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Culturally Modified Trees of British Columbia

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Version 1:

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Abstract

This Handbook in 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. There are many kinds of CMTs in British Columbia. Examples in-clude 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 the CMTs of the Coast where CMTs are frequent and better understood than in the Interior, but Interior CMTs are also discussed. The Handbook also provides background information on CMT dating and CMT protection and management as currently practised in British Columbia.

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

Cultural stump almost completely overgrown by large nursing tree

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 was 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 was intentionally felled, or it could be a complete tree with roots if the tree was windfallen. If no sections are missing, then the tree modification presumably was 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 was complete if there is a missing section, for at least one of the sections was removed from the logging site.

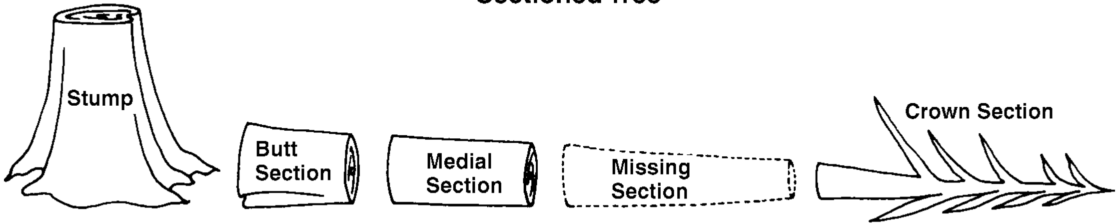
A sectioned tree is characterized by the presence of two or more log sections. Other features may include:

- stump
- logging detritus

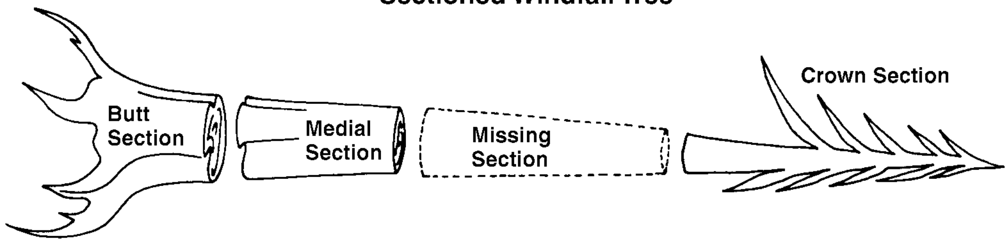
Log section: Several kinds of log sections have been defined:

- *butt section:* that section of the log closest to the stump

Sectioned Tree



Sectioned Windfall Tree



- *medial section:* the middle section 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 was chopped into a felled or sectioned log
- butt, medial, crown or missing sections — if the notch was 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 both ends of each plank scar

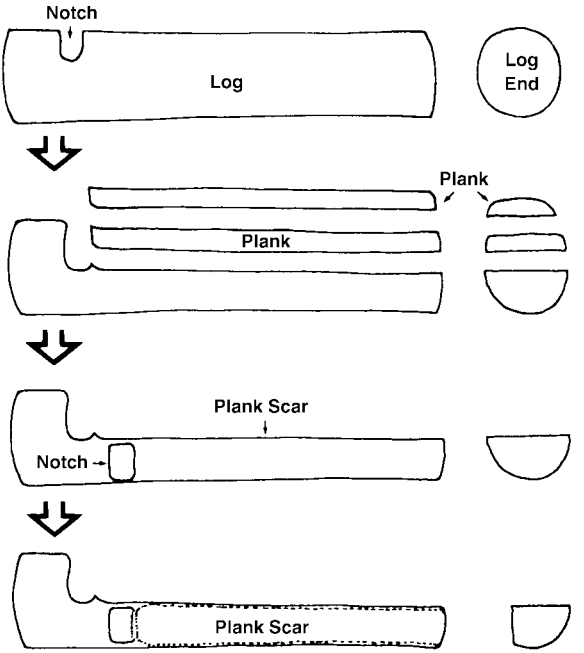
Other features may include:
- stump — if the plank was removed from a felled or sectioned log
- butt, medial, or crown sections — if the plank was removed from a sectioned log
- notch — in associated butt, medial, or crown sections
- logging detritus

*Plank scars: T*hese 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.

