either a “U”-shaped or “V”-shaped cross section; in the latter, the top is sloping or stepped. Notches are typically about 20 to 80 cm wide (maximum, on outer edge of tree), 10 to 40 cm high, and 10 to 35 cm deep. On old (18th century) notched trees, a small test hole is sometimes found at the back of the notch. Notches were cut to provide an opening for plank removal, to fell trees, and to section logs.

Planked trees

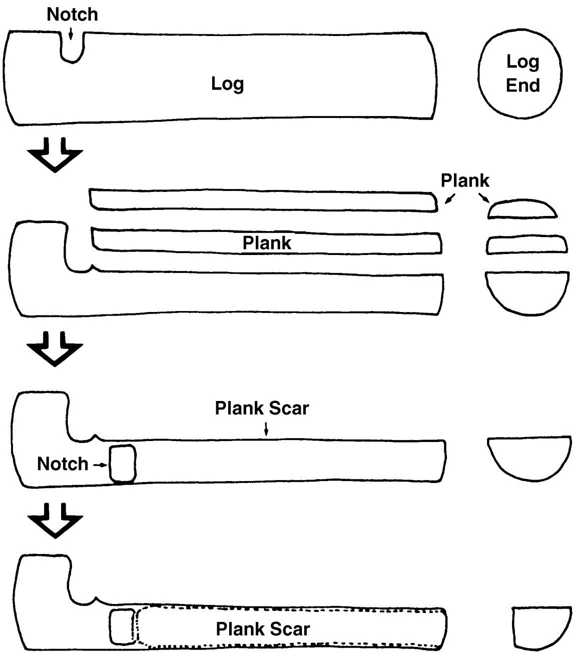
These are standing or non-standing (windfallen or intentionally felled) trees from which planks were detached.

Features always present on a planked tree are:
- the standing or non-standing tree
- one or more plank scars
- remnant notch at one or both ends of each plank scar. (The lower notch may rot away but the notch location is often marked by nurse trees or bushes.)

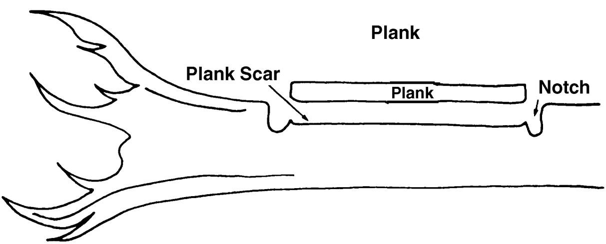
Other features may include:
- stump — if the plank is removed from a felled or sectioned log
- butt, medial, or crown sections — if the plank is removed from a sectioned log
- notch — in associated butt, medial, or crown sections
- logging detritus

Plank scars: These features are flat rectangular surfaces on standing trees, windfallen trees, logs, or log sections that are the result of plank removal [see figures and photos]. Notch remnants are often present at both ends of the scar because planks were normally removed by first notching the tree or log at the two ends of the anticipated plank, and then wedging the plank off the tree or log. The size of the scar reflects the size of plank removed, and scars of several lengths have been reported. Long scars are 10 m or more in length and between 1 and 2 m wide; short scars are generally under 4 m in length, and under 1 m wide.

Examples of Multiple Plank Removal from Medial Log Section



Plank Removal from Windfall Tree



Standing western redcedar with multiple plank scars.

Western redcedar log with plank scar.

Both standing trees and logs with multiple plank scars have been reported. Up to seven plank scars have been reported for a single planked tree.

Toolmarks are usually restricted to the notch remnants at both ends of the planks, though the surface of the plank scar can be scored from wedges used to pry the plank from the log or tree.

Medial log section with short plank scar.

Canoe trees

A canoe tree is one in which a log or log section is partially shaped into a canoe (a canoe blank) but is never completed.

The only feature necessary for a canoe tree is the canoe blank. Other features that may be present include:

- stump
- log sections
- lofting logs
- logging detritus

If other log sections are present, they could have notches or plank scars.

Canoe blank: A canoe blank is a log in the initial or intermediate stage of shaping into a canoe. A canoe blank has a shaped bow and stern. Other attributes of the canoe blank will vary with the size and style of the canoe, and the degree of completeness.

Canoe blank.

Lofting logs: In order to raise the canoe blank off the ground, the blank is sometimes placed on logs. These are termed lofting logs. Lofting logs do not appear to have been used to lift other kinds of logged trees. Lofting logs have been observed in missing sections, indicating that the removed section has been shaped into a canoe.

Canoe blank with low flat stump in background.

Identifying Other Modified Trees

This class of CMTs is for trees modified for purposes other than bark collecting, or the procurement of large pieces of wood. These other purposes include the collection of kindling, pitch and small pieces of wood suitable for the making of tools. Some trees are modified for ceremonial and spiritual purposes; others to mark trails, assert tree ownership, facilitate passage on streams, serve as support posts for shelters and drying frames, provide alcoves for the placement of trapsets in winter, and other purposes. In many cases these CMTs are difficult to confirm as being aboriginal. Modifications not attributable to bark-stripping or aboriginal logging should be examined carefully when deciding if a tree should be recorded as a CMT. A few comments follow on some of these modified trees.

Pitch collection trees

Pitch from Sitka spruce, several species of pine, and a number of other species is used for waterproofing, glue, caulking, scents, medicines, and other purposes. A number of recorded CMTs show bark and wood scarring attributable to pitch collection.

Pitch collection scars consist of cut marks used to release the pitch for collection. Apparently the collecting of pitch does not involve bark removal in most cases; instead, a cut is made through the bark into the wood, and the pitch accumulates at the site of the wound where it is collected. Multiple cut marks can be expected: one such CMT had about 120 horizontal axe cut marks in an area of 150 by 84 cm starting approximately 50 cm above the ground.

Kindling collection trees

Small pieces of wood are removed from a number of tree species, probably for use as kindling or fuel. These trees usually have one or more kindling removal scars.

Kindling removal scar: These scars are highly variable, but usually take the form of chop marks and missing narrow pieces of wood. These have been found most commonly on the dry hollow interiors of western redcedar where access into the tree is possible, and on dry scar faces. In other cases, bark is removed along with the wood underneath in such an irregular shape that it probably is the result of dry firewood collection.

Delimbed trees

Instances of delimbed trees have been recorded as CMTs. These include Sitka spruce where branches are removed after placement of a burial box high in the tree; and western yew trees where limbs are traditionally collected for the manufacture of paddles, digging sticks, wedges, and other implements.

Arborglyph and arborgraph trees

Arborglyphs (carvings on trees) and arborgraphs (paintings on trees) are rare types of CMTs. In some cases of tree painting, bark is first removed to expose a scar face which is then painted. To be genuine arborgraph or arborglyphs, it should be demonstrated that the art work is — or very likely is — aboriginal in origin. Depending on the situation, this can be done by: interview with aboriginal Elders; an analysis of the paintings and carvings in terms of traditional art styles; tree-ring dating of the associated bark-strip scar; and, possibly, associations with nearby features or sites. It may be difficult to demonstrate that the painting or carving is associated with the scar, and that the scar date is a reliable indicator of the age of the art.

Interior British Columbia

Introduction

Interior British Columbia is that vast part of the province that lies east of the Coast Mountains. Although tree use was an important part of traditional aboriginal life in the Interior, and CMTs were first recorded in the Interior in the early 1950s, archaeologists made little effort to identify and record CMTs in the subsequent four decades.

CMT Classification

As discussed in the Introduction, CMTs are classified based on the kinds of modifications present on the trees. CMTs are first divided into three main groups (classes): bark-stripped (BS) trees, aboriginally-logged (AL) trees, and other modified (OM) trees. Each class is then divided into a number of types. The chart in the Introduction shows the most common types for each CMT class. The most common CMT types found in the Interior are discussed below. Terms are defined at that time, as well as in the glossary.

Many traditional tree uses in the Interior do not result in modifications that can be identified years later. Also, many traditional uses involve chopping and cutting that produces modifications that cannot be distinguished from those produced by non-aboriginal people. Most of the modifications that are unequivocally of aboriginal origin involve bark removal. It is not surprising then that most of the CMTs recorded so far in the Interior are bark-stripped trees.

Toolmarks

Cut marks made by steel axes, hatchets and knives are the most common kinds of toolmarks found on Interior CMTs. The presence of toolmarks is often convincing evidence that a modification is cultural rather than natural in origin. In addition to cut marks, grooves and shallow impressions produced by bone and antler peeling tools can be expected.

Identifying Bark-stripped Trees

A bark-stripped tree is a tree from which bark has been partially removed by aboriginal people. These trees are characterized by the presence of one or more areas of removed bark and exposed wood commonly referred to as *bark scars*. A bark scar resulting from human stripping is called a *bark-strip scar*, whereas the more general term bark scar refers to any scar, whether of natural or human (cultural) origin.

Key terms

In addition to *bark scar* and *bark-strip scar*, key terms for discussing bark-stripped trees are:

- *scar face:* the wood surface exposed by bark removal.
- *scar lobe:* the vertical ridge of wood tissue formed on both sides of a scar face. In response to bark removal, a tree attempts to heal itself by growing over the dead wood of the scar face, which results in the development of vertical ridges of wood tissue called scar lobes, callus lobes or healing lobes.
- *scar window:* the opening created by the lobes growing on both sides of a scar. As lobes grow, they join together above a scar, as well as below the scar if the scar does not extend to the ground, thereby obscuring the edges of the scar and forming a lenticular (lens-like) or triangular opening (the scar window) over the scar.

These terms are illustrated in the previous section.

Types of bark-stripped trees

The bark of more than 20 tree species is used traditionally in the Interior. Tree bark is stripped to collect:

- cambium for food and medicines (cambium is the thin living layer between the inner bark and wood of the tree)
- inner bark for fibrous material, medicines, and cleansers
- bark for containers, canoes, roofing, flooring, and other uses
- bark for use as fuel, dyes, cleansers and medicines
- sap from exposed wood for food and medicines

As on the Coast, bark-stripped trees in the Interior are classified according to the type of bark-strip scar(s) present. Bark-strip scars in the Interior are of four types:

- rectangular scars (BSR)
- girdled scars
- tapered scars (BST)
- other scars

Rectangular bark-strip scars (BSR)

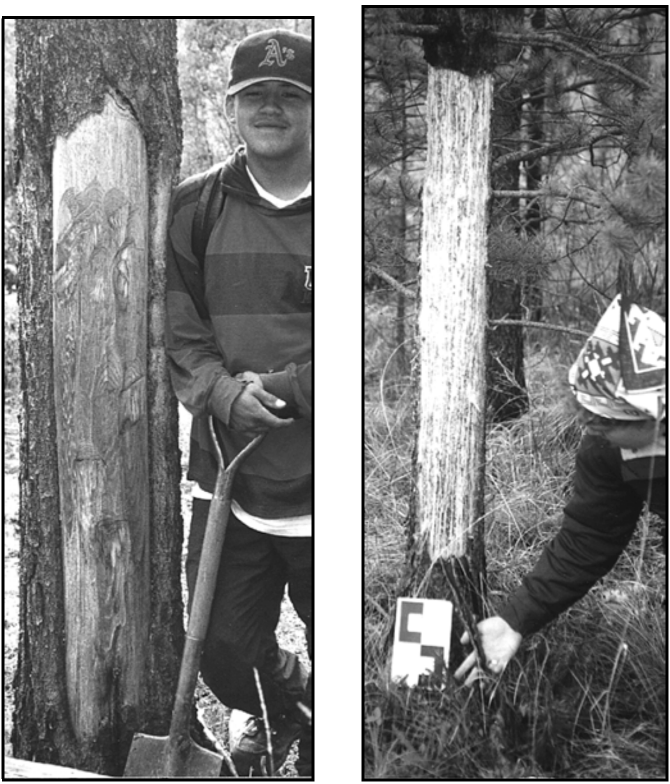
These scars are characterized by four more or less straight sides, two of which are longer than the other two. The two longer sides are more or less parallel. Scar lobes are usually present along the vertical sides of the scar (but not in some kinds of bark-strip scars on birch). Scars are usually oriented vertically, but horizontal examples are known. Horizontal rectangular scars that surround a tree are recorded as a separate scar type (girdling). Rectangular bark-strip scars range in size from small to large. They occur on a variety of tree species, but more than 95 percent of trees recorded so far in the Interior with rectangular bark-strip scars are lodgepole pines.

Rectangular bark-strip scars on lodgepole pine

Bark-stripped lodgepole pine are found throughout the Interior wherever lodgepole pine grows. Most scars are rectangular in shape, the result of cambium collection. Lodgepole pine cambium has been called “an almost universal food” of the Interior Indians. The cambium is sweetest and juiciest near the bottom of the tree, and trees were often stripped by children.

The bark is pulled off by hand, or pried off with an instrument. First, a cut is made into the trunk, often at chest height, with a knife or other sharp implement or with an antler bark peeler. The bark is then pulled down to the ground, or until it breaks from the tree, leaving a fringe of bark at the base of the scar. Sometimes another cut is made lower on the tree so that the strips would stop at that point. In some cases, a vertical cut is made to split the bark, which is then pried off. Once the bark is removed, the cambium is scraped with a knife or bone scraper from either the exposed tree or the inside of the removed bark, depending on the maturity of the bark at the time of stripping. Small young trees are preferred for stripping, for diameter at breast height of stripped trees is typically under 35 cm.

Most recorded bark-stripped lodgepole pine have a single bark scar. However, pines with up to four scars have been reported.



Two bark-stripped lodgepole pines with rectangular bark-strip scar.

Scar description: Scars on lodgepole pine are usually rectangular in shape, with parallel or slightly contracting sides.

However, scars sometimes have contracting sides, producing an inverted triangular shape, that is, with a wide top and a narrow base. Scars are typically between 40 and 160 cm long and up to 20 cm wide (maximum). These scars will appear smaller if partly hidden by scar lobe growth. In fact, the observed shape of this scar window can vary greatly and should be described when recorded (see discussion below on scar windows).

Scar tops: Scar tops on lodgepole pine have several different appearances, depending on the initial cut into the tree. Tops created by single horizontal, multiple horizontal, zig-zag, angled to left or right, rounded, tapered (or inverted 'V'shaped), L-Shaped and X-shaped cuts (consisting of two intersection cuts that often extend beyond the edges of the scar) have been recorded. When a bone or antler peeler rather than a metal tool is used, the bark is sheared rather than cut, leaving denticulate "tabs" instead of clear-edged cuts.

Scars frequently continue to the ground. If not, a scar may have a cut base, may terminate on a branch or may taper to a "basal V." Branches are sometimes present on the scar face, with the bark stripped around the branch. When a small tag of bark remains on the scar face around the base of a branch or knot, it is called a bark button.

Scar windows: In response to the stripping, the tree gradually grows vertical healing lobes on both sides of the scar. As the lobes grow they join together above the scar, as well as below the scar if the scar does not extend to the ground. Continued lobe growth will eventually cover the sides and top of the scar, creating an opening over the scar known as a scar window. Scar windows on lodgepole pine vary in shape, but are most commonly rectangular, lenticular (bi-convex), triangular, inverted triangular and columnar (where the original scar almost girdled the tree creating a column of exposed scar face). If growth continues, the lobes may coalesce, closing the scar window, and completely hiding the scar. These CMTs are classified as "healed."

Bark-stripped lodgepole pines with rectangular scar on left, and rectangular scar formed into a lenticular scar window by lobe growth.

Toolmarks: Toolmarks are common on bark-stripped lodgepole pine. Lodgepole pines appear to retain their sapwood long after stripping, more so than cedars and some other species, thereby often retaining toolmarks. Most are cut marks from the initial cutting of the bark at the top and, sometimes, bottom of the strip. These are typically made with an axe, hatchet or steel knife. Bone and antler tools usually leave no marks on the wood. However, when bark is "tight," these tools can leave very shallow impressions or rounded grooves on the wood.

Multiple axe or hatchet marks, usually associated with areas of missing wood, have been observed on some scars. These chop marks may be the result of kindling removal or cutting of the hardened pitch that accumulates on the scar. Lodgepole pine pitch is used by some groups for medicinal purposes. These marks probably are not associated with the bark removal in most cases, instead representing a later use of the exposed scar face.

Dating: Dates from the early 1700s have been obtained on lodgepole pine bark-strip scars, but the majority date to the latter part of the 1800s to the early 1900s. The prevalence of wild fires in the forests of the Interior, and the general youth of the forests, may be responsible in large part for the scarcity of trees predating 1900. Undoubtedly many older bark-stripped pines will be identified once larger numbers of CMTs are dated.