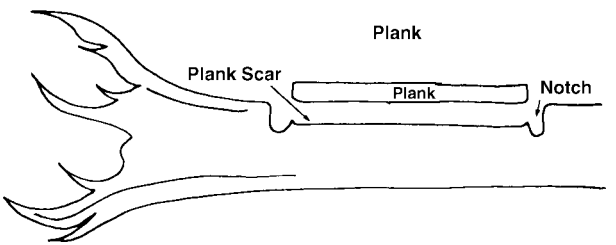
Both standing trees and logs with multiple plank scars have been reported. Up to seven plank scars have been reported for a single planked tree.

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.

Examples of Multiple Plank Removal from Medial Log Section



Plank Removal from Windfall Tree



Standing western redcedar with multiple plank scars

Western redcedar log wih plank scar

Medial log section with short plank scar

Canoe Trees

A canoe tree is one in which a log or log section was partially shaped into a canoe (*a canoe blank*) but was never completed, possibly due to the death of the canoe maker.

The only feature needed 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 log was 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 had been shaped into a canoe.

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 were 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

Canoe blank with low flat stump in background

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 was used for waterproofing, glue, caulking, scents, medicines, and other purposes. A number of recorded CMTs show bark and wood scarring attributable to pitch collection.

Features always present on these CMTs are:
- the tree itself
- one or more pitch collection scars

Pitch collection scar: These scars consist of cut marks used to release the pitch for collection. Apparently the collecting of pitch did not involve bark removal in most cases; instead, a cut was made through the bark into the wood, and the pitch would accumulate at the site of the wound where it was 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 were 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 has been 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 limbs (branches) had been removed after placement of a burial box high in the tree; and western yew

trees where branches were 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 was first removed to expose a scar face which was 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 native 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 (that is, what else is around the tree). 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 1950's, archaeologists have 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 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 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 did not result in modifications that still can be identified years later. Also, many traditional uses involved chopping and cutting that produced modifications that cannot be distinguished from those produced by non-aboriginal people. Most of the modifications that are unequivocally of aboriginal origin are those involving 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, but the marks have to be associated with the modification (and not added later). 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 rides of wood tissue called s*car 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 was used traditionally in the Interior. Tree bark was 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
- girdled scars
- tapered scars
- other scars

Rectangular Bark-Strip Scars

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—see p. 60). 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 was pulled off by hand, or pried off with an instrument. First, a cut was made into the trunk, often at chest height, with a knife or other sharp implement or with an antler bark peeler. The bark was then pulled down to the ground, or until it broke from the tree, leaving a fringe of bark at the base of the scar. Sometimes another cut was made lower on the tree so that the strips would stop at that point. In some cases, a vertical cut was made to split the bark, which was then pried off. Once the bark was removed, the cambium was 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 were 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 multiple scars have been reported, the largest number of scars so far being four.

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 (see discussion below on scar windows).

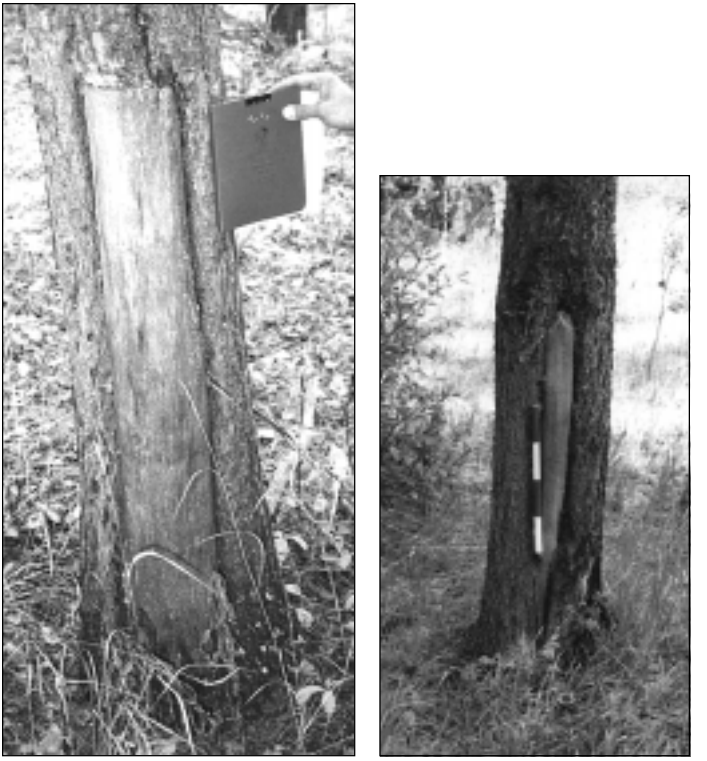
Scar tops have several different appearances, depending on the initial cut into the tree. Tops created by single horizontal, multiple horizontal, zig-zag, diagonal, transverse, and inverted V-shaped cuts (consisting of two intersecting cuts that often extend beyond the edges of the scar) have been recorded, and others undoubtedly exist. 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 usually 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, with the bark having been stripped around the branch.

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 are usually lenticular (bi-convex) in shape, but other shapes such as triangular (where the lobes on one end grow faster than the other end) and S-shaped (where the window partly twists around the tree, presumably following a twisted scar) have been observed. If growth continues, the lobes may coalesce, closing the scar window, and completely hiding the scar.

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

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



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

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 was 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: D*ates as old as 1713 have been obtained on lodgepole pine bark-strip scars, but the majority date to the latter part of the 19th century, or to the first part of this century. 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 by themselves, singly or in groups, or in association with other kinds of archaeological sites. Stripped pines have been noted in association with aboriginal trails and aboriginal camps. Stripped pines sometimes occur in very large groups of "hundreds" of CMTs.

Natural Bark Scarring on Lodgepole Pine: Not all rectangular bark scars on lodgepole pine are cultural (human) in origin. 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 tool marks.

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 tool marks. In most cases, these modifications are of aboriginal origin. Care should be taken to ensure that modifications produced by non-aboriginal people are not recorded as CMTs.

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 was used)
- no galleries from engraver beetles on scar face
- tear tabs at the bottom of the scar (cut marks if bottom of strip was 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)

Rectangular Bark-Strip Scars on Western Red Cedar

Two kinds of rectangular bark-strip scars have been identified on western red cedar 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 redcedars 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. 58]. 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 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 redcedars 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.

Rectangular Bark-Strip Scars on Paper Birch

The bark of the paper birch was widely used by the people of the Interior. Bark sheets were 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. was harvested in winter. It was peeled off in large sheets. Birch bark also was used for tanning and for

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

torches. Birch cambium was eaten, birch sap was collected for medicinal purposes, and birch pitch was 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 was sought; the inner bark was 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 Sars: These scars resemble the rectangular scars on lodgepole pine, though usually smaller. Both the inner and outer bark has been stripped, indicating the bark was removed 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 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 was used traditionally for medicinal purposes, and as a cleanser, bleach, and hair remover. Aspen cambium was eaten, and aspen sap was 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. These scars are about 120 cm wide. Other information on these scars is not available.

Two spruce (presumably Engelmann spruce) in the Cariboo have also been recorded as bark-stripped CMTs. One has a rectangular bark-strip scar similar to those found on lodgepole pine. Little information is available about either CMT.

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 lodgepine 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 were often sought, and could sometimes be obtained by girdling a tree [see photo, p. 61]. 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 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. Tool marks 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.

Bark-stripped paper birch with girdled scar

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 Kitsilas Canyon and Hazelton where the Coastal Western Hemlock Zone with its large cedars penetrates the Coast Mountains and aboriginal groups weaved 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 has not been 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 have 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, white pine, willow, and western hemlock.

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 native 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 worked 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. These would be classified as felled trees, as defined in the glossary and discussed in the section on the Coast.

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. The technique used to remove the plank is identical to that used on the Coast, but the scar is notably shorter (120 cm) than those on the Coast.

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. At present, only one aboriginal logging site has been recorded in the Interior outside the the Coastal Western Hemlock Zone. However, as the awareness of these kinds of CMTs increases, others will undoubtedly be identified and recorded.

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 outiside the Coastal Western Hemlock Zone is a canoe tree. While several finished canoes or parts of finished canoes have been documented archaeologically in the Interior, only one instance of a canoe tree (CMT) has been recorded, a ponderosa pine specimen in the North Thompson Vally. 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 so far in the Interior. Undoubtedly other examples will be recorded 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 pieces of removed wood have been observed on a number of tree species. The removed wood probably was used as kindling or fuel. These trees usually have one or more kindling removal scars (areas with chop marks and missing pieces of wood). These chopped areas occur on both natural and cultural bark scars [see photo below].