Associations: Bark-stripped lodgepole pines are found alone or in groups, or in association with other kinds of archaeological sites. Stripped pine have been noted in association with aboriginal trails ("trail-type" CMT sites) and aboriginal camps. Stripped lodgepole pine sometimes occur in very large groups of hundreds or even thousands. This type of site is called a cambium harvest site.

Natural bark scarring on lodgepole pine: Not all rectangular bark scars on lodgepole pine are cultural (human) in origin (see Appendix II). Animals known to consume tree cambium and strip trees include porcupines, squirrels, bears, moose, snowshoe hares, cottontail rabbits, and deer. In many cases, the scars left by animals are oval or irregular (without geometric shape), have no sharp border, are at low heights on the tree, and occur on very young trees. Tooth marks may be present on these scars.

Bears strip bark starting at the base of the tree, tearing upwards and often girdling the tree, thereby killing it. These scars are usually widest at the base at the bottom of the tree, and taper upwards. Often these scars have tops comprised of several "peaks," each the result of a different strip. Long strips of bark sometimes hang from the scar tops, and scar edges are often irregular. The exposed sapwood often has a regular pattern of transverse marks from the bear's lower incisors which are used to remove the inner bark. Pieces of bark, claw marks, and canine puncture marks also may be present on the scar. Other kinds of bark modifications by bears (territorial claw marks and tree demolition) are unlikely to be confused with cambium stripping.

Scars resulting from fires, lightning strikes and extreme frost can usually be easily distinguished from rectangular cultural scars. They are normally larger than cultural scars, often extend down to the ground, and sometimes extend up to the tree crown. Scars from wild fires are usually triangular in shape (sometimes oval), and start at ground level (sometimes part way up the trunk). Lightning and extreme freezing commonly split the wood beneath the scar. Scars of natural origin do not have toolmarks.

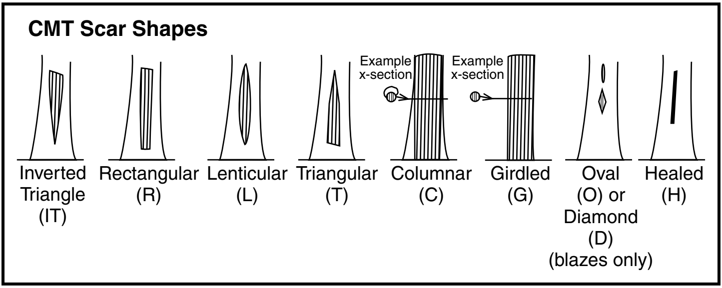
When a group of scarred trees is encountered, a careful inspection for toolmarks should be made. Where at least one tree shows toolmarks, the others probably can be assumed to be cultural. Many bark-strip scars are obviously cultural because of the presence of toolmarks. In most cases, these modifications are of aboriginal origin.

Additional discussion of natural bark scarring of logdepole pine can be found in Appendix II.

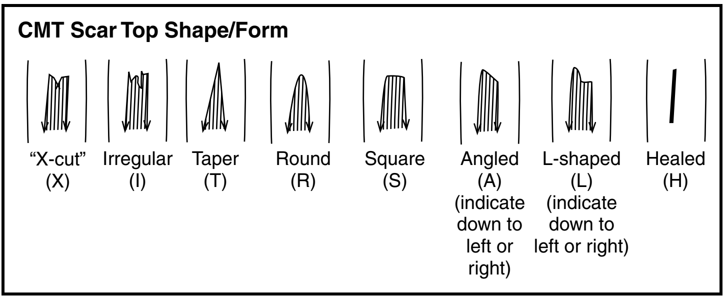
Characteristics of Cultural Rectangular Bark-strip Scars on Lodgepole Pine

Cultural rectangular bark-strip scars on lodgepole pines usually exhibit the following characteristics:

- overall rectangular or inverted triangular shape (obscured on older trees by a scar window of lenticular or other shape)
- relatively straight, parallel or contracting, sides (which can be obscured by the scar window)
- well-defined top
- well-defined base (in some cases)
- cut marks in the bark and wood at the top of the scar (denticulate tabs if bone or antler tool is used)
- no galleries from engraver beetles on scar face
- tear tabs at the bottom of the scar (cut marks if bottom of strip is cut)
- horizontal linear impressions from use of bone and antler peelers (rare)
- no tooth or claw marks in wood of scar face
- no long strips of bark hanging from the scar top
- found in groups (often, but not always)
- association with trails, camps and other kinds of archaeological sites (sometimes)



*Overall shape of the scar window. Any scar which does not conform to any of these shapes should be called "irregular."**



*Top shape describes either the top of the original scar or the top of the scar window, depending on the overall morphology of the scar.**

* Diagrams used with permission of Traces Archaeological Research and Consulting Ltd., Ver. May 28, 1998.

Rectangular bark-strip scars on western redcedar

Two kinds of rectangular bark-strip scars have been identified on western redcedar in the Interior, representing two different uses:

- large rectangular scars
- smaller rectangular scars

Large rectangular scars: These scars resemble the large rectangular bark-strip scars found on the Coast. They have been recorded on western redcedar in the Interior wet belt in the vicinity of Shuswap and Adams Lakes. These scars have straight sides with chopped tops and bases [see photo, p. 72]. Cut and chop marks may be present at the top and/or bottom of the scar. Scar lobes form along both sides of the scar, sometimes forming lenticular scar windows. These large rectangular scars are usually the result of collecting slabs of thick outer bark for use as roofing, wall lining, and flooring for pithouses and winter lodges.

Smaller rectangular scars: These bark-strip scars are found on western redcedar located on the eastern flanks of the Coast Mountains. Similar scars have been reported in interior Washington State, but not on the Coast. The scars are rectangular in shape and usually considerably smaller than the big scars resulting from the removal of bark slabs. Lengths of just under 1 m are common. Sometimes, multiple rectangular strips were removed one above the other, resulting in long rectangular scars up to 2 m long. Some scars are horizontal rather than vertical. Trees were sometimes climbed to considerable heights to obtain bark (over 10 m in one case). Toolmarks are common. In Washington State these scars are attributed to the collecting of bark for making baskets. The Interior scars are presumably for a similar purpose.

Bark-stripped western redcedar with large rectangular bark-strip scar.

Rectangular bark-strip scars on paper birch

The bark of the paper birch is widely used by the people of the Interior. Bark sheets are used as material for containers, baby cradles, canoes, and toboggans; for wrapping food and lining storage caches; and for walls and roofs of dwellings. Thick leathery bark suitable for canoes, etc. is harvested in winter. It is peeled off in large sheets. Birch bark also is used for tanning and for torches. Birch cambium is eaten, birch sap is collected for medicinal purposes, and birch pitch is used as a fire starter.

The stripping of birch bark resulted primarily in rectangular bark-strip scars with relatively straight sides. The scars vary considerably in size, depending on the intended use. Three kinds of rectangular bark-strip scars have been recorded so far for birch CMTs:

- girdled scars — discussed later in this section
- rectangular outer-bark scars
- rectangular bark-strip scars

Rectangular outer-bark scars: These scars are the result of collecting smaller pieces of bark, possibly for wrapping food. Only the outer bark is taken; the inner bark is left on the tree. Cut marks are present along both sides of the scar; scar lobes are present where the cuts have penetrated the inner bark into the sapwood.

Rectangular bark-strip scars: These scars resemble the rectangular scars on lodgepole pine, though usually smaller. Both the inner and outer bark has been stripped, in order to access the cambium. The scar face is exposed, and scar lobes are present along the sides of the scar.

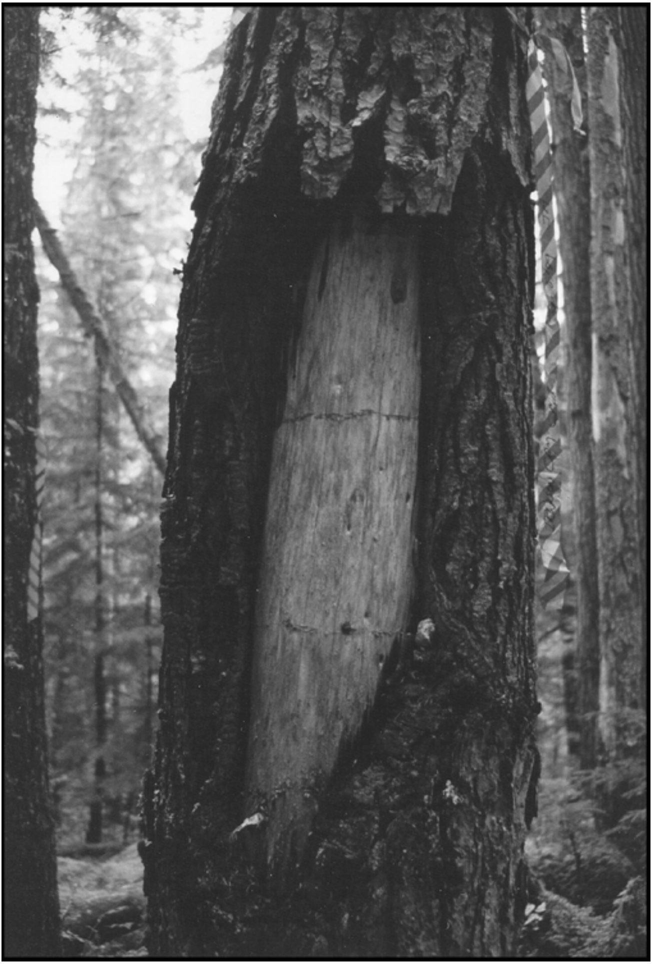
Rectangular bark-strip scars on hemlock

In recent years, an increasing number of bark-stripped western hemlock trees have been recorded in the northwestern portion of the BC Interior. Primarily, they have been in the Skeena-Nass River area, but also have been recorded closer to the coast and on the Queen Charlotte Islands.

Bark-stripped hemlocks, like pine, are stripped for their inner cambium which is used both medicinally and as food. Hemlock CMTs are frequently found in areas where pine trees are also used. They have been recorded in great numbers in CMT Harvest sites, as well as in association with trails, cache pits and village sites. Dates ranging from the early 1800s to the mid 1900s have been obtained from hemlock CMTs.

Hemlock bark scars are typically small in size (less than 1 m in length, on average about 85 cm), raised well above the ground (generally at knee-breast height, on average 65 cm), and exhibit either rectangular or oval shaped scar windows. Scar window tops and bottoms can vary depending on the amount of bark die-back immediately above and below the original scar. Scar window widths are on average approximately 25 cm. Toolmarks are relatively common, and are most often recorded as a series of small, horizontal cut marks extending across the scar face at the top, middle and bottom. As well, some hemlock CMTs retain a visible lateral cut edge. This is the vertical cut edge of the original bark along the side(s) of the scar. It is sometimes visible on or near the healing lobe of the scar.

A bark-stripped hemlock CMT with an oval shaped scar window. Note the relatively short length of the scar (approx. 1 m) and the height above ground (approx. 40 cm).



A rectangular bark-stripped hemlock CMT with two sets of parallel horizontal cut marks visible across the scar face.

Rectangular bark-strip scars on other species

Trembling Aspen: A few trembling aspen with what may be rectangular bark-strip scars have been recorded, mainly in the central Interior. These scars are not described, but in one case the scars are said to be "like pine" and presumably are rectangular in shape. The few that are recorded are found either with or in the vicinity of stripped lodgepole pines. Aspen bark is used traditionally for medicinal purposes, and as a cleanser, bleach, and hair remover. Aspen cambium is eaten, and aspen sap consumed by some groups.

Spruce: A few spruce CMTs with rectangular bark-strip scars have been recorded, but little information is available about these scars. In most cases, the species of spruce is not identified. Long vertical rectangular scars, probably from the collection of bark sheets for canoes or housing material, have been recorded on large spruce in central British Columbia.

Girdled bark-strip scars

Girdled bark-strip scars are horizontal rectangular scars that span the entire circumference of a tree. They are found primarily on paper birch, but have been observed on cedar, lodgepole pine and other species.

Girdled bark-strip scars on paper birch

The importance of birch bark was noted earlier in this section. Large sheets of birch bark can sometimes be obtained by girdling a tree. These scars can be of almost any size. A vertical cut mark, usually made with a knife, is found on these scars, and sometimes extends just beyond the top and bottom of the scar. This mark is the result of an initial cut, from which the bark is stripped by hand. Short horizontal "starter" cuts are sometimes made near the top and bottom of the vertical cut to help guide the start of the strip. Sometimes the horizontal cuts circle the tree.

Girdling does not kill the birch because only the outer bark is cut and removed. Encircling cuts, when present, usually do not penetrate the inner bark. The vertical cut often penetrates into the sapwood. Scar lobes form only along the vertical cut because it is the only cut that penetrates the bark.

Girdled bark-strip scars on cedar

Girdled scars on cedar trees have been reported from the Fraser Canyon, Stein River Valley and Skeena River areas, and have been found alongside tapered and rectangular scarredcedar trees. Girdled scars, like rectangular scars, are cut at the scar top and bottom to remove a large sheet of bark from around the entire circumference of the tree. Girdling a cedar kills the tree and thus there is no lobe growth or healing associated with the scar. Tool chop marks are frequently identifiable at the top and/or bottom of the scar. Both western red and yellow cedar trees have been recorded as girdled CMTs in the Interior.

Girdled bark-strip scars on lodgepole pine

Girdled scars also have been reported on lodgepole pines, though they are infrequent. These scars are similar in many aspects to the rectangular scars on pines for cambium collecting, differing primarily in the removal of bark from around the entire circumference of the tree. Toolmarks are present at the top and bottom of the scars. Girdled lodgepole pines on the Chilcotin Plateau have been attributed to the collection of bark sheets for smoking fish and curing hides.

Tapered bark-strip scars

Tapered (triangular) scars are relatively long and narrow scars with straight sides that contract to a peak or crease at their top. They are found on western redcedar.

Tapered bark-strip scars are infrequent in the Interior except in transition areas like the Fraser Canyon and the Skeena Valley between Kitselas Canyon and Hazelton where the Coastal

Western Hemlock Zone with its large cedars penetrates the Coast Mountains and aboriginal groups weave inner cedar bark. In these transition areas, the tapered scars are indistinguishable from those on the Coast. Elsewhere, including the so-called "Interior wet belt" (Interior Western Hemlock Zone) where western redcedar is a dominant species, tapered scars have not been reported except in the Stein River Valley.

In the Stein River Valley, the tapering scars are similar to those on the Coast, though somewhat shorter in length. Many of the scars have bases, and toolmarks are present on a number of scars. For a discussion on the identification of these scars, see the section on Coastal British Columbia.

Other bark-strip scars

This category consists of all other bark-strip scars. These include S-shaped scars, oval scars, and scars with no regular shape. They have been reported for a number of tree species, particularly lodgepole pine. Presumably these other scar types are the result of individual preferences in how bark is removed, uses not associated with the other scar types, failed attempts to remove rectangular scars, and special circumstances that allowed an unorthodox method of bark removal. An example of the latter is two scarred lodgepole pines on the Chilcotin Plateau stripped in a "barber-pole" fashion, each with a scar winding around the trees starting at a height of 450 cm above the ground. In both cases the trees were very small (14 cm diameter), and the purpose of the bark removal is not reported.

In older archaeological reports, bark-strip scars often are simply identified as present, and are not described. Consequently, it is not possible to classify these bark-stripped trees. These include stripped ponderosa pine and alpine fir.

Ponderosa pine bark was stripped for cambium, for slabs used as building material, and for pieces used as fire fuel. Bark-stripped ponderosa pines should be common in those parts of the southern Interior where this species thrives. Most of these scars should be rectangular in shape. Although bark-stripped ponderosa pine with rectangular scars have been observed, none have been recorded. Two instances of bark-stripped ponderosa pine have been recorded, but these scars are not described. Apparently short stubby young trees growing in open terrain were preferred when seeking cambium. The use of ponderosa pine bark for construction has a considerable antiquity: bark slabs thought to be roofing material were found in a house at Adams Lake that was occupied about 1500 years ago.

One bark-stripped alpine fir CMT has been recorded in the alpine parkland of the Chilcotin Plateau. However, no information is available about this bark scar other than the "bark had been removed with a knife."

Undoubtedly examples of other bark-stripped tree species will be identified once people start looking for them. Other species that could exhibit cultural bark-strip scars, but have not been recorded archaeologically in the Interior, include red alder, Douglas-fir, black cottonwood, black spruce, black poplar, western larch, and willow.

Identifying Aboriginally-logged Trees

As on the Coast, an aboriginally-logged tree is a tree which has been tested, felled, cut, or otherwise modified by aboriginal people as part of the traditional procurement of logs, posts, planks and other pieces of wood. It is anticipated that in transition areas between the Interior and Coast, where large cedars grow and aboriginal groups work wood in ways similar to groups on the Coast, many aboriginally-logged cedars similar to those on the Coast will be eventually recorded. At present, flat and stepped cedar stumps have been recorded, along with logs, log sections and missing log sections.