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.

Lodgepole pine with kindling removal scar (chopped area)

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. This includes an arborgraph in the Kispiox River valley and another in the Stein River valley. 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 was first removed, and the scar face was painted. Probably not all arborglyphs and arborgraphs were 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 native 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, and that the scar date is 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 known to have been occupied 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 natural or cultural reservoir is used to collect sap. Cultural reservoirs consist of small holes dug or cut into the tree 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." More likely, these trees represent a ritual associated with puberty training, as similar tree modifications have been 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 had been 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

People encountering CMTs are encouraged to record them. Two levels of CMT recording are recommended. In addition, the detailed recording of CMT features is recommended.

LEVEL I RECORDING

Level I recording is intended to provide basic information on the presence of CMTs, notably location, type, and frequency. It should be used when detailed information about individual CMTs is not needed, or is not possible to record 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

A group of CMTs constitutes a CMT site (also called a forest utilization site). Level I recording is concerned with providing 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., trails, 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 be problematical, particularly when CMTs are scattered more or less continuously over a large area. However, in many cases, boundaries are self evident if sufficient time is available to establish the spatial distribution of the CMTs. In many cases, site boundaries are somewhat arbitrary.

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 Form

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

The insert that follows is a blank Level I CMT Recording Form. The form is in landscape format so that it occupies just one sheet of $4^1/_2$ x 7 inch notebook paper. The form can be photocopied as needed, and inserted into a $4^1/_2$ x 7 inch 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 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 National Topographic Series (NTS) 1:50,000-scale map sheet number, or enter Terrain Resource Information Management (TRIM) 1:20,000-scale map sheet number. Circle either NTS or TRIM to indicate map series used. If both known, enter NTS map sheet number here and TRIM map sheet number under Comments.

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.

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:
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, 400m 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 x 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: 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.

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 x 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 class box, or boxes if more than one 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 First Nation 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).

A caution

Do not dig or otherwise disturb the ground in search for possible other remains without a permit from the Archaeology Branch.

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

Indicate on form 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 Recording Form

Completed Level I forms should be sent to the Archaeology Branch at the address on page 89 for entry into the Provincial Heritage Register. Entry into the Register will provide automatic protection under the H*eritage Conservation Act* to those CMT sites that meet certain requirements (see section on CMT protection).

LEVEL II RECORDING

Level II recording is intended to provide information about the CMT site, including detailed information about individual CMTs. Level II recording is appropriate for detailed inventories, archaeological impact assessments, and research studies where documenting individual CMTs is the main concern. Level II recording is always required for studies carried out under a permit issued pursuant to section 7 of the *Heritage Conservation Act* (see section on permits), unless the Archaeology Branch waves this requirement because of the existence of special circumstances.

Level II Recording Form

For Level II recording, the Standard Recording Form developed by the Archaeology Branch should be used. Copies of this form can be obtained from the Archaeology Branch at the address on page 89.

Where to send a Level II Recording Form

Completed Level II forms should be sent to the Archaeology Branch at the address on page 89 for entry into the Provincial Heritage Register. Entry into the Register will provide automatic protection under the *Heritage Conservation Act* to those CMT sites that meet certain requirements (see section on CMT protection).

CMT FEATURE RECORDING

The Standard Recording Form developed by the Archaeology Branch requires, among other things, 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.

What is a CMT feature?

A CMT feature is a modification produced by wood or bark removal. Examples of features include bark-strip scars, test holes, undercut scars, plank scars, stumps, logs, log sections, notches, canoe blanks, pitch collection scars, and kindling removal scars. The modified tree, whether standing or felled, also is considered a feature.

CMT Feature Recording Form

It is recommended that the CMT Feature Recording Form below be used to record individual CMTs. The blank form is in landscape format and occupies one sheet of $4^1/_2$ x 7 inch notebook paper. The form can be photocopied and inserted into a $4^1/_2$ x 7 inch 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 first feature (the tree itself), enter on third line a description of the second feature present (in nearly all cases will a CMT consist of at least two features). An additional line is completed for each 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 first feature.

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 a 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 II Recording 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 locate the CMT if a site map is 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.

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 Level II Recording 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. ▲	—	—	800E	—	—	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 Level II Recording 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	5	axe	–
				5. ◠ (on 4)	–	–	15	55	25	30	5	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 Level II Recording Form.

7. *FEAT* — List each feature of the CMT, using as many lines as needed. If more lines are needed, use a second form. 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. The insert is in landscape format so that it can be photocopied and inserted into a $4^1/_2$ x 7 inch field notebook.

   Number each feature for ease of reference. List the features in sequence. Start either with the tree itself if the CMT is standing or windfallen, or with stump if the CMT has been felled. If felled but no stump present, start with log or log section. If a feature is located on another feature (e.g., notch at end of plank scar), give the number of the feature on which the feature is located (see example below). It is not necessary to indicate that a feature is on a standing tree (this is assumed to be self evident).
   - for bark-strip scars, stumps, and log sections, list kind of scar, stump, or section
   - for bark-strip scars that are possibly 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.

DESCRIBING CMT ATTRIBUTES

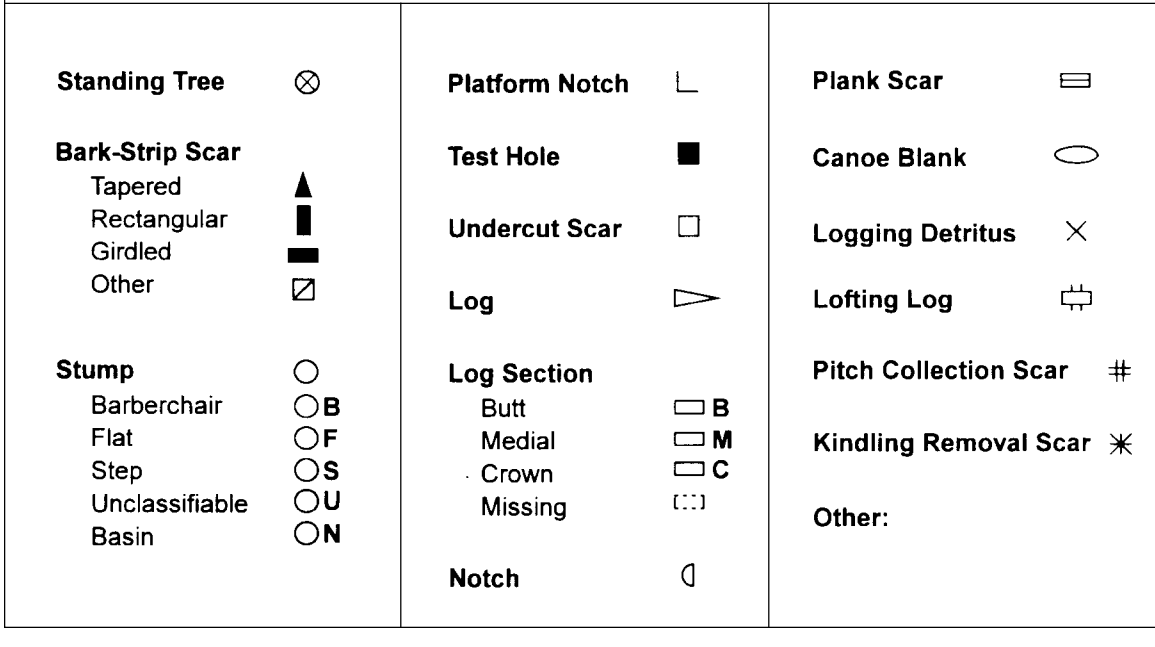
CMT features are described in terms of observed or measured attributes. Up to nine different attributes can be recorded for a single feature using the CMT Feature Recording Form. The attributes comprise Fields #8 through #16 on the form. They are discussed below. All dimensions (except slope) should 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, whether bark-stripped, aboriginally logged, or otherwise modified. DBH is measured only on standing and windfallen CMTs. For stumps and non-standing features such as logs, log sections, lofting logs, and others, width rather than DBH is measured.

Diameter is measured at breast height on standing and windfallen CMTs. If a tree is on a steep slope, measure on uphill side.