In the Stein Valley, a single standing plank-stripped western redcedar has been recorded. The tree has a single plank scar, with a notch at both ends of the scar. In the Interior away from the Coastal Western Hemlock Zone, traditional logging activities relied on species other than western redcedar, and did not result in modifications that can be identified many years later. Also, many traditional uses involved chopping and cutting that produced modifications that cannot be distinguished from those produced by non-aboriginal people.

The classification used for aboriginally-logged trees on the Coast is also used in the Interior, though some types either do not occur in the Interior, or occur only in cedar-rich transitional areas between the Coast and Interior.

The single aboriginally-logged CMT recorded so far outside the Coastal Western Hemlock Zone is a canoe tree. While several finished canoes or parts of finished canoes have been documented in the Interior, only one instance of a canoe tree (CMT) has been recorded, a ponderosa pine specimen in the North Thompson Valley. A canoe tree is a log or log section partially shaped into a dug-out canoe (canoe blank) that was never completed. The defining characteristic of a canoe tree is the presence of a canoe blank. A canoe blank is a log in the initial or intermediate stage of shaping into a canoe. A canoe blank usually has a shaped bow and stern. Other attributes of a canoe blank will vary with the size and style of the canoe, and the degree of completion.

Other features that may be present are the stump of the tree from which the canoe blank was cut, other sections of the felled log from which the blank was cut, lofting logs (logs placed underneath the canoe blank to raise it off the ground), and logging detritus (waste chips, chunks and slabs).

Identifying Other Modified Trees

This class consists of all CMTs other than bark-stripped trees and aboriginally-logged trees. It includes trees modified:

- to obtain kindling, sap and pitch
- to display messages and images of ceremonial, spiritual and other significance
- to mark trails

- to serve as support posts for shelters, drying frames, and other structures
- for other purposes.

Only a few instances of these kinds of CMTs have been recorded in the Interior, but others will be found as more attention is paid to these trees. A few comments follow on some of these trees.

Kindling collection trees

Exposed wood with chop marks and small areas of removed wood have been observed on a number of tree species. The removed wood probably is used as kindling or fuel. These trees can have one or more kindling removal scars (areas with chop marks and missing wood). These chopped areas occur on both natural and cultural bark scars [see photo below].

Lodgepole pine with kindling removal scar (chopped area).

Message trees

Several message trees have been recorded archaeologically in the Interior. These are bark-stripped trees with syllabics painted on the bark-strip scar. The messages are written in the syllabic script introduced by Father Morice in the 1880s. In one case, the message might be a notification of a wake or funeral.

Arborglyph and arborgraph trees

Arborglyphs (carvings on trees) and arborgraphs (paintings on trees) are rare types of CMTs. They reportedly occur in sparse numbers throughout much of the province, but only a few instances have been recorded as archaeological sites. It is anticipated that more will be found, for there are ethnographic accounts of both tree carving and tree painting. In some accounts of tree painting, the bark is first removed, and the scar face painted. Probably not all arborglyphs and arborgraphs are first bark-stripped. To be genuine arborglyphs or arborgraphs, it should be demonstrated that the art work is — or is very likely to be — aboriginal in origin. Depending on the situation, this can be done by: interview with aboriginal Elders; an analysis of the paintings and carvings in terms of traditional art styles; tree-ring dating of the associated bark-strip scar; and associations (that is, what else is near the tree). In the case of a carved tree, the degree of infilling over the figures may assist the determination of age. It may be difficult to demonstrate that the painting or carving is associated with the scar. Therefore, the scar date is not a reliable indicator of the age of the art.

Blazed trees

A number of blazed trees have been recorded as CMTs based on their association with aboriginal trails and/or more recent camps used by aboriginal people. A variety of species have been blazed.

Sap collection trees

Sap from a number of tree species was collected traditionally in the Interior. Two basic collecting methods were used, both of which could leave physical evidence. In the first method, one or more cuts were made with an axe or knife into the bark or, if the bark has been removed, into the wood, to drain the liquid sap into a collecting container attached to the tree at the base of the cuts. Such cuts have been observed in the bark of trees in the northeast Interior.

In the second method, a reservoir is used to collect sap. Reservoirs can consist of small holes dug or cut into the tree or natural holes from which the accumulated sap could be scooped.

Entwined trees

Entwined trees are a rare CMT type where trees have been intentionally intertwined, resulting in their merging into an unusual form. One such instance in the Interior has been protected by designation under the *Heritage Conservation Act*. These ponderosa pines were entwined by Lakes Salish people moving south when the international boundary was surveyed in 1857, allegedly "to symbolize friendship of the US and Canada." Such trees may also represent a ritual associated with puberty training, as similar tree modifications are reported in the ethnographic literature for some Salish groups.

Other CMTs

In addition to the above, a number of other types of CMTs have been reported, but little information is available about these trees, or they are difficult to confirm as being of aboriginal origin. These include:
- axed and sawn tree stumps
- support trees (where standing trees are used as posts for drying frames, shelters, etc.)
- shaped standing trees

- blazed trees apparently not associated with an aboriginal trail or camp
- delimbed trees, usually associated with an aboriginal trail
- trees with chopped alcoves (rectangular holes) used for placing trapsets

The evidence for the traditional aboriginal use of these trees must be considered individually when deciding if a tree should be recorded as a CMT. Evidence to consider includes:

- age — is the modification older than the arrival of Europeans?
- association — is the modified tree associated with an aboriginal trail, camp or other kind of undisputed aboriginal site?
- nature of modification — is the modification of a kind (such as a canoe carved in a particular style) that is distinctively aboriginal?

To establish the age of a modification, tree-ring dating will be required (see section on CMT dating).

RECORDING CMTS

Recording CMTs encompasses two broad topics: recording CMT sites, and recording CMT features.

Two forms have been developed to aid in recording CMT sites. These are the Level I CMT Site Recording Form and British Columbia Archaeological Site Recording Form.

An additional form, the CMT Feature Recording Form is used to expedite the recording of CMT features. The CMT Feature Recording Form often is mislabelled the Level II form. The CMT Feature recording form accompanies the Level I or BC Archaeological Site Form to expedite the detailed recording of CMT features within a site.

Specific direction concerning CMT site and feature recording under provincial permit is found in the Archaeology Branch operational procedure "Recording CMTs" (www.archaeology.gov.bc.ca).

CMT Site Recording

Detailed recording of a site containing CMTs can be exceedingly difficult, particularly in a rainforest environment. However, if the purpose of study is impact assessment then this level of site recording is necessary to allow informed decision making. Site recording during an impact assessment must include: identification of site boundaries, estimation of the number and types of CMTs present, determination of the spatial organisation of the CMTs, assessment of feature attribute variability and estimation of the maximum age of features at the site. Each is discussed below:

Identification of site boundaries

Site boundaries should be determined through intensive field reconnaissance. In the case of extremely large sites extending significantly beyond the boundaries of a given study area, it may be appropriate to estimate site boundaries extending beyond impact areas.

Estimation of the number and types of CMT features

Estimation of the number and types of features within the sites should be obtained in a systematic fashion. In some cases it may be possible to count 100% of the features. In larger sites, tallying features (by type) while traversing broadly spaced transects should provide adequate data. In many cases, 20 metre wide transects at 100 metre intervals will result in reasonable population estimates.

A discussion paper on CMT site and feature recording (*Sampling Culturally Modified Tree Sites Final Report*, R.J. Muir) can be found on the Archaeology Branch website (www.archaeology.gov.bc.ca).

Spatial organisation of features

The spatial organisation of features should be characterised in terms of density and distribution. If distinct spatial patterning of features or feature types are evident (e.g., distinct clusters or linear distributions) these should be identified and their approximate locations mapped. For more uniform distributions, transect tallies can be used to estimate average feature densities.

Assessment of feature attribute variability

A minimum of 10 features of each type should be documented in detail to allow an estimate of attribute variability. Selection of features for documentation should be random to avoid investigator biases. This may be arbitrary, random spatial or systematic. Under no circumstances should these features be selected judgementally (e.g., selection of 'the best' or 'most typical' examples of each feature types) as this will greatly bias the resulting variability data.

Estimating maximum age of features

Data should be gathered which will allow for a reasonable estimate of the maximum age of the site. This may include obtaining a datable sample from judgementally selected features which appear to represent the earliest site use. However, reasonable maximum age estimates may be deduced through other means (e.g., through consideration of stand age, presence of stone toolmarks, maturity of nursing trees, and sometimes scar depth/ thickness.)

Level I CMT Site Recording

Level I CMT site recording is intended to provide basic information on the presence of CMTs, notably location, type, and frequency. It should be used if detailed information about individual CMTs is not needed, or cannot be recorded within the time available. Level I recording is appropriate for both preliminary archaeological studies and broad-area inventories where documenting the spatial distribution of CMTs is the main concern.

CMT sites

There are many CMTs in British Columbia. It is not practical to manage, study and protect these CMTs if they are recorded only as individual trees. These undertakings are more manageable when CMTs are recorded and mapped in larger groups called sites. The recording of CMT sites does not preclude the recording, study, and protection of individual CMTs.

Level I recording emphasizes information about CMT sites rather than the individual CMTs that make up a site. A CMT site can vary considerably in area, can consist of any number of CMTs, and can include CMTs of one or more types. Other types of archaeological remains (e.g., artifacts, village sites) can be associated with the CMTs. Determining the boundaries of a CMT site, and the number of CMT sites in an area, can pose problems, particularly when CMTs are scattered more or less continuously over a large area. Boundaries are often self evident if sufficient time is taken to establish CMT distribution. In other cases, site boundaries can be arbitrary.

Level I CMT site recording form

Basic information about CMT sites should be recorded on Level I CMT Site Recording Forms. Complete one form per site.

The insert that follows is a blank Level I CMT Site Recording Form. The form is in landscape format so that it occupies just one sheet of 4½×7 inch notebook paper. The form can be photocopied as needed, and inserted into a field notebook. A summary of the most common CMT classes and types follows the recording form insert, and can be photocopied onto the back of the form for reference in the field. An example of a completed Level I CMT Site Recording Form is included.

Fields: The form contains 12 fields to be completed by recorder plus one field at top of form to be completed by the Archaeology Branch; if uncertain, follow your entry with a question mark:

1. Register Site Number — Leave blank for Archaeology Branch.
2. Temp. Site Number — Enter any unique number of your design that can serve as a temporary site number. This same number should be on any maps attached to the form.
3. Map Sheet — Enter Terrain Resource Information Management (TRIM) 1:20,000-scale map sheet number.
4. Location — Describe location of site, from general to specific.
5. Location (Grid) — Provide UTM or longitude and latitude of site centre. Circle either 27 or 83 to indicate if grid location is based on North American Datum 1927 or 1983.
6. Tenure/Legal — Enter forest tenure, cutting permit and block, or brief legal description of property, on which site is located, if applicable.

7. Site Dimensions — Estimate maximum length and width of site in metres. Place cardinal directions (true) after length and width. For example: 150 m NE–SW × 25 m NW–SE.
8. No. of CMTs — Enter number of CMTs counted or estimated (if estimated, follow number with an upper case E).
9. CMT Species — Enter CMT tree species, with most frequent species first. Use Ministry of Forest forest cover map species abbreviations. See above for abbreviations.
10. CMT Class/Type — Enter class and type of CMTs present. Check boxes of each class present. Follow each checked box with a single letter code for each type present for that class. See above for single letter codes.
11. Recorder — Provide your name and a means of contacting you: affiliation (if any), address, telephone and fax numbers.
12. Date — Enter date of recording/observation.
13. Comments — Enter any other observations, for example, access to site, potential impacts from proposed development, presence of rare features, information from aboriginal persons on site use, etc. Mention if you have photographs of the site. Note if any other kinds of archaeological remains are obviously present and, if so, type of remains (for example, trail, artifacts, village site).

No Permit, No Dig

Do not dig or otherwise disturb the ground in search for associated artifacts without a *Heritage Conservation Act* permit.

LEVEL I CMT RECORDING FORM	1. Register Site Number:____________
2. Temp. Site Number:	**3. Map Sheet: NTS TRIM**
4. Location:	
	5. Location (Grid): 27 83
6. Tenure/Legal:	
7. Site Dimensions:	**8. No. of CMTS:**
9. CMT Species:	**10. CMT Class/Type(s): ☐ BS_______ ☐ AL_______ ☐ OM_______**
11. Recorder:	
12. Date:	**13. Comments:** (include permit # and/or reference, if applicable)
Following maps are attached: ☐ NTS map ☐ TRIM map ☐ Development map at scale of:	

Please provide as much information as possible. Use back to draw site map or provide additional comments.

ABBREVIATIONS TO USE WHEN RECORDING CMTS

CLASSES AND TYPES OF CMTS

BS Bark-stripped Tree
- **T** Tree with Tapered Bark-Strip Scar(s)
- **R** Tree with Large Rectangular Bark-Strip Scar(s)
- **G** Tree with Girdled Bark-Strip Scar(s)
- **O** Tree with Other Bark-Strip Scar(s)

AL Aboriginally-Logged Tree
- **T** Tested Tree
- **U** Undercut Tree
- **F** Felled Tree
- **S** Sectioned Tree
- **N** Notched Tree
- **P** Planked Tree
- **C** Canoe Tree

OM Other Modified Tree
- **P** Pitch Collection Tree
- **K** Kindling Collection Tree
- **D** Delimbed Tree

OM Other Modified Tree (Continued)
- **M** Message Tree
- **A** Arborglyph Tree
- **G** Arborgraph Tree
- **B** Blazed Tree
- **S** Sap Collection Tree
- **O** Other

TREE SPECIES ABBREVIATIONS
- **C** = western red cedar
- **YC** = yellow cedar (cypress)
- **H** = hemlock
- **S** = spruce
- **Pl** = lodgepole pine
- **At** = aspen
- **Py** = yellow pine
- **E** = birch
- **Pa** = whitebark pine
- **B** = balsam

LEVEL I CMT RECORDING FORM	1. Register Site Number: ___________
2. Temp. Site Number: ML-1	**3. Map Sheet: NTS TRIM** 92C.093
4. Location: W. Vancouver Island, approx. 5 km NE of Ucluelet, 400 m	
S. of Maggie Lake	**5. Location (Grid): 27 83** 323000/5429200
6. Tenure/Legal: NW Forest Products, CP 402, Block R-12	
7. Site Dimensions: 100 m N-S × 75 m W-E	**8. No. of CMTS:** 3
9. CMT Species: C	**10. CMT Class/Type(s):** ☑ **BS** T ☑ **AL** P ☐ **OM** ______
11. Recorder: V. Feddema/H. Pratt, 55A Fawcett Rd, Coquitlam Tel: 604-526-2456 Fax: 604-526-2438	
12. Date: Oct. 16/96	**13. Comments:** (include permit # and/or reference, if applicable)
CMTs are located in N. portion	
of proposed timber harvesting block, near N. falling boundary.	
(Photos 12-17, Roll 1, Arcas project # 96835)	
Following maps are attached: ☐ **NTS map** ☑ **TRIM map** ☐ **Development map at scale of:** 1:5,000	

Please provide as much information as possible. Use back to draw site map or provide additional comments.

Attach to the completed Level I form:

- the relevant part of an NTS or TRIM map sheet showing the location of the CMT site; for large sites, draw the site boundary rather than a single dot on map
- a 1:10,000 or better scale development map showing the location of CMT site, if available

On the form indicate which maps are attached in case they become separated from the form. A map of the site can be drawn on the back of the form.

> **Where to Send a Level I CMT Site Recording Form**
>
> Completed Level I forms should be sent to the Archaeology Branch (see page 109) for entry into the Provincial Heritage Inventory. Entry into the Inventory will aid in providing protection to site types noted in the *Heritage Conservation Act* (see section on CMT protection).

The British Columbia Archaeological Site Inventory Form

The British Columbia Archaeological Site Inventory Form, in conjunction with the CMT Feature Recording Form, is intended to provide detailed information about the CMT site and features. This level of recording is appropriate for detailed inventories, archaeological impact assessments and research studies documenting individual CMTs. Use of the British Columbia Archaeological Site Inventory Form is required for studies carried out under a heritage inspection permit.

The British Columbia Archaeological Site Inventory Form is available directly from the Archaeology Branch (address on page 109) or through the Branch website (www.archaeology.gov.bc.ca).

> **Where to Send a Site Recording Form**
>
> Completed paper forms are sent to the Archaeology Branch for entry into the Heritage Resource Inventory. Should an electronic facility be developed for entry into the inventory, details will be available through the Branch website.