ICONS FOR MOST COMMON CMT FEATURES



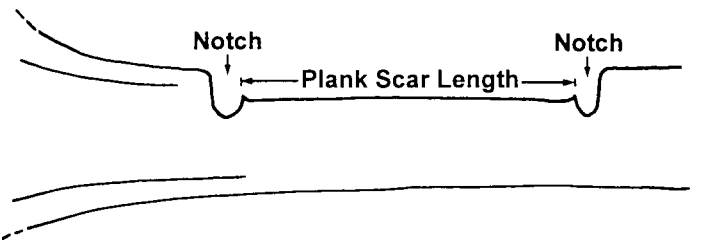
Slope (SLP)

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. 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 large 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]

- 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).

Width (WID)

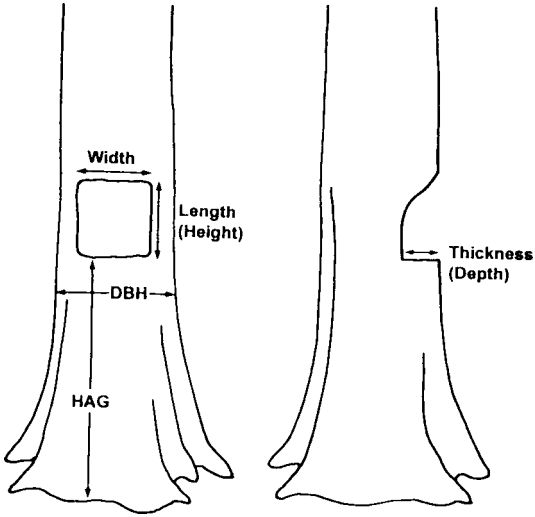
This is the maximum width of a feature in centimetres. If the minimum width of the feature is substantially different, enter minimum width in Field #8 (Comments)

- 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 long axis of the tree. In some cases, these features can be wider than they are high [see figure]
- 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 attributes 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



Selected measurements on test hole, notched and undercut CMTs

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

- if toolmarks present, enter type (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 if 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.

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 or is not recommended for recording.

PROVINCIAL HERITAGE REGISTER

Under the authority of Section 3 of the *Heritage Conservation Act*, the Archaeology Branch maintains a series of registers collectively known as the Provincial Heritage Register. The Provincial Heritage Register includes a Culturally Modified Tree Register. CMT sites recorded using either a Level I or Level II Recording Form will be entered into the Culturally Modified Tree Register if the form is sent to the Archaeology Branch.

Access to the Provincial Heritage Register is subject to provisions on the Fr*eedom of Information and Protection of Privacy Act*, and any reasonable conditions the minister may impose. Only persons with legitimate research or other interests as determined by the Archaeology Branch can obtain site information from the Register. For more information about access to CMT information in the Register, contact the Manager, Inventory and Mapping Section, Archaeology Branch, Ministry of Small Business, Tourism and Culture, Box 9816, Station Provincial Government, 5th Floor, 800 Johnson Street, Victoria, B.C. 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 to many persons. 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. Various aspects of traditional tree and forest use can be reconstructed with the aid of dating, 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. 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 living and dead wood by the study of tree rings. It is the only method devised so far by which CMTs can be dated other than testimony from living persons or written records. Whether or not a particular wood sample can be dated, through the use of dendrochronology, depends on a number of factors, such as tree species, geographic location, physical condition of the sample, and the particular dating methods used. Some general guidelines for recognizing, collecting and dating the most common CMTs are considered here.

WOOD CHARACTERISTICS RELEVANT TO CMT DATING

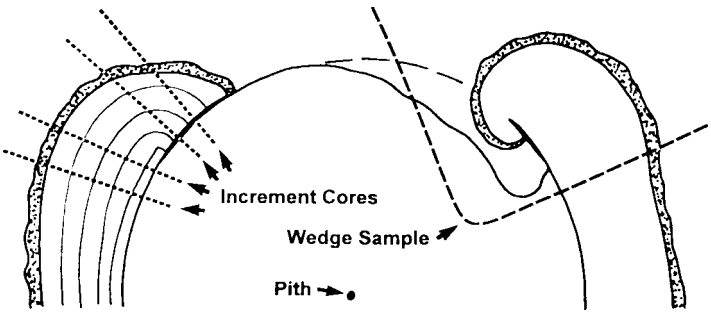
Tree-ring dating of coniferous trees usually involves an examination of the transverse cross section of the tree stem. At the centre of the section is the pith, which is the first ring-year of growth at that height of the tree. As the tree grows, the rings produced are sapwood which turns into heartwood 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 handsaw or chainsaw 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