CMT Feature Recording

The BC Archaeological Site Recording Form requires a description of individual CMTs at the site. Feature recording ranges from relatively straightforward to complex, depending on the number and kinds of CMTs present at a site.

CMT Feature Recording Form

It is recommended that the CMT Feature Recording Form below be used to record individual CMTs for attachment to the site recording forms. The blank form is in landscape format and occupies one sheet of 4½×7 inch notebook paper. The form can be photocopied and inserted into a field notebook. The back of the form can be used for comments or a site map.

The form was designed to accommodate all types of CMTs. Up to five CMTs can be recorded on one form. Usually there will be a minimum entry of three lines per CMT: enter on first line CMT#, species, class, type and location (put location description on remainder of line, using all blank cells if needed) (see example), enter on second line a description of the tree itself, enter on third line a description of the first feature. A further line is completed for each additional feature present.

Locational information should be provided in terms of distance (in metres) and bearing (true) from a fixed point that can be located in the field. Where this information is not available, the first line can be used for a description of the tree.

An example of a completed two-page form is provided with entries for three CMTs:

- a bark-stripped western redcedar with one tapered scar
- a bark-stripped western redcedar with two tapered scars
- a planked tree (western redcedar) comprised of a flat stump and a log consisting of a missing butt section, a medial section with one plank scar and notch at the end of the scar, and a crown section.

Fields: The CMT Feature Recording Form consists of eight fields to be completed by the recorder; if uncertain, follow your entry with a question mark. Due to lack of space, fields are not numbered on the form.

1. Temp. Site Number — Enter the same temporary site number used on the Level I or the British Columbia Archaeological Site Inventory Form.
2. Page of — Enter current page number and total number of pages. For example, page 3 of 5.
3. CMT — Enter a unique number identifying the CMT. Sequential numbering of CMTs by site is recommended. This same number should be used to label the CMT on a site map when included.
4. SP — Enter species of tree. Use abbreviations on Ministry of Forests forest cover maps. See list of common abbreviations above.
5. CL — Enter CMT class. Use abbreviations listed above.
6. TP — Enter CMT type. Use the single letter codes listed above. If the tree is a windfall, place a "W" in parentheses after the class abbreviation.
7. FEAT — List each feature of the CMT using a second form if needed. Because the names of most feature types are long, it is recommended that icons be used. For more information on icons, see discussion below. An insert follows listing of the most common CMT features and their icons. This list should be consulted when completing the FEAT field.

   Number each feature for ease of reference. List the features in sequence. Start with the tree, if standing or windfallen; the stump if felled; or the log if no stump is present. Features located on other features are given the number of the larger, containing feature (e.g., notch at end of plank scar

   - for bark-strip scars, stumps, and log sections, list kind of scar, stump, or section
   - for bark-strip scars that are not confirmed as cultural, enter "?" after scar icon

- for planked trees, include in list of features the partial notches that usually are present at one or both ends of the plank scar

8. DBH — diameter at breast height of CMT (see discussion below)
9. SLP — slope of area around CMT (see discussion below)
10. LEN — length of feature (see discussion below)
11. WID — width of feature (see discussion below)
12. THK — thickness of feature (see discussion below)
13. HAG — height of feature above ground (see discussion below)
14. SDE — side of tree (see discussion below)
15. TMK — toolmarks (see discussion below)
16. NT — nursing tree (see discussion below)
17. COMMENTS — The back of the form should be used for any comments. Comments will depend on the particular interests of the recorder. Some observations that could be entered here include:
    - whether or not CMTs were flagged or otherwise marked in field
    - photographs taken
    - description of "Other" bark-strip scars
    - description of features for "Other" modified trees
    - functional interpretations, such as "medicine bark scar," and basis for such interpretation (for example, information from Elders)
    - shape of scar window and scar base on bark-strip scar
    - description of canoe blank, including overall shape, shape of bow and stern, etc.
    - description of other complex features (some kinds of test holes, logs with multiple plank scars and notches, etc.)
    - minimum dimensions (maximum dimensions are in Fields #10 through 12)
    - the amount of logging detritus and variation in size of pieces
    - size and location of spire on barberchair stump
    - height of step on stepped stump

- location and description of platform notches on stump
- dates obtained by tree-ring dating, or estimates of age relative to other CMTs at site

For complex CMT features, a sketch is often helpful, and can be put on the back of the form.

CMT Icons

In some parts of coastal British Columbia, icons are used to describe CMTs. The icons for aboriginally-logged trees correspond to what are here called CMT features (though not all of the features in this handbook have an icon). Icons are combined until the entire CMT is described. For bark-stripped trees, the icon refers to the stripped tree rather than the bark-strip scar. Icons are an effective visual means of describing a CMT and the features that comprise a CMT.

Because of their visual effectiveness, it is recommended that icons be used in Field #7 of the CMT Feature Recording Form to identify the features present. The icons presented below are based on those already in use, with a number of changes. For bark-stripped trees, an icon now represents the scar rather than the tree. Additional icons have been defined for CMT features with no established icon.

CMT FEATURE RECORDING FORM

Temp. Site Number: Page of

CMT	SP	CL	TP	FEAT	DBH	SLP	LEN	WID	THK	HAG	SDE	TMK	NT

Put Location on line after CMT #. Comments can be placed in unused lines or on back. Put site map on back or separate sheet. Attach to Level I or British Columbia Archaeological Site Inventory Form.

CMT FEATURE RECORDING FORM

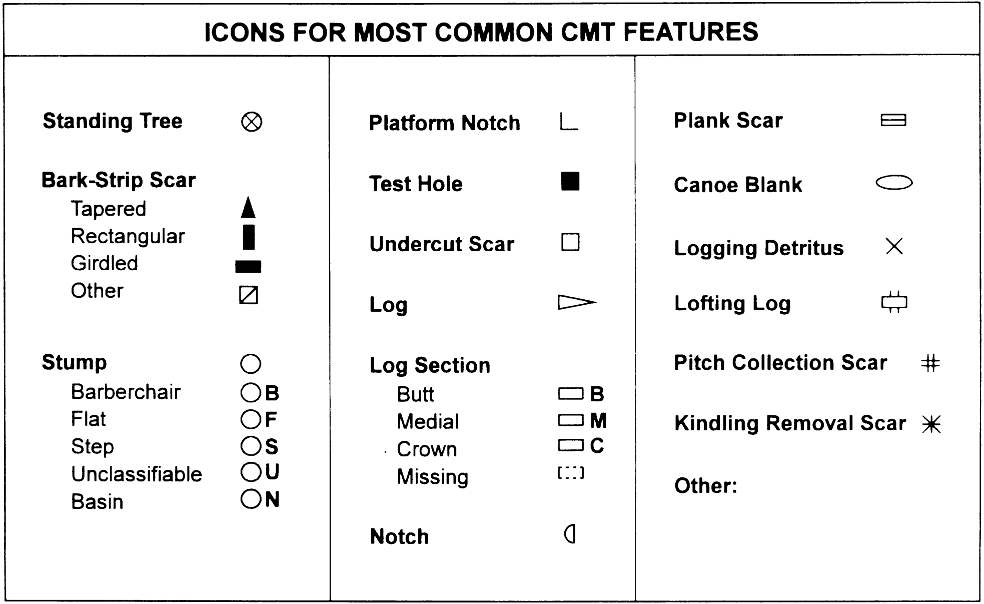
Temp. Site Number: ML-1 **Page** 1 **of** 2

CMT	SP	CL	TP	FEAT	DBH	SLP	LEN	WID	THK	HAG	SDE	TMK	NT
1	C	BS	T	(located 32 m @ 146° from FC# 8)									
				1. ⊗	82	10%	–	–	–	–	–	–	–
				2. ▲	–	–	800 E	–	–	60	U	–	–
2	C	BS	T	(located 16 m @ 62° from CMT # 1)									
				1. ⊗	74	8%	–	–	–	–	–	–	–
				2. ▲	–	–	1000 E	–	–	–	S	–	–
				3. ▲	–	–	700 E	–	–	56	U	–	–
3	C	AL	P	(located 20 m @ 180° from FC# 9)									
				1. OF	–	15%	–	140	–	210	–	axe	H
				2. [ ] B	–	–	700 E	–	–	–	–	–	–

Put Location on line after CMT #. Comments can be placed in unused lines or on back. Put site map on back or separate sheet. Attach to Level I or British Columbia Archaeological Site Inventory Form.

CMT FEATURE RECORDING FORM													
Temp. Site Number: ML-1											Page 2 of 2		
CMT	SP	CL	TP	FEAT	DBH	SLP	LEN	WID	THK	HAG	SDE	TMK	NT
3				3. M	–	–	950	95	–	–	–	axe	H
				4. (on 3)	–	–	610	55	20	45	S	axe	–
				5. (on 4)	–	–	15	55	25	30	S	axe	–
				6. C	–	–	820	74	–	–	–	axe	–

Put Location on line after CMT #. Comments can be placed in unused lines or on back. Put site map on back or separate sheet. Attach to Level I or British Columbia Archaeological Site Inventory Form.


ICONS FOR MOST COMMON CMT FEATURES
Standing Tree
Bark-Strip Scar
Tapered
Rectangular
Girdled
Other
Stump
Barberchair B
Flat F
Step S
Unclassifiable U
Basin N
Platform Notch
Test Hole
Undercut Scar
Log
Log Section
Butt B
Medial M
Crown C
Missing
Notch
Plank Scar
Canoe Blank
Logging Detritus
Lofting Log
Pitch Collection Scar
Kindling Removal Scar
Other:

Describing CMT Attributes

CMT features are described in terms of observed or measured attributes. Up to nine different attributes can be recorded for a single feature using the CMT Feature Recording Form. The attributes comprise Fields #8 through #16 on the form. They are discussed below. All dimensions (except slope) should be expressed in centimetres. When dimensions are estimated rather than measured, follow the estimate with an upper case "E."

Diameter at breast height (DBH)

This is the diameter at breast height of the modified tree.

Slope (SLP)

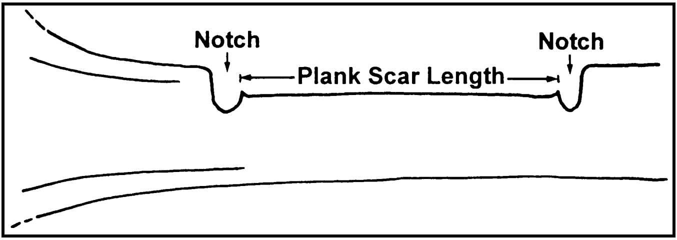
This is the average slope of the area around the CMT expressed in % (rise over run). Do not confuse percentage of slope with degree of slope. If possible, the slope measurement should be determined from the adjacent slope, for example, the slope of the area where the bark-stripper walked to strip the tree. Use a clinometer to determine slope.

Length (LEN)

This is the maximum length of a feature:

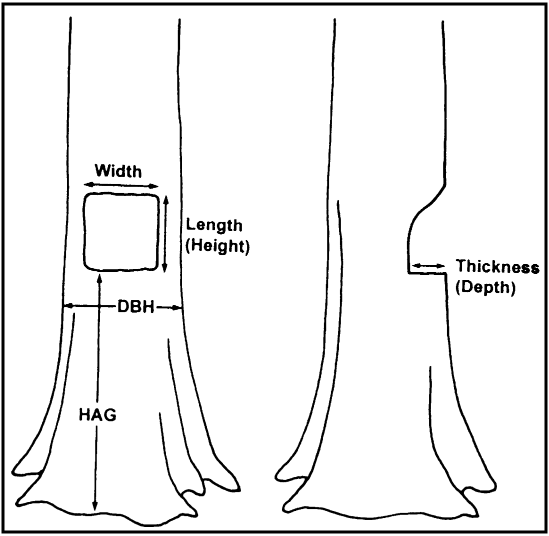
- for long tapering bark-strip scars, length can be measured with a clinometer or estimated. When scar length is estimated, it is not necessary to first establish the original location of the scar base (if absent) since estimates are not precise
- for rectangular bark-strip scars, length often can be measured. First determine if bark above and below scar has died and sloughed off tree, thereby making scar longer than when stripped. Whenever possible, use toolmarks to establish top and bottom of scar. Scar bottoms often are indicated by an eroded horizontal groove. When entering an estimated length follow value with an upper case "E."

- for plank scars, measure between the ends of the scar, excluding any notch remnants that may be present [see figure]



Selected measurements on plank scar.

- for test holes, undercut scars, notches, platform notches, pitch collection scars, and kindling removal scars, this attribute refers to the maximum height of the feature. The height of these features is always measured along the long axis of the tree. In some cases, these features can be wider than they are high. If the minimum height of the feature is substantially less, enter minimum height in Field #8 (Comments) [see figure, p. 105]
- for logging detritus, all debris associated with a single CMT is treated as one feature. Individual pieces will vary in size and can vary in other attributes such as the absence or presence of toolmarks and the kinds of toolmarks present. Generally the minimum and maximum dimensions of the detritus pieces and the types of toolmarks present are recorded. Some may want to record "typical" dimensions, or dimensions of individual pieces. If necessary, detritus dimensions can be entered in Field #8 (Comments).



Selected measurements on test hole, notched and undercut CMTs.

Width (WID)

This is the maximum width of a feature in centimetres. If the minimum width of the feature is substantially different, enter minimum width in Field #8 (Comments)

- for stumps, width is measured at the cut (top) of the stump, excluding the barberchair spire
- for test holes, undercut scars, notches, platform notches, plank scars, pitch collection scars, and kindling removal scars, width is always measured at right angles to the grain of the tree. In some cases, these features can be wider than they are high [see figure, p. 105]
- for bark-strip scars with healing lobes, record the width of the original scar if this can be determined. Do NOT record here the size of the gap between the lobes because this gap is usually smaller than the original width of the scar
- for logging detritus, see comment under Length.

Thickness (THK)

This is the maximum thickness of a feature in centimetres:

- for test holes, undercut scars, notches, platform notches, plank scars and kindling removal scars, this attribute refers to the depth of the feature (the distance into the tree). In some cases, these features can be thicker (deeper) than they are high or wide
- for bark-strip scars and pitch collection scars, this attribute does not apply. Do not record the thickness of the healing lobes as the thickness of the bark-strip scar. Healing lobe thickness may be recorded for dating purposes in some cases (see section on CMT dating); these measurements should be entered in Field #8 (Comments)
- for logging detritus, see comment under Length.

Height above ground (HAG)

This is the location of the feature on the tree expressed in height above ground (HAG). Measure in centimetres as follows:

- for features on standing trees, measure distance between the base (bottom) of feature and ground
- for stumps, measure distance between ground and cut (highest part of stump, including step on step stumps but excluding spire on barberchair stumps). For stumps on steep slopes, measure on uphill side
- for features on logs, measure distance between base of feature and butt end of log or log section
- for features on windfallen trees, measure distance between base of feature and what is thought to be the past ground surface based on staining and wood erosion near base of tree
- for bark-strip scars, measure distance between scar base (or toolmarks if present instead of scar base) and ground surface. Enter a value of "0" only if it can be determined through the presence of toolmarks that the bottom of the scar base is at ground level
- for bark-strip scars where wood is exposed to the ground, but which cannot be confirmed as having started at ground level, enter "N/A" for HAG

Toolmarks (TMK)

This important attribute refers to the kinds of toolmarks present, and should be entered as follows:

- if toolmarks present, enter type (adze, axe, hatchet, knife, metal chisel, non-metal chisel)
- if unsure of identification, follow type with "?"
- if toolmarks present, but type not known, enter "Y" (for "Yes")
- if unsure whether marks are cultural, enter "?"
- if toolmarks are absent, enter "N" (for "No")
- if more than one type of toolmark is present, enter each type

Make sure that the toolmark is associated with the tree modification and was not added later.

Side (SDE)

This attribute indicates the location of one feature relative to the tree or another feature.

- for features on standing trees (bark-stripped scars, undercut scars, test holes, etc.), platform notches, logs, and canoe blanks indicate if feature is on upslope ("U"), downslope ("D") or sideslope ("S") side of tree
- for notches and plank scars on logs and log sections, indicate if feature is on top ("T"), side ("S") or bottom ("B") surface
- for some features such as pitch collection scars and kindling removal scars, side is usually not recorded. These could be recorded if important for a specific study
- for barberchair stumps, the side on which the spire is located is usually recorded

Nursing tree (NT)

This attribute indicates whether or not a nursing tree is present on a CMT feature. If present, enter the abbreviation for the species of the nursing tree using the abbreviations listed above for Field #2 (Tree species). Make sure that the nursing tree is growing ON the CMT feature, and not beside it. If nursing trees of more than one species are present on a feature, enter the abbreviations for each species. Note the diameter of the largest nursing tree. Other trees which aid in dating the feature can also be included in this section (e.g., trees growing within the missing section of an aboriginal logging feature).

Suitability for dating (DAT)

Indicate if the tree would be a good candidate for dating samples.
IB – Increment Bore
WS – Wedge Sample
CS – Cookie Sample
? – Unsure

CMT Dating is discussed on page 110.
Tree Alive (ALI)
SA – Standing Alive
DS – Dead Standing
DF – Dead Fallen

Recording CMT features

Not all of the above attributes need or even can be recorded for each type of CMT feature. The grid on the next page indicates which attributes are normally recorded for the more common feature types. A plus sign indicates that the attribute is recommended for recording; a minus sign indicates that the attribute cannot be recorded.

Certain fields must be addressed if work is conducted under a *Heritage Conservation Act* permit. These requirements are discussed in the Archaeology Branch Operational Procedure "Recording CMTs."

Provincial Heritage Inventory

Site records for sites containing features predating 1846 will be entered in the Archaeology Branch Heritage Resource Inventory. Access to this inventory is guided by Section 3 of the *Heritage*

Conservation Act and detailed in the policies available through the Archaeology Branch website (www.archaeology.gov.bc.ca). For more information about access to information in the inventory, contact the Manager, Inventory and Mapping Section, Archaeology Branch, Ministry of Small Business, Tourism and Culture, PO Box 9816, Stn Prov Govt, Victoria, BC, V8W 9W3.

Attributes Recommended for Recording for Different Kinds of CMT Features

Feature type	DBH	SLP	LEN	WID	THK	HAG	TMK	SDE	NT
Tree	+	+	–	–	–	–	–	–	–
Undercut scar	–	–	+	+	+	+	+	+	–
Test hole	–	–	+	+	+	+	+	+	–
Bark-strip scar	–	–	+	+	–	+	+	+	–
Stump	–	+	–	+	–	+	+	–	+
Platform notch	–	–	+	+	+	+	+	+	–
Log	–	–	+	+	–	–	+	+	+
Log section	–	–	+	+	–	–	+	–	+
Notch	–	–	+	+	+	+	+	+	+
Plank scar	–	–	+	+	+	+	+	+	+
Canoe blank	–	–	+	+	+	+	+	+	+
Lofting log	–	–	+	+	–	–	+	–	+
Logging detritus	–	–	–	–	–	–	+	–	+
Pitch collection scar	–	–	+	+	–	+	+	–	–
Kindling removal scar	–	–	+	+	+	+	+	–	–

DATING CMTS

Introduction

The dating of CMTs is of considerable interest. Dating will establish when a CMT was modified, sometimes as precisely as the season of a particular year. When a large number of dates are obtained from an area, the traditional use over time of the trees of that area can be reconstructed. For example, the interval between multiple modifications of the same tree, or the extent to which the trees in one location were used at any one time may be revealed. Also, dating can determine whether or not a CMT is protected under the *Heritage Conservation Act* (see section on CMT protection).

Dendrochronology is the dating of wood by the study of tree rings. The use of a particular dating technique depends on several factors, such as tree species, geographic location and the physical condition of the sample. General guidelines for recognizing, collecting and dating the most common CMTs are considered here.

Wood Characteristics Relevant To CMT Dating

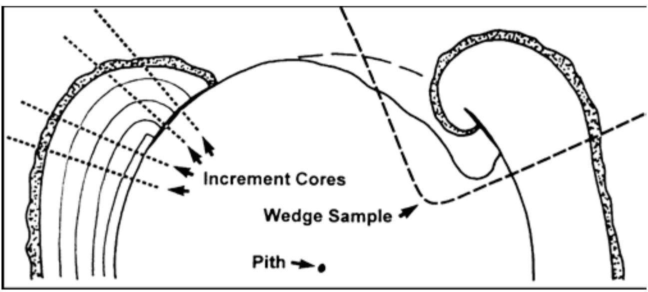
Tree-ring dating of coniferous trees usually involves an examination of the transverse cross section of the tree stem. At the centre of the section is the pith, which is the first ring-year of growth at that height of the tree. As the tree grows, the rings produced are sapwood which turns into heartwood as the tree matures. Sapwood is present between the heartwood and the cambium, the major living part of the stem. The cambial layer is only a few cells wide. It divides during the growing season to form wood toward the inside and bark toward the outside of the tree. Inner bark forms next to the cambium. Outer bark lies next to the inner bark, and forms the outside surface of the tree stem.

The most essential component of dendrochronology is the annual ring. In conifers (softwoods), the annual ring consists of a light-coloured earlywood band and a dark-coloured latewood band. As a tree grows, an annual ring will be put down beneath the bark, over the entire outside wood surface of the stem, branches and roots. Therefore, the outside ring of a tree will represent the same year for the entire tree. This ring-year is the one that will date the cultural modification and will be the same ring-year at the bottom of the scar as it is at the top of the scar.

Sample Collection and Processing

Three kinds of wood samples can be collected from CMTs for dating purposes [see illustration]:

- discs (also called radial discs, stem cross-sections, stem rounds, and "cookies")
- wedges (partial discs)
- increment cores



Bark-stripped tree partial cross-section showing where wedge and increment core samples should be collected.

Disc samples

- a disc is a "cookie-like" transverse cross section through a tree stem cut with a saw from a nursing tree growing on a CMT, or from the CMT itself
- if from a CMT, the sample should be cut through the modification (bark-strip scar, plank scar, test hole, etc.) and NOT above or below it (bark-strip scars should be cut at breast height to ensure that the sample is from the scar and not wood exposed after stripping by sloughed bark)

- discs cut from nursing trees should be cut as low on the tree as possible
- the collection of a disc normally requires felling of the nursing tree or CMT from which it is taken, a dangerous activity that requires the services of a skilled faller when collecting samples from large trees
- disc samples are the preferred kind of sample when:
  i) the precise location of the modification is uncertain
  ii) there is considerable rot in the tree
  iii) the pith is to be included in the sample, or
  iv) information on possibly internal (hidden) modifications such as completely closed over (healed) bark-strip scars is wanted

Wedge samples

- a wedge is a partial disc removed from the edge of the modification [see figure, p. 113]
- a wedge should be cut so as to include the relevant parts of the tree and the modification
- a handsaw or chainsaw can be used to cut wedges
- wedges can be taken if a tree will be felled (see Workers' Compensation Board *Occupation Health and Safety Regulations*, Section 26.25)
- wedge samples are the preferred kind of sample when:
  i) the location of the area to be dated is clearly known
  ii) information on internal scars is not needed
  iii) it is not possible to transport large disc samples out of the forest
  iv) rot prohibits the collection of increment cores

Wedge sample cut from scar lobe of bark-stripped tree. Note how bark-strip scar is obscured by moss and other organic growth.

Wedge Sampling Produces Danger Trees

Wedge sampling has been widely used as a dating technique in coastal rainforest environments when felling of large CMTs was not desirable. However, Worker's Compensation Board Regulations state that trees with wedges removed constitute danger trees and must be felled.

Increment core samples

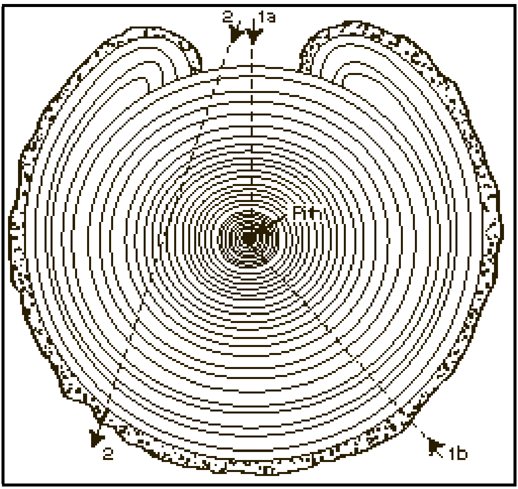
- an increment core is a usually 5 mm-diameter tree-ring sample extracted from living trees using an increment boring tool
- increment cores can be taken from nursing trees growing on CMT logging features and from living CMTs
- increment cores provide the least accurate date because anomalies such as locally absent rings often cannot be identified
- increment cores are well suited for dating small diameter bark-stripped trees such as lodgepole pine, but are of limited utility in dating large diameter bark-stripped trees such as western redcedar
- increment cores are of little use on bark-stripped trees when scar face decay is extensive

- an exact date often cannot be obtained on increment cores from bark-stripped cedar, but the date of simple scars can be approximated if a number of cores are taken
- the collection of increment cores can be time consuming when multiple cores are needed from each CMT

Caution with Dating via Increment Core

When multiple scars, or scars with complex ring patterns are present on bark-stripped redcedar, increment cores can give completely wrong dates.

- the collection of increment cores results in the least damage to the tree
- increment cores are easy to transport
- increment cores are the preferred kind of samples when tree damage needs to be kept to a minimum.



Two methods for determining the age of a scar on lodgepole pine. 1) Requires two increment cores (1a and 1b). 2) Requires one core, but does not give the age of the tree (just the age of the scar). Method 2 is easily used for small diameter trees.

Increment core sampling technique

1. Choose an appropriate increment borer size: six inch for small trees, 12 inch for young growth stands, 18 inch for large trees. Redcedar scar lobes usually require a 12–18 inch borer.
2. Lubricate the borer before each insertion: beeswax lubricant on exterior of borer and light oil lubricant spray into interior of borer (good lubrication prevents the core from expanding and shattering when it is removed from the borer). Storage of an increment borer may include cleaning the interior of the borer with a 0.22 calibre rifle cleaning kit and spraying light oil lubricant on and in the entire instrument.
3. Place the borer tip on the bark, preferably on the thinnest area of bark.
4. Turn the handle borer handle clockwise and allow the threads to pull the bit into the wood.
5. Once desired depth is reached, stop at a point where the handles are parallel to the ground.
6. Insert the extractor tray completely into the borer (along the lower side of the wood core). A light tap with your hand may be necessary for the last half centimetre.
7. Reverse the handle of the borer one complete rotation: turn the borer handle counterclockwise 360°.
8. Pull the extractor tray from the borer.
9. Remove the wood core from the tray and insert the core into a straw (or number of straws that are subsequently taped together at the joints).
10. Label the straw clearly and record relevant data in a field book (e.g., species, DBH, diameter at core height, core height, bark thickness).
11. A cut down map tube may safely transport the straws containing the wood cores.

Note: A skeleton plot is the recommended minimum tree-ring analysis. Field analysis in the absence of a skeleton plot is not a universally recognized technique.

Sample collection

- discs and wedges should be cut as thin as possible while still permitting transportation without breakage
- disc and wedge samples should be wrapped in duct tape or similar packing material in case the sample breaks during transport
- a "replacement wedge" (usually a piece of wood) can be inserted in the hole left by the removal of the wedge sample to avoid weakening of the tree
- the sample should include the pith if the age of the tree at time of modification is to be established
- a tag should be attached to each sample noting:
  - i) CMT number
  - ii) modification number (if more than one modification is present)
  - iii) collection date (see below)
  - iv) which side of sample is the top

Cutting date

When collecting samples, it is important to record the date of collection so that the cutting date can be correctly established. The cutting date is the year during which the most recent annual ring (the outside ring) was formed. The cutting date is important because the ring count is subtracted from that date. The cutting date is the same as the year of collection if the sample was cut from the tree after the growing season for that year. If the sample was collected prior to the growing season, then the cutting date is the previous year. For example, a sample collected in October of 1996 would have a cutting date of 1996 because October is after the 1996 growing season; a sample collected in February of 1996 prior to the 1996 growing season would have a cutting date of 1995. It is usually possible to examine the outside ring of a tree-ring sample and determine if the tree was cut during the growing season because that ring would be incomplete and may consist of only earlywood.

Some Tips for Helping Fallers Collect Samples

If disc and wedge samples are to be collected at a later date by a faller in the absence of the CMT recorder, a number of problems in cutting and labelling can occur. To avoid these we recommend that you:

- paint a horizontal cut line on the CMT or nursing tree where the faller is to cut the sample
- paint the CMT number both above and below the cut line

or

- attach a plastic or aluminum tag to the CMT or nursing tree (use string or flagging tape; do NOT use a nail) with the CMT number or CMT feature number which can then be attached to the sample after cutting

or, if the area with the CMTs is to be logged

- have CMTs felled at cut lines, leaving high stumps. Samples can then be cut from the stump at a later date.

Sample preparation

- Field counts can provide preliminary age estimates, but samples should be brought from the field and prepared prior to final dating if accurate dates are wanted
- wedges and discs should be laid out to dry for a few days, and then sanded using progressively finer grits of sandpaper
- any areas with very narrow rings, the sapwood region immediately beneath the bark, and the scar lobe at the edge of the original scar may need to be shaved with a sharp scalpel to ensure accurate dating
- increment cores should be returned from the field in something that provides stability and allows the core to dry in a straight condition
- in the office, increment cores should be shaved with a scalpel to clarify the cellular structures within the annual rings

Common Methods of CMT Tree-ring Dating

CMTs in British Columbia can be tree-ring dated by one of several methods, each of which has its own strengths and weaknesses. The four most common are discussed here.

Ring count on nursing trees growing on CMT features

This important CMT dating method is used to establish an approximate date for aboriginal logging features. Nursing trees are living trees, usually western hemlock and sometimes western redcedar, growing on CMT features such as stumps or logs. A date can be determined by counting the annual rings on these trees, but this does not provide an exact date of modification because:

- an unknown amount of time would have passed between the CMT event (modification) and the establishment of the nursing tree on that feature
- the exact point of germination on the nursing tree is almost never collected.
- the annual rings on nursing trees are usually very small, especially near the pith. Rings may be absent from the tree-ring series and so jammed together that they cannot be counted accurately. The dates provided by nursing trees are always equal to or more recent than the CMT event being dated. Dating nurse trees does not require a *Heritage Conservation Act* permit since no protected features is altered.

Ring count from bark to ring-year of injury (Method 1)

In this, and the next two methods, the date of the modification is established by counting the number of annual rings in a sample from the outside of a living tree back to the ring-year of injury. A *ring-year* is the year during which a particular annual ring was laid down; the *ring-year of injury* is the year in which the tree was bark stripped, plank stripped, or otherwise modified. The exact method to be used depends on how much of the modification has eroded away, and the amount of accuracy wanted.

For CMTs such as bark-stripped lodgepole pine, where the sapwood is in relatively good condition (not eroded) and wood loss is minimal, it is possible to date the modification by counting back from the outside ring on the unmodified part of the tree to a distinctive ring, tracing that ring around to the modified part of the tree, and continuing the count to the modification. This method can use disc, wedge or increment core samples. If increment cores are to be used, then the samples should be collected using the "face-boring" procedure of Barrett and Arno where two cores are extracted, one through the modification and the second through the unmodified side of the tree. One or more annual rings immediately behind the scar face are usually lost using this method.

Ring count from bark to ring-year of injury (Method 2)

For CMTs where sapwood decay is normally extensive (such as bark-stripped western redcedar), only increment cores can be collected, or only approximate dates are wanted, then the "scar-boring" method of Barrett and Arno can be used. In this method, a number of cores (probably 4 or more in most cases) need to be taken per bark-strip scar; all cores are taken through the healing lobe, some from just in front of the modification and others from behind the modification. Depending on exactly where the cores were taken, and the quality of the wood, these cores will provide dates for sometime after or following the modification, but will not normally allow for the identification of the exact year of modification. Recent investigations indicate that the depth of the healing lobe is roughly equal to the distance from the edge of the healing lobe to the edge of the scar. This could aid in the placement of increment bores. Accuracy is reduced in cases of extensive rot at the juncture of the modification and healing lobe, or for trees with multiple bark-strip scars.

Ring count from bark to ring-year of injury (Method 3)

A third technique can be used for dating CMTs where:

- sapwood decay is extensive
- accurate dates are wanted
- disc or wedge samples can be collected (these are required for this method).

In this method, the annual ring formed during the growing season of the year when the modification (injury) occurred is first identified. Direct counting is then used to count back from the cutting date of the outside ring to the date of the annual ring at the time of modification (that is, the ring-year of injury).

Identifying the annual ring at the time of injury usually requires careful examination of the pre-injury tree rings behind one of the healing lobes along the original edge of the modification. The wood samples used to date the CMT should be collected from that part of the modification that contains the critical tree-ring characteristics, and should be large enough to permit preparation and handling.

The annual ring at time of injury is identified by the presence of:

- a pronounced increase in ring size, starting in the healing lobe, that is initiated by the modification event
- one or two rings in the lobe directly adjacent to the modification that are smaller than the pre-modification rings and that show the effect of the injury in the form of traumatic resin canals (this is less frequent than increase in ring size)
- a truncation of the annual ring at the edge of the modification
- annual rings in subsequent years that curl around the annual ring formed at the time of injury
- a scar crust (in the case of bark-stripped trees) along part of the annual ring formed at the time of injury. The scar crust formed on the inner side of a healthy scar lobe where it grows against the smooth surface of an uneroded scar.