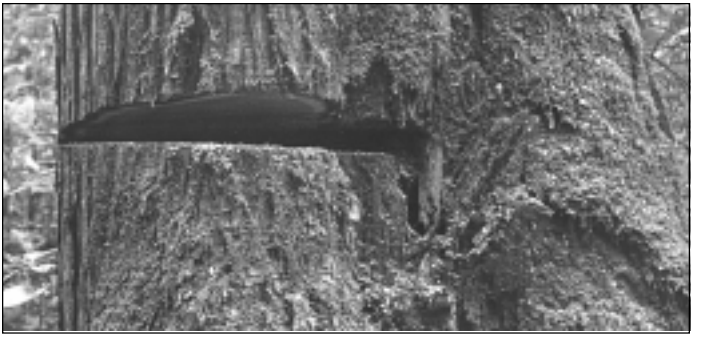
below it (bark-strip scars should be cut at breast height to ensure that the sample is from the scar and not wood exposed after stripping by sloughed bark)
- discs cut from nursing trees should be cut as low on the tree as possible
- the collection of a disc normally requires felling of the nursing tree 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 bark-strip scars is wanted

Wedge Samples

- a wedge is a partial disc removed from the edge of the modification [see figure]
- 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
- the collection of a wedge does not normally require the felling of a tree
- wedge samples are the preferred kind of sample when:
  (i) it is not possible or desirable to fell a CMT or nursing tree
  (ii) the location of the area to be dated is clearly known
  (iii) information on internal scars is not wanted
  (iv) it is not possible to transport large disc samples out of the forest
  (v) rot prohibits the collection of increment cores

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 such as bark-stripped trees



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

Increment Core Samples (continued)

- 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 red cedar
- 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
- when multiple scars, or scars with complex ring patterns are present on bark-stripped cedars, 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:
  (i) exact dates are not required
  (ii) tree damage needs to be kept to a minimum

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 (only if sample is cut from a nursing tree) (the top and bottom will have different dates, especially in slow growing nursing trees)

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, for a sample collected in October of 1996, the cutting date would be 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 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. The most common methods are:

- Ring count on nursing trees growing on CMT features

- Ring count from bark to ring-year of injury (method 1)
- Ring count from bark to ring-year of injury (method 2)
- Ring count from bark to ring-year of injury (method 3)

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. Some sort of tree-ring date always can be determined by counting the annual rings on these trees. This method does not provide an exact date for the modification of the tree 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.

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 red cedar), 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. This method will reduce accuracy 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)

This method should be used for dating CMTs where sapwood decay is extensive, as accurate as possible dates are wanted, and disc or wedge samples can be collected (these are required for this method). This method involves identification of the ring-year of injury. 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 and accidental removal from the sample 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 annual rings or locally absent rings (see glossary).

A Caution

The dating of modifications on CMTs is more complex than the straightforward dating of nursing trees and other unmodified trees. A large proportion of bark-stripped western redcedars have complex ring patterns that are not always easily analysed, and this is particularly true for cedars with multiple modifications, for example, trees with several bark-strip scars. Dating of modifications should be undertaken by someone with appropriate training and experience dating CMTs.

OTHER ASPECTS OF DENDROCHRONOLOGICAL ANALYSIS OF CMTS

Dates and Ages

When undertaking dendrochronological analysis of CMTs, the results can be expressed in one of 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.

Age of Stands

An indirect method of establishing an approximate maximum date for a CMT is to date the 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.

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 red cedar 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 in British Columbia is an internal bark-strip scar stripped in 1467 (The oldest known date for a visible external tapering bark-strip scar on the Coast is 1565).

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 stripping was indeed 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. 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 possible protection under the *Heritage Conservation Act*. The *Act* protects a CMT from damage, alteration or removal if:

- the CMT(s) has been designated by the Lieutenant Governor in Council as a "Provincial heritage site," or
- the CMT was, or, in the case of multiple CMTs, some of the CMTs were, used before 1846, or
- it is reasonable to assume, in the absence of absolute (calendar) dates, that the CMT(s) was used before 1846, or
- the CMT (s) is located on a property deemed to have heritage value and subject to an order for a heritage inspection or a heritage investigation, or
- the CMT(s) is included on a schedule of heritage sites that are of particular spiritual, ceremonial or other cultural value to an aboriginal people which whom the Province has entered into a formal agreement regarding the conservation and protection of heritage sites.