This method will result in dates of varying accuracies. In many cases, it is possible to obtain exact dates. In other cases, some uncertainty may be present, depending on a number of factors. These include: uncertain identification of the exact ring-year of injury; the absence of annual ring-years of injury due to wood decay or damage during collection or transportation; the presence of unhealthy growth, characterized by areas of dead sapwood under the outer bark; the presence of microscopic or very narrow annual rings that suggest that there may be missing or locally absent annual rings (see glossary).

Dating Modifications

The dating of modifications on CMTs is more complex than the dating of nursing trees and other unmodified trees. A large proportion of bark-stripped western redcedar have complex ring patterns. This is particularly true for cedars with multiple modifications such as those with several bark-strip scars. Dating of modifications should be undertaken by someone with appropriate training and experience.

Other Aspects of Dendrochronological Analysis of CMTs

Dates and ages

When undertaking dendrochronological analysis of CMTs, the results can be expressed in two ways. In the first, the modification event is expressed as a calendar date, for example, the CMT was stripped in A.D. 1880 or, just simply 1880. In the second, the modification event is expressed as an age in years ago, for example, the CMT was stripped 116 years ago. Of course the age of the modification event should not be confused with the age of the tree at the time of the event.

Modification events should be expressed in terms of dates rather than ages (years ago), since an age of an event changes annually. A precise date cannot always be obtained on a CMT. This is always the case when nursing trees are dated. Such dates should be expressed as “Before 1880” where 1880 is the date obtained on the nursing tree, or the oldest possible date obtained on the sample from the CMT. When reporting the results of dating in an archaeological impact assessment or alteration report, investigators must include the following dating data for the feature(s) and tree, where possible:

- year of germination
- year of modification/injury for each feature
- age of tree when modified (for each feature)

The age of the tree at modification can reflect cultural preference related to tree age or size.

Age of stands

An indirect method of establishing an approximate maximum date for a CMT is to date similar unmodified trees in the same stand as the CMT. Though individual trees within a stand will vary in age, if the overall age of the stand can be established, then the cultural modification is younger in age than the stand. Care should be taken to ensure that the CMT is not a veteran.

Internal scars

Disc and wedge samples can be used not only to date a CMT, but also to check for the presence of hidden internal bark-strip scars on the sampled tree. These are cultural scars totally covered by healing lobe growth and not visible from the outside of the tree. So far, internal scars have been identified on western redcedar and lodgepole pine. The same type of tree-ring characteristics found on external scars (that is, scars visible on the outside of the tree) also can be used to identify internal scars. Disc samples are best suited for this purpose, since they give a complete radial cross-section through the tree stem. Internal scars can be dated in the same manner as external scars. In all likelihood, internal scars will be the oldest CMTs found. At present, the oldest dated CMT feature in British Columbia is an internal scar, created by bark stripping in 1186 AD.

Confirming cultural bark-stripping

Disc and wedge samples can be used not only to date a CMT and check for internal scars, but also to confirm that a bark-stripping event was cultural. Cultural bark-stripping results in distinctive tree-ring characteristics. When samples for bark-stripped CMTs are analysed, they should be checked for the presence of these characteristics to confirm that the bark removal is cultural and not natural in origin. During the examination toolmarks may be found under scar lobes, particularly at the top of stripped pine trees.

CMT PROTECTION, MANAGEMENT, PERMITS AND ABORIGINAL RIGHTS

CMT Protection

The *Heritage Conservation Act* protects many of British Columbia's archaeological sites from development related disturbance by requiring specific alteration permits before site alterations may proceed. These provisions of the Act apply whether archaeological sites are located on public or private land. CMTs, whether they occur singly or in a group, are subject to potential protection under the *Heritage Conservation Act*. There are several sections of the Act which can apply to the protection of CMTs, however the central provisions are found under Heritage protection. Within this section a CMT may not be damaged, altered or removed without an alteration permit if:

- the CMT was, or, in the case of a CMT site, some of the CMTs were modified before 1846, or
- it is reasonable to assume, in the absence of absolute (calendar) dates, that the CMT (s) was modified before 1846, or
- the CMT is a feature within a protected archaeological site.

CMT Management

Responsibility for the integration of CMTs and other archaeological resources into Ministry of Forest operations is shared by the Ministry of Small Business, Tourism and Culture, and the Ministry of Forests.

The roles and responsibilities of both parties are defined in the Protocol Agreement on the Management of Cultural Heritage Resources. CMTs are managed in accordance with the following policies, operational procedures, and agreements:

- The Ministry of Small Business, Tourism and Culture and Ministry of Forests *Protocol Agreement on the Management of Cultural Heritage Resources* (revised October 1996)

- *British Columbia Archaeological Impact Assessment Guidelines*
- *British Columbia Archaeological Resource Management Handbook*
- *Procedures for Culturally Modified Trees* (Ministry of Forests)
- *Provincial Heritage Register Access and Security* (Archaeology Branch Operational Procedure)
- *Recording Culturally Modified Trees* (Archaeology Branch Operational Procedure)

These documents are available through the Archaeology Branch and Ministry of Forests websites. They are subject to periodic change.

Ministry of Small Business, Tourism and Culture

The Archaeology Branch of the Ministry of Small Business, Tourism and Culture encourages and facilitates the protection and conservation of the province's archaeological resources through the Archaeological Impact Assessment and Review Process. This is a three-stage review process consisting of:

- archaeological overview assessment (AOA)
- archaeological impact assessment (AIA)
- archaeological impact management (AIM)

The archaeological impact assessment section contains introduction to assessing site significance.

AOA: In a forestry context, an AOA determines the potential for archaeological sites in an area proposed for forest management activities, whether that area be as large as an entire Forest District or as small as a proposed harvesting block. The AOA is intended to predict archaeological site locations and guide subsequent impact assessment studies.

AIA: An AIA involves an inventory and impact assessment of a proposed development area. It is usually required where the need for one has been identified in an AOA. An AIA usually addresses the full range of archaeological site types possible in a development area, and normally is not restricted to an assessment of CMTs unless that is the only site type expected. An AIA includes a field inventory, an evaluation of the significance of any sites present, an assessment of potential impacts to sites present by proposed development, and the recommendation of measures to manage adverse impacts. The field survey can involve ground alteration (testing with a shovel to determine if buried archaeological remains are present, or removing the forest litter mat in search of CMT logging detritus), or the alteration of CMTs (collecting wood samples for dating purposes). Often dating samples are removed after completion of the AIA by fallers during harvesting or other operational development.

CMT significance

The evaluation of CMT significance is an important component of the AIA process, since recommendations for the management of CMT sites are based on their assessed significance. Several types of significance (scientific, ethnic or cultural, historic, public, economic) may be taken into account when evaluating CMTs or CMT sites, but scientific and cultural significance generally have the most important implications for management recommendations.

Scientific significance

CMTs have the potential to shed light on many aspects of aboriginal culture, such as the history and nature of traditional forest use, and the ways in which society was organized at the social, economic and political levels. They also have the potential to corroborate oral histories and identify the locations of traditional use areas, trails, and other less visible types of sites that sometimes occur in association with CMTs in inland areas. Because of their ability to provide precise dates, CMTs can establish when specific lands were occupied and used, demonstrate changing demographic and settlement patterns, and identify technological innovations.

In a 1997 report entitled *The Significance and Management of Culturally Modified Trees*, Morley Eldridge presents a scheme for rating the scientific significance of CMT sites and individual CMTs. Variety, number, condition, and context of CMTs are considered as well as the suitability for detailed investigation. This article is available on the Archaeology Branch website (www.archaeology.gov.bc.ca).

Cultural significance

Cultural significance is the importance placed on CMTs by the indigenous community. It may include scientific and spiritual values, as well as values that derive from aboriginal rights. One reason that CMTs are considered to be important is the link that they provide between aboriginal people and their ancestors, and the connection to the land that they symbolize. CMT sites are also important for educational purposes: they demonstrate the cultural achievements of the ancestors, and they are a source of knowledge of specific woodworking procedures and techniques. The time depth of CMTs can provide information about aboriginal society, and their ability to provide precise dates can provide information about historical events and may help establish claims to Aboriginal Rights and Title.

Cultural significance of CMTs is pursued through consultation with aboriginal representatives; not independently assessed by the investigating archaeologists. Appropriate questions used to help evaluate the relative cultural significance of the CMTs are detailed in *The Significance and Management of Culturally Modified Trees* (ibid.).

AIM: AIM involves the implementation of measures to manage adverse impacts to archaeological sites. Usually these measures are intended to avoid or reduce impacts. Mitigation also provides for emergency impacts (those not identified in the AIA). For CMT sites, both site avoidance through project redesign (e.g., road realignment or block boundary adjustment) and data recovery through tree-ring dating are impact management options.

Ministry of Forests

Archaeological sites, including CMT sites, are considered to be cultural heritage resources for the purpose of forest planning and management. The *Forest Act* defines a cultural heritage resource as "…an object, a site or the location of a traditional societal practise that is of historical, cultural or archaeological significance to the province, a community or an aboriginal people."

The need to address the management of cultural heritage resources, including archaeological sites, in forestry operations is clearly stated in the *Forest Act*. The *Forest Practices Code of British Columbia Act* requires the inclusion of cultural heritage resources in operational planning. The *Operational Planning Regulation* and Forest Road Regulation of the *Forest Practices Code of British Columbia Act* state that an AIA must be carried out for an area where timber harvesting or road construction is planned "if the district manager is satisfied that the assessment is necessary to adequately manage and conserve archaeological sites in the area." However, in matters of heritage conservation where the *Heritage Conservation Act* applies, the *Heritage Conservation Act* prevails over other legislation. Therefore, the Minister responsible for this act can require an AIA where a district manager does not consider one necessary.

For previously unidentified cultural heritage resources, the *Forest Practices Code of British Columbia Act* states that "if a person carrying out a forest practice, other than fire control or suppression, finds a [cultural heritage] resource feature that was not identified on an approved operational plan or permit, the person carrying out the forest practise must (a) modify or stop any forest practise that is in the immediate vicinity of the previously unidentified resource feature to the extent necessary to refrain from threatening it, and (b) promptly advise the district manager of the existence and location of the resource feature."

Permits to alter a CMT

The *Heritage Conservation Act* contains three main sections which apply to the management of CMTs. The heritage protection section defines the types of sites which are automatically protected by this legislation. CMT sites are usually captured by the subsection which states:

> *Except as authorized by a permit…a person must not do any of the following:*
>
> *damage, excavate, dig in or alter, or remove any heritage object from, a site that contains artifacts, features, materials or other physical evidence of human habitation or use before 1846.*

Two other *Heritage Conservation Act* sections, heritage inspection and heritage investigation, and permits, determine the permitting conditions to alter these protected sites.

Inspection and alteration permits are the two types of *Heritage Conservation Act* permits which apply to CMT management. Inspection permits are issued to the archaeological researcher to allow site alterations which may take place during an inventory or impact assessment. Alteration permits are issued to the project proponent to allow resource extraction related alterations of protected sites. Work permitted may be specific to each situation, and is therefore outlined in an associated permit methodology.

CMTs as Evidence of an Aboriginal Right

In addition to being an archaeological resource, a CMT may constitute evidence regarding the practise of a potential aboriginal right. A proposed development that may affect a CMT could constitute an infringement of a potential aboriginal right where the forest development activity will preclude the continued practice of that activity. Consultation with the First Nation in whose asserted traditional territory a CMT is located should occur to determine whether a potential aboriginal right exists and whether or not a proposed forest development constitutes an infringement. Consultation should follow the Ministry of Forests *Aboriginal Rights and Title Policy and Consultation Guidelines*.

Glossary

Aboriginal logging feature: A particular form of wood removal found on a logged tree (e.g., a plank strip scar) or a particular kind of tree remnant produced by the wood removal (e.g., a stump or log section).

Aboriginally logged tree: A tree which has been felled, cut, or otherwise modified by aboriginal people to obtain wood.

Absent ring: An annual ring that is missing from a tree-ring series.

Alcove: A term used by some as a synonym for test hole.

Arborglyph: A carving on a tree made by aboriginal people as part of a traditional activity.

Arborgraph: A painting on a tree made by aboriginal people as part of a traditional activity.

Archaeology: The understanding of the human past, including the recent past, through the examination of material remains.

Archaeological site: Bounded space(s) that contain(s) physical evidence of past human use or occupation.

Barberchair stump: A stump having a distinctive projecting spire of wood on one side. This spire consists of part of the outer side of the tree which was not detached from the stump when the tree fell.

Bark scar: An area on a tree stem from which bark has been removed to expose the underlying wood. Can be the result of either cultural (human) or natural bark removal.

Bark-strip scar: A bark scar resulting from human stripping.

Bark-stripped tree: A tree from which bark has been partially removed by aboriginal people. These trees are characterized by the presence of one or more areas of removed bark and exposed wood commonly referred to as bark-strip scars.

Basin stump: A stump with a concave top created by cut surfaces that slope down into the centre of the stump.

Blazed tree: A tree with bark removal and chop marks modified to identify a trail or boundary.

Callus lobe: Same as scar lobe.

Cambium: The thin layer of living cells found in trees between the bark and sapwood that generates new inner bark and wood cells.

Canoe blank: A log in the initial or intermediate stage of shaping into a canoe.

Chisel: A long-handled tool with a sharp bit of stone, bone, shell or iron used traditionally with a handmaul to fell trees.

Claim tree: A tree with ownership marks cut into the bark.

CMT: Culturally modified tree.

CMT feature: An individual bark-strip scar, logging feature or other modification on a CMT.

Culturally modified tree: A tree that has been intentionally altered by aboriginal people as part of their traditional use of the forest.

Cultural scar: A bark or wood scar that is the result of human action.

Culture: That complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities acquired by humans as a member of society.

Cut site: An archaeological site that contains one or more CMT features.

Cutting date: The year during which the most recent annual ring (the outside ring) of a tree was formed.

Delimbed tree: Trees from which one or more limbs (branches) have been removed by aboriginal people as part of a traditional activity.

Dendrochronology: The dating of living and dead wood by the study of tree rings.

Die-back (bark): The progressive lateral death of cambium and bark, resulting in a bark scar.

Direct ring count: A dendrochronological method in which the number of annual rings are added or subtracted from a known ring-year.

Discs: A "cookie-like" transverse cross-section through a tree stem used for dendrochronology.

Earlywood: Wood cells produced by the cambium in the early part of the growing season. These cells are wide in radial dimension and have thin walls, making the wood relatively soft and light in colour.

Entwined tree: A rare type of CMT where several trees have been intentionally intertwined, resulting in an unusual form.

Ethnography: The study of the culture of a particular social group through participatory observation and interviews with the members of that group.

Face-boring: A procedure for collecting tree core samples, where two cores are extracted, one through the area of modification, and the second through the unmodified side of the tree.

Felled tree: Usually large diameter, these trees were completely felled using traditional felling techniques, and not felled by the wind.

Flat stump: A stump having a single level or sloping top.

HAG: Height above ground (the distance between the base of the trunk and the bottom of a CMT feature).

Handmaul (Maul): A heavy hammer or mallet used for driving chisels, stakes and wedges.

Healing lobe: Same as scar lobe.

Heartwood: As a tree grows, the annual rings produced are sapwood which turns into heartwood as the tree matures.

Hidden scar: Same as internal scar.

Increment core: Usually 5 mm-diameter cylindrical tree-ring samples extracted from living trees with the aid of a special borer.

Internal scar: A bark scar totally covered by scar lobe growth and not visible from the outside of the tree. Also called hidden scar.

Kindling collection tree: A tree with one or more kindling removal scars.

Kindling removal scar: An area of chop marks and missing wood that is the result of the removal of small pieces of wood, used as kindling or fuel.

Latewood: Wood cells produced by the cambium in the late part of the growing season. These cells are narrow in radial dimension and have thick cell walls, making the wood relatively hard and dark in colour.

Locally-absent annual ring: An annual ring which cannot be traced around the entire circumference of the tree; rather than forming a continuous loop, it forms an arc.

Lofting log: A log placed on the ground for the purpose of elevating a log or canoe blank.

Log: A felled tree showing no signs of further modification.

Logging detritus: The waste chips, chunks, and slabs produced as a by-product of logging activity.

Logging feature: Same as aboriginal logging feature.

Microscopic annual ring: An annual ring which is extremely small and requires a 10× hand lens or low-power microscope to be viewed.

Missing annual ring: An annual ring that did not form, therefore, is missing from a ring series.

Missing section: A section of a log (felled tree) which has been removed from the CMT site. A missing section is defined by the presence of two log sections separated by a gap, or by the presence of a stump and its separated crown log.

Message tree: A type of bark-stripped tree found in some parts of Interior British Columbia with syllabics painted on the bark-strip scar.

Notch: A rectangular and often paired feature chopped into a log or tree during the initial stage of plank removal or, sometimes, tree felling.

Notched tree: A standing tree or log into which one or more notches have been chopped.

Nursing tree: A tree growing on and nurtured by a fallen dead tree, stump or log. Sometimes mistakenly called a nurse tree.

Pitch collection scar: One or more cuts in the bark of a tree and extending into the wood beneath made to release pitch for collection.

Pitch collection tree: A tree with a pitch collection scar.

Pith: The central annual ring of a tree.

Planked tree: A tree or log from which a plank has been detached (stripped).

Plank scar: A flat rectangular surface on a standing tree, windfallen tree, log, or log section that is the result of plank removal.

Platform notch: A feature found on some but not all stumps which held braces from platforms, ladders, and other means of providing a firm footing for the aboriginal loggers close to the tree but above the forest floor. These features include round to square notches, L-shaped notches, rectangular notches (with four sides), and rectangular channels (with two sides).

Rectangular bark-strip scars: Bark-strip scars with an overall rectangular shape, usually produced by a horizontal cut at both the top and bottom of the scar.

Resin canal: Tubular, intercellular space, sheathed by secreting cells and bearing resin in sapwood.

Ring-year: The year during which a particular annual ring was laid down.

Ring-year of injury: The year during which the annual ring associated with the modification of the tree was laid down.

Sapwood: As a tree grows, the annual rings produced are sapwood which turns into heartwood as the tree matures. Sapwood has some living cells and continues to be present between the heartwood and cambium.

Scar-boring: A procedure for collecting tree core samples in which a number of cores (probably 4 or more) need to be taken per cultural modification. All cores are taken through the healing lobe, some from in front of the modification and the others from behind the modification.

Scar crust: A hard black or dark brown layer formed on the inner side of a healthy scar lobe where it grows against the smooth surface of an uneroded scar face.

Scar face: The wood surface exposed by bark removal.

Scar face/scar lobe interface: Area of contact between post-injury annual growth rings (scar lobe) and the original scar face, whether present or decayed.

Scar lobe: The vertical ridges of wood tissue formed on both sides of a scar face. Also known as a callus lobe and healing lobe.

Scar window: The opening created by the lobes growing on both sides of a scar.

Sectioned tree: Trees where the log (stem) is cut into two or more sections. The log sections show no signs of further modification though some sections might have been removed. Different kinds of log sections are butt, medial, crown and missing sections.

Skeleton plot: The recommended minimum tree-ring analysis.

Step stump: A stump having a level top on two planes separated by a vertical step.

Stump: Standing remnant of a felled tree. Stumps are classified by the kinds of tops: flat, step, barberchair, basin and unclassifiable.

Support tree: A standing tree used as a post for a drying frame, shelter, etc.

Tapered (triangular) bark-strip scar: A relatively long and narrow bark-strip scar that gradually tapers to a point or crease.

Test hole: A hole, usually four sided, chopped into a standing tree, often deep into the heartwood.

Tested tree: A tree into which a test hole has been chopped.

Toolmarks: The cuts, striations, and other marks left on a tree as a result of tool use.

Trapping alcove tree: A tree used to trap animals, with a wooden "run" or plank leading to a test hole-like alcove in the tree (the entrance being usually smaller than the hole), where a trapset has been placed.

Traumatic resin canal: A resin canal arising from an injury to the tree. These canals are characterized by linear alignments of cells with irregular walls and a darker colour than regular resin canals. Traumatic resin canals form a type of false annual growth ring.

Tree-ring dating: Same as dendrochronology.

Unclassifiable stump: A stump having a top surface too badly deteriorated to classify as barberchair, flat-top, basin-top or stepped.

Undercut scar: An area of missing wood and bark on a standing tree that was removed as part of the initial stage of felling the tree. Undercut scars resemble test holes but generally are larger and have sides formed by scar lobe growth rather than chopped wood.

Undercut tree: A standing tree with an undercut scar.

Veteran: Older trees in a younger stand; often survivors of a fire, disease or other event that killed most trees.

Wedge: A tapering tool made of bone, antler, wood or stone used to spilt wood.

Wedge sample: A partial disc removed from one side of a tree for dendrochronological purposes.

SUGGESTED READINGS

Information about CMTs is often difficult to obtain as most of it exists in unpublished reports. Many of these reports have limited distribution, are hard to locate, and often contain site-specific information that is confidential or available on a "need to know" basis. The Provincial government maintains an inventory of recorded archaeological sites, but access to this information is made available only under certain conditions.

Three articles published recently in scientific journals provide the best summary of CMT studies to date. These can be obtained from university and college libraries, and some public libraries.

- *Culturally Modified Trees in the Pacific Northwest* by Charles M. Mobley and Morley Eldridge, published in the journal Arctic Anthropology in 1992 (volume 29, number 2, pages 91–110)
- *CMT Archaeology in British Columbia: The Meares Island Studies* by Arnoud H. Stryd and Morley Eldridge, published in the journal BC Studies in 1993 (number 99, pages 184–234)
- *Dating and Interpreting Pine Cambium Collection Scars from Two Parts of the Nechako River Drainage, British Columbia* by Paul Prince, published in the Journal of Archaeological Science in 2001 (volume 28, number 3, pages 253–263)
- *Modern Bark-stripped Culturally Modified Trees Shed Light on an Old Problem* by Andrew R. Mason, published in the journal Forum, January/February 2000 (page 28)

There are also several short articles in *The Midden*, the newsletter of the Archaeological Society of British Columbia. The newsletter is intended for a lay readership, and articles are often illustrated. *The Midden* is available from the Society, and from public and academic libraries. CMT articles in past issues include:

- *Culturally Modified Trees* by Hilary Stewart, 1984, volume 16, number 5, pages 7–9

- *Test Pits: Are They Caused by Native Logging or Historic Trapping?* by J. Tirrul-Jones, 1985, volume 17, number 3, page 6
- *An Archaeological Survey of the Prince Rupert-Terrace Area* by David Archer and M. Denny, 1985, volume 17, number 2, pages 7–9
- *Kitsumkalum Survey: Initial Results* by David J.W. Archer, 1988, volume 20, number 2, pages 6–10
- *Victoria Still Stumped by Trees* by Katherine Bernick, 1984, volume 16, number 4, page 10
- Untitled editorial by Kathryn Bernick, 1985, volume 17, number 1, page 2
- *Precontact Dates Revealed by Ring Counts* by Russell Hicks, 1984, volume 16, number 5, pages 11–14
- *Zayas Island Archaeological Survey Project* by James C. Haggerty, 1988, volume 20, number 3, pages 6–9
- *CMTs* (in field notes section), 1994, volume 26, number 4, page 9
- *The Bear Facts in the Ursus Valley* by Jim Stafford and Morley Eldridge, 1995, volume 27, number 4, pages 7–9

The anthropological (ethnographic) literature for British Columbia contains numerous accounts of the importance of wood and bark in traditional aboriginal culture. Many kinds of CMTs can be ascribed to the tree uses described in the anthropological literature. These accounts provide a cultural context for understanding CMTs. Unfortunately, these sources rarely give detailed information about aboriginal logging, bark-stripping, and other tree-use practices. Those that do are particularly valuable for CMT research.

Although much of this anthropological information is to be found in unpublished reports and field notes, and in hard-to-access academic publications, some is contained in publications intended for a wider audience and available in selected bookstores. These publications include:

- *Cambium Resources of the Pacific Northwest: An Ethnographic and Archaeological Study*, by Anne Eldridge, 1982. Also available online at: http://www.islandnet.com/~millres/
- *Cedar: Tree of Life to the Northwest Coast Indians* by Hillary Stewart, 1984, Douglas and McIntyre, Vancouver
- *Ethnobotany of the Nitinaht Indians of Vancouver Island* by Nancy Turner, John Thomas, B.F. Carlson, and R.T. Ogilvie, 1983, Occasional Papers Series No. 24. British Columbia Provincial Museum, Victoria
- *Ethnobotany of the Hesquiat Indians of Vancouver Island* by Nancy Turner and Barbara Efrat, 1982, British Columbia Provincial Museum Cultural Recovery Paper No. 2, Victoria
- *Food Plants of British Columbia Indians Part I: Coastal Peoples* by Nancy Turner, 1975, Handbook No. 34, Royal British Columbia Museum, Victoria
- *Food Plants of British Columbia Indians Part II: Interior Peoples* by Nancy Turner, 1978, Handbook No. 36, Royal British Columbia Museum, Victoria
- *Plants in British Columbia Indian Technology* by Nancy Turner, 1979, Handbook No. 38, Royal British Columbia Museum, Victoria.
- *The Adventures and Sufferings* of John R. Jewitt, Captive of Maquinna by Hilary Stewart, 1987, Douglas and McIntyre, Vancouver
- *Ethnobotany of the Okanagan-Colville Indians of British Columbia and Washington* by Nancy Turner, Randy Bouchard and Dorothy I.D. Kennedy, 1980, Occasional Paper Series No. 21, British Columbia Provincial Museum, Victoria

- *Thompson Ethnobotany: Knowledge and Usage of Plants by the Thompson Indians of British Columbia* by Nancy J. Turner, Laurence C. Thompson, M. Terry Thompson, an Annie Z. York, 1990, Memoir No. 3, Royal British Columbia Museum, Victoria
- *Shuswap Indian Ethnobotany* by G. Palmer, 1978, in journal Syesis, volume 8, pages 29– 81
- *Plants of Carrier Country* by D. Walker, 1973, Carrier Linguistic Committee, Fort St. James
- *Notes on the Western Dene* by A.G. Morice, 1893, in Transactions of the Canadian Institute, Session 1892–93

Also of interest are several books on the trees and plants of British Columbia, including:
- *Plants of Coastal British Columbia* by Jim Pojar and Andy MacKinnon, 1994, B.C. Ministry of Forests and Lone Pine Publishing, Vancouver, Edmonton
- *Plants of Northern British Columbia* by Jim Pojar and Andy MacKinnon, 1992, B.C. Ministry of Forests and Lone Pine Publishing, Vancouver, Edmonton
- *Plants of Southern Interior British Columbia* by Roberta Parish, Ray Coupé, and Dennis Lloyd, 1996, B.C. Ministry of Forests and Lone Pine Publishing, Vancouver, Edmonton

Information on various methods of tree-ring dating is widely available. Sources used by archaeologists in British Columbia are:
- *The Care and Feeding of Increment Borers* by James K. Agee and Mark H. Huff, 1986, Seattle: National Park Service
- *An Introduction to Tree-ring Dating* by Marvin A. Stokes and Terah L. Smiley, 1996, Tucson: University of Arizona Press
- *Increment-borer methods for determining fire history in coniferous forests* by S.W. Barnett and S.F. Arno, 1988, in USDA, General Technical Report, INT-244

For more information on CMT significance, see:

- *The Significance and Management of Culturally Modified Trees* (available from the Vancouver Forest Region) by M. Eldridge, 1997.
- *Sacredcedar: The Cultural and Archaeological Significance of Culturally Modified Trees* by Stryd and Feddema, 1998, available on the Internet at http://www.davidsuzuki.org/publications/pacific_salmon_forests_reports/

Standards for archaeological overview and impact assessments can be found in the following government publication:

- *British Columbia Archaeological Impact Assessment Guidelines* (Third Revised Edition) edited by Brian Apland and Ray Kenny, 1998, Archaeology Branch, Ministry of Small Business, Tourism and Culture, Victoria.

APPENDIX I

Criteria for Identifying Cultural Tapered Bark-strip Scars

Introduction

The forests of British Columbia contain many bark-scarred trees. Most of these scars are not cultural, that is, the result of traditional bark collection by aboriginal people. Instead, they are the result of a variety of natural forces and agents. For western redcedar and yellow cedars, the trees most often used by aboriginal people, these natural forces and agents include fire, lightning, falling trees, breaking branches, animals, fungi, sun scalding, nutrient deficiency, lack of soil, and falling or sliding rocks. Modern machine damage is another source of bark removal. Following damage, a tree attempts to heal itself by covering a wounded area with new layers of wood and bark.

These natural scarring forces and agents, the scars they produce, and the tree-ring characteristics of these scars, are discussed in two consulting reports by Arcas Associates that can be viewed at the Ministry Library, Ministry of Small Business, Tourism and Culture, Victoria, B.C. They are: *Meares Island Aboriginal Tree Utilization Study* (1984) prepared for MacMillan Bloedel Limited (Nanaimo), and *Native Tree Use on Meares Island, B.C.*, Volume III (1986), prepared for the Ahousaht and Tla-o-qui-aht First Nations. Most natural scarring forces and agents produce scars that are not likely to be confused with cultural bark-strip scars. These scars usually have an irregular shape or a shape not found in cultural scarring, sometimes show distinctive wood damage on the scar surface (for example, when a rock slides into a tree), lack toolmarks, often have bark patches on the scar surface, and have other characteristics that quickly indicate that the scar is natural in origin. However, some natural scarring forces and agents produce scars that might be confused with tapering bark-strip scars and, occasionally, with large rectangular bark-strip scars. These natural scarring sources are breaking branches, standing water, nutrient deficiency, lack of soil, some kinds of rock damage, and grizzly bears.

Based on descriptions of traditional cedar bark harvesting by Coastal peoples, the examination of undoubted natural and cultural bark scars, and the comparison of tree-ring samples from known cultural tapering bark scars and morphologically similar natural scars, a number of criteria have been identified for distinguishing between natural bark scars and cultural tapering bark-strip scars on cedar trees. These criteria are discussed below. The discussion is quite detailed, and is intended for those with a particular interest in the sometimes difficult identification of tapering bark-strip scars.

Scar Face Bark

Because both outer and inner bark are removed during the cultural stripping process, no bark will be present on the scar face unless the bark-stripping was unsuccessful. One situation in which bark may appear to be present on a cultural scar is when two adjacent strips leave a strip of bark at the top, where the tapers diverge, and subsequent scar lobe growth near the top of the scar gives the appearance of bark on the scar face. Patches of bark are often present on the faces of natural scars, since such scars often result from gradual bark die-back rather than a fast removal. In some cases all bark has sloughed off and the resulting scar may resemble a cultural scar. Occasionally, fungal rot turns sapwood black and papery resembling bark remnants.

Scar Crusts

A scar crust is the hard black or dark brown layer that forms on the inner side of a healthy scar lobe where it grows against the smooth surface of the uneroded scar face. On cultural bark-strip scars, this crust is smooth and follows the regular curve of the annual ring exposed by stripping. Where preserved, these smooth scar crusts extend for the entire length of the scar.

Scar crusts are also found on some natural scars, particularly those that form healing lobes in response to damage. These include scars on healthy trees attributable to windfall damage, rockfall damage and wind cracking. However, in the case of scars from windfall or rockfall damage, these scar crusts follow the damaged wood surface (often with bark patches), and will not be smooth like those that develop over the sapwood of a cultural scar. In addition, these scar crusts will not be as long as those on a cultural scar. If the original core has rotted away, scar crusts may indicate half or more of the tree was stripped. This is in marked contrast to the narrow arc removed by windfalls. In the case of scars from wind cracking, long smooth scar crusts may be present, but the scar can be distinguished from cultural tapering bark-strip scars by other characteristics (length, width, location on tree, etc.). Sometimes wind-cracked scars still have strips of bark attached.

Annual Ring Characteristics

Cultural stripping results in several changes to the annual growth-rings in the lobes adjacent to the scar. These changes are:

1. expanded growth-ring width caused by increased production of both earlywood and latewood;
2. the presence of high density latewood and the absence of low density latewood; and, sometimes,
3. the presence of traumatic resin canals.

In some cases, the first and sometimes second growth ring after scarring are reduced rather than expanded in width near the juncture of the scar face and lobe. Changes (i) and (ii) above are associated with cultural bark-stripping; the presence of traumatic resin canals also is associated with cultural bark-stripping, but its absence does not mean that the scar is of natural origin.

Toolmarks

Knife, axe, adze, chisel and wedge marks may be present on cultural bark-strip scars. Toolmarks establish the cultural origin of a scar. Care must be taken to confirm that the toolmarks are associated with the scarring event, and were not added to the scar at a later date. The absence of toolmarks does not mean that the scar is of natural origin because sapwood decay and lobe growth usually remove or obscure the toolmarks. Moreover, some aboriginal people attempted not to leave toolmarks because they were seen to be injurious to the tree, or to indicate a lack of respect or skill.

Scar Shape and Size

Cultural tapering bark-strip scars are typically long and narrow, with straight tapering sides. Maximum scar width is at the base and scar margins gradually taper to a point or bark crease at the top of the scar. A cultural scar will occasionally spiral around the trunk of a tree when the bark has a spiral grain. This is usually limited to a partial circuit. Longer spirals, especially if they pass branches, are natural. Scar shape should not be confused with the existing original window shape.

Cultural tapering scars are typically between 5 and 8 m long. Width usually depends on the diameter of the tree at the time of stripping, but is typically less than 50 cm. Scar width should not be confused with the size of the gap between the two healing lobes. The latter is often incorrectly reported as the width of the scar, but is in fact the amount of scar that has not yet been covered by lobe growth. Scar width on a standing tree can be approximated by window width and healing lobe thickness. This can also assist in finding a scar crust. Otherwise this dimension can only be obtained from stem round wood samples from the tree.

In some cases, two or more adjacent bark-strips were removed from the tree at the same time, creating a wider bark scar. These wide scars can be sometimes detected by the presence of two or more points or bark creases at the top of the scar.

In contrast, natural scars are either short (<3 m) and taper quickly from a wide base, or have parallel sides that often continue to the crown of the tree. The latter are often associated with poor growing sites, and may have large branches on the scar face.

The sides of cultural tapering scars are more or less straight. In contrast, natural scars that could be confused with tapering bark-strip scars are the result of die back, which leaves bark scars with irregular sides.

Tree Diameter

Cultural tapering bark-strip scars usually occur on cedars that, at the time of stripping, had a diameter at breast height of no more than about 60 cm. Because cedar bark thickens and toughens with age, bark was preferably collected from trees which did not exceed 60 cm in diameter. Therefore, scars on trees over 60 cm in diameter at the time of stripping are unlikely to be cultural. However, if bark was stripped from a scar lobe that had grown over a previous bark scar, the trunk diameter may have been in excess of 60 cm at the time of stripping. Trees with diameters considerably less than 60 cm were stripped; archaeological examples with diameters of less than 30 cm are common. Diameter at time of stripping is best determined from stem round wood samples, but can be estimated in the field.

Branches

Large branches are not present on cultural scars. Large branches will either terminate a bark-strip or will cause the strip to continue on one side of the branch or, occasionally, in two narrower strips on either side. However, a cultural strip can slip over branches up to 3–4 cm in diameter, leaving small holes in the bark. Sapwood decay can leave the impression that the branches on a scar face are smaller than they were at the time of stripping.

Scar Bases

Scars that have bases are likely to be cultural. Because few natural processes result in cedar bark scars that originate at a point above the ground surface, scars that do originate above the ground are usually cultural. These scars can be identified by the presence of a base. For the majority of documented cultural bark-strip scars that have retained their bases, the initial cut was made at approximately waist height.

When bark is removed by falling rocks, breaking branches, and falling trees, the resulting bark scars often do not continue down to the ground surface. These scars are not, however, likely to be mistaken for cultural scars because these scars do not usually display the other characteristics of cultural scars.

The absence of bark below the scar does not necessarily mean that the scar is natural, because the bark below the base of a cultural scar often dies and falls off, producing a bark scar that begins at the base of the trunk. In addition, some cultural groups made the initial cuts in the bark at the base of the tree, rather than at waist height. Basal cuts would have been especially effective on flat slopes or on the downslope sides of trees, since they would have permitted the bark-stripper to back further away from the tree to detach the bark.

Straight Trees

Straight tall cedars with no twist are best suited for stripping because long and straighter strips are more likely to be obtained on such trees.

Tree Side

Cultural tapering bark-strip scars usually are located on the uphill or lateral sides of a tree located on a slope. Cultural tapering scars are seldom found on the downhill side of a tree. These sides are favoured for the simple reason that bark is more easily pulled from the tree when the ground is level or slopes uphill. The uphill side usually also is the dark side of the tree and has fewer branches that could thwart the bark removal.

Multiple Scars on Trees

The presence of multiple scars on young trees increases the likelihood that some or all of the scars are cultural. People frequently remove bark from the unstripped portions of previously stripped trees, and people also remove more than one bark-strip from a tree at one time. Both result in the presence of multiple bark scars on the same tree. In contrast, many of the natural scarring agents and causes produce just a single scar under most circumstances. Natural multiple scars can occur in areas subject to windfall, but these are very rare on young trees. Old dying western redcedar can have multiple natural scars associated with die-back.

Tree Clustering

The presence of clusters of scarred trees increases the chance that the bark scars are cultural. The context of a scarred tree is a very important criterion for determining if a scar is natural or cultural in origin. Presumably, the preference is to strip nearby rather than distant trees within the stand. Consequently, culturally bark-stripped trees usually occur in spatial clusters. Naturally scarred trees can cluster on poor growing sites (i.e., locations with little soil and with poor drainage). In these locations, scar lobe growth will be suppressed due to poor vigour, the scarred side of the tree often will be fairly flat, and the tree usually will be gnarled in appearance. Scars with these attributes should be discounted unless tree-ring attributes suggest a cultural origin.

A scar that cannot be confidently assigned to cultural or natural causes due to large lobe growth should be recorded if associated with numerous other definite CMTs. This will ensure ancient bark-strips are included in the inventory. A similar, isolated, scarred tree (located in a remote area) should not be recorded unless sufficient criteria are present to be confident of a cultural origin.

Relative Age

The presence of multiple bark scars of similar age on one tree or nearby trees increases the probability that the scars are cultural. The probability that multiple bark scars are cultural in origin is increased when the scars date to the same year, because cultural scarring is undoubtedly more clustered in time than most (if not all) natural scarring processes.

APPENDIX II

Identifying Cultural Cambium Scars on Lodgepole Pine

Introduction

Cambium-stripped lodgepole pine are found throughout British Columbia wherever lodgepole pine grows. When first stripped most cultural scars on lodgepole pine are rectangular in shape and result from cambium collection. However, not all scars on lodgepole pine are cultural (human) in origin. Scarring can also occur as a result of insects, disease, animals, and environmental conditions such as fire, sunscald, freeze and treefall. As time passes and scars partially or totally heal over, distinguishing between cultural and natural scarring agents can be difficult. The following discussion is intended to help field personnel distinguish between cultural and natural scars on lodgepole pine.

The *Field Guide to Forest Damage in British Columbia* (1999), co-published by the BC Ministry of Forests and the Canadian Forest Service, is a comprehensive source for identifying natural scarring agents on trees within BC. The guide focuses on the initial damage done to the tree but provides little information regarding scar characteristics as the tree ages and scar lobes develop.

Cambium Resources of the Pacific Northwest: An Ethnographic and Archaeological Study, by Anne Eldridge (1982), provides comprehensive discussion of cambium use from an ethnographic and archaeological perspective. It is available online at http://www.islandnet.com/~millres/.

Additional information and sources may be found in this handbook (see Suggested Readings). The Queen's Printer, Crown Publications, Pacific Forestry Centre and the US Forest Service maintain websites containing searchable databases of publications, many of which are available for download.

Site and Feature Context

When determining whether a scar is cultural, the context must be considered. While feature characteristics, such as cutmarks, may indicate that a scar is cultural, it is more often the feature's context that will provide clues to the origin of the scar.

Cambium stripped lodgepole pine are often found in areas with good growing conditions (e.g., on south-facing, moist, well-drained slopes, and at the headwaters of small creeks, at the forest margins, near wetlands and open parkland).

As with cedar CMTs, culturally modified lodgepole pine are commonly associated with other archaeological and traditional use sites. Culturally modified lodgepole pine have been found in large numbers in Northern BC, suggesting that the intensive harvest of pine cambium is a primary activity in some areas. However, culturally modified lodgepole pine are also stripped by people engaged in other activities, such as travelling, hunting and gathering. They can be found along travel routes, near camps, spiritual locales and other resource acquisition sites such as root and berry patches, and hunting grounds.

Many traditional use activities will not leave archaeological remains or features which are easily visible. However, nearby trees may be modified during associated traditional use activities. The presence of a traditional resource on the landscape, when found in association with scarred lodgepole pine, is a good indication that the scars may be cultural.

Clusters of lodgepole pine with scars displaying similar shapes and sizes is a good indicator that some or all of the scars are cultural. Likewise, the presence of trees with multiple scars increases the likelihood that one or more of the scars is cultural. Characteristics of cultural scars on lodgepole pine are provided below.

Natural Scarring on Lodgepole Pine

Animals may be attracted to the same resources as humans. Thus, many sites contain scars which are both natural and cultural. Animal habitat and range, forest health, and fire history must be taken into consideration when determining if a scar or cluster of scars is cultural. The following descriptions are mainly taken from the *Field Guide to Forest Damage in British Columbia* (1999), co-published by the BC Ministry of Forests and the Canadian Forest Service.

Insects, mainly bark beetles, will attack and damage or kill lodgepole pine. Bark beetles bore under the outer bark of trees, laying their eggs along galleries in the phloem. When hatched, the larvae eat the phloem and cambium. Outbreaks mainly occur in old seral stands or mature stands stressed by drought, disease and other damage. However, healthy stands may be affected by large bark beetle populations. Woodpeckers will remove the outer bark of trees in search of beetle larvae.

Diseases, mainly stem rusts, can infect and damage or kill lodgepole pine. Large blister-like cankers will develop and fester in the spring on the lower 2 m of the tree stem. These open tree sores are white, yellow or orange with profuse amounts of resin at the borders which are fed upon by small mammals such as squirrels (see below). Comandra Blister Rust stem cankers are most likely to be confused with cultural scars, especially if inactivated by squirrel feeding. These cankers are often found within 1 m of the ground, are oval or diamond shaped.

Mammals known to consume tree cambium and strip or damage trees include squirrels, porcupines, deer, elk, moose, snowshoe hares, cottontail rabbits, voles and bears. In many cases, the scars left by animals are:

- oval or irregular (without geometric shape)
- have no sharp border
- are at low heights on the tree
- include areas near or around large branches

- occur on very young trees
- may have toothmarks.

Tooth marks may be present on natural scars. However, small mammals will also feed on the freshly exposed surfaces and flowing resin created by cultural scarring and therefore toothmarks do not necessarily indicate the scar is natural.

Red squirrels exist throughout BC with exception of the Queen Charlotte Islands and south coast mainland and will feed on young lodgepole pine between 6 to 20 cm dbh during the spring and early summer. Squirrels will remove 1 cm diagonal or vertical strips from the tree stem and branches although tree damage is usually on the tree bole. Toothmarks are indistinct and damage results in a relatively smooth scar surface. Squirrels will often feed on pine stem rust cankers (open tree sores) and mistletoe infections, sometimes eradicating the disease and preventing the death of the tree, thereby producing a scar which may look cultural.

American porcupines exist throughout BC with exception of Vancouver Island and the Queen Charlotte Islands. They feed on the inner bark of trees during the winter, discriminating by taste and selecting individual trees for feeding while testing small areas of adjacent trees. Lodgepole pine trees are damaged less frequently than other tree species although all ages of lodgepole pine are affected. The bark is gnawed from trees, with basal girdling common on younger trees. Vertical and diagonal toothmarks, about 2.5 mm in width, are prominent. Large saplings and mature trees are debarked on the upper bole and on large branches. Stalactiform blister rust and atropellis cankers can be mistaken for porcupine damage.

Deer, elk and moose exist throughout BC and may peel the bark from sapling stems, leaving vertical toothmarks about 4 to 6 mm wide in the sapwood. In the fall, antler polishing/rubbing will strip bark from the branches and trunk of saplings. These damages usually occur in clusters and result in irregular shaped scars that can envelop branches and extend beyond 2 m above ground.

Snowshoe hares and cottontail rabbits are found throughout BC with exception of the north coast area and coastal islands. These small mammals feed on the inner bark of small lodgepole pine (<6 cm diameter), primarily during the winter. Feeding damage, as indicated by small gnawed patches, is dependent upon snow depth but usually occurs at the base of the stem and on lower branches. The feeding occurs above the snow line and results in a ragged looking scarface with indistinct horizontal or diagonal toothmarks about 2 mm in width.

Voles are found throughout BC with exception of the Queen Charlotte Islands and feed on the lower stem of the tree during the winter. Voles feed under the snow, gnawing the surface of the tree and leaving indistinct toothmarks resembling light fuzzy scratches about 1.5 mm wide and 8 mm long. Vole damage usually occurs on saplings or at the base of small trees.

Bears are found throughout BC and will occasionally strip bark from lodgepole pine trees which are pole sized or larger. Damaged trees are generally very scattered and found in areas, such as drainages, where bears have learned this particular behaviour. The bear starts stripping at the base of the tree, tearing upwards and often girdling the lower stem of the tree, thereby killing it. These scars are usually widest at the base of the tree, and taper upwards. Often these scars have tops comprised of several "peaks," each the result of a different strip. Long strips of bark sometimes hang from the scar tops, and scar edges are often irregular. The exposed sapwood often has a regular pattern of transverse marks from the bear's lower incisors which are used to remove the inner bark. Pieces of bark, hair, claw marks, and canine puncture marks also may be present on the scar. Other kinds of bark modifications by bears (territorial claw marks and tree demolition) are unlikely to be confused with cambium stripping.

Scars resulting from **fires, lightning strikes, extreme frost and treefall** can usually be easily distinguished from cultural scars. They are normally larger than cultural scars, often extend down to the ground, and sometimes extend up to the tree crown. Treefall damage may be indicated by a fallen tree at the base of the scar or by poor forest health. Scars from wild fires are usually triangular in shape (sometimes oval), and start at ground level (sometimes part way up the trunk) and can be indicated by burnt bark on the face or base of the tree. Lightning and extreme freezing commonly split the wood beneath the scar.

Cultural Scarring on Lodgepole Pine

Many of the natural scarring agents noted above could produce scars which look cultural. In addition to the scar feature and site context, scar feature characteristics must be considered. The following descriptions of common characteristics provide the basis for examining scar features.

Toolmarks: Scars of natural origin do not have toolmarks and only some cultural scars display toolmarks. When a group of scarred trees is encountered, a careful inspection for toolmarks should be made first. Where at least one tree shows toolmarks, the others may be assumed to be cultural. In most cases, these modifications are of aboriginal origin.

Lodgepole pines appear to retain their sapwood long after stripping, more so than cedars and some other species, and often retain toolmarks. Most toolmarks are cut marks from the initial cutting of the bark at the top and, sometimes, bottom of the strip. These are typically made with an axe, hatchet or steel knife. Bone and antler tools may leave marks on the wood. When the bark is "tight," these tools can leave very shallow horizontal impressions or rounded grooves on the wood at regular intervals along the scar face and near branches.

Scar shape and size: Scar shape and size should not be confused with the scar window. When first stripped most cultural scars on lodgepole pine are rectangular in shape, with parallel or slightly contracting sides. However, scars sometimes have contracting sides, producing an inverted triangular shape with a wide top and a narrow base. Scars are typically between 40 and 160 cm long and up to 20 cm wide. These scars will appear smaller if they are partly hidden by scar lobe growth. Scar tops have several different appearances, depending on the initial cut into the tree. When a bone or antler peeler, rather than a metal tool, is used the bark is sheared rather than cut, leaving denticulate tabs instead of clear-edged cuts. Scars may continue to the ground. If not, the scar either has a cut base, or terminates on a branch. Branches are sometimes present on the scar face, the bark having been stripped around the branch.

Tree diameter: Relatively small young lodgepole pine seem to have been preferred for stripping. Diameter at Breast Height at time of stripping is typically between 10 and 35 cm.

Scar face: Cultural scars on lodgepole pine often have few branches on the scarface. If branches are present, they are usually small (less than 3 cm) and have been cut or broken prior to or during stripping. Branches on the scarfaces of culturally modified lodgepole pine will often have a small tab of bark below or above the branch, left from when the bark was peeled. As well, shallow depressions and cutmarks resulting from prying and cutting the bark away from the branch stem are sometimes visible (see Toolmarks above). Because lodgepole pine trees are resinous, cultural scars will often have yellow resin on the scar face, sometimes in association with small mammal toothmarks (see mammal scarring above). Cultural scars, especially those with a lot of resin on the scarface, will also be prone to fire damage and may have black fire staining on the scarface (see fire scarring above).

Scar bases: Some cultural scars on lodgepole pine do not have a scar base. However, clean bases are an indication that a scar is cultural and these could range from about 5 cm to over 1 m above ground.

Tree side: In the southern interior, the cambium on the north or shady side of the lodgepole pine tree is preferred. Sun exposure on the south side of the tree makes the cambium less sweet and succulent. In areas with multiple strips, the first (oldest) scar will likely be on the north side.