As of this writing (October 1998), one CMT site has been protected through designation as a Provincial heritage site, and the Province has not entered into any agreements with First Nations under the *Heritage Conservation Act* with respect to the protection of CMT sites.

CMT MANAGEMENT

Responsibility for the integration of CMTs and other cultural heritage resources into the Ministry of Forests land and resource management plans and operations is shared by the Ministry of Small Business, Tourism and Culture, and the Ministry of Forests.

The roles and responsibilities of both parties is 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

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)

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 survey (examination), 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 at the time of harvesting or road right-of-way clearing.

AIM: AIM involves the implementation of measures to manage adverse impacts to archaeological sites. Usually these measures are intended to avoid or reduce impacts. An impact management plan includes measures for dealing with 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* (sections 2 and 17) requires the inclusion of cultural heritage resources in both strategic and operational planning. The Operational Planning Regulation 37(1)(e) and Forest Road Regulation 4(8) of the *Forest Practices Code of British Columbia* 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 affecting heritage conservation, the *Heritage Conservation Act* prevails over other legislation, and the Minister of Small Business, Tourism and Culture can still require an AIA where a district manager does not consider one necessary.

For previously unidentified archaeological sites or remains, the *Forest Practices Code of British Columbia Act* (section 51) 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

A person may not alter, that is, change in any manner, a Provincial heritage site or an archaeological site (including CMTs) protected under section 13 of the *Heritage Conservation Act*, without a permit issued by the Minister or designate under section 12 or 14, or an order issued under section 14, of the *Heritage Conservation Act*. The *Act* affords considerable discretionary authority in determining if, and under what circumstances, such permits are to be issued.

Permit Under Section 14: A permit or order issued under section 14 authorizes the holder to undertake a heritage inspection or heritage investigation. The permit allows for the alteration of a site in the course of the inspection or investigation as long as the alteration is consistent with the terms and conditions of the permit. AIAs, the most common kind of heritage inspection, are conducted under a section 14 permit issued to the person undertaking the assessment. Applications for section 14 permits are made to the Archaeology Branch, Ministry of Small Business, Tourism and Culture, which reviews and forwards them for comment to the First Nations in whose asserted traditional territory the AIA is to take place. An application can be for the assessment of a specific proposed development, or for a number of developments during a particular time period and within a specified geographic area (for example, for all AIAs needed in a particular TFL within a calendar year). If the application is properly worded, a section 14 permit can allow for not only the initial field survey, and any alterations to the ground or CMTs involved in the survey, but also any subsequent alterations to CMTs such as the removal of samples for dating

purposes. As discussed earlier in the handbook, this could involve the cutting of wedges from standing CMTs and the felling of standing CMTs for the removal of stem-round disc samples. However, a section 14 permit only authorizes the cutting of a CMT for heritage inspection or investigation purposes, and does not allow the felling or removal of a CMT for other purposes, that is, for milling or other commercial ends.

Permit Under Section 12: A permit issued under section 12 authorizes the holder to alter an archaeological site when the alteration is not part of a heritage inspection or investigation. Examples of alterations to CMTs that could be authorized under a section 12 permit include: felling of standing CMTs; disturbing or moving CMT logs and stumps during yarding; removal of felled CMTs from the cut block (including the removal of CMTs felled under a section 14 permit for the collection of stem-round dating samples) and the milling of CMTs.

Applications for section 12 permits are made to the Archaeology Branch, where they are reviewed and referred for comment to the First Nations in whose asserted traditional territory the alteration is to take place. Section 12 permits can be sought on a development-specific basis, or, in the case of CMTs, submitted jointly with a section 14 permit application for a number of AIAs during a particular time period and within a specified geographic area. In either case, alterations under the section 12 permit cannot be initiated until the AIA for the proposed development has been completed. This includes the review and approval of the AIA report by the Archaeology Branch.

CMTS AS EVIDENCE OF AN ABORIGINAL RIGHT

In addition to comprising an archaeological resource, a CMT may constitute evidence regarding the practise of an aboriginal right. A proposed development that may affect a CMT may constitute an infringement of an aboriginal right where the forest development activity will preclude the continued practice of that aboriginal right. Proposals to remove that evidence should be reviewed through consultation with the First Nation in whose asserted traditional territory a CMT is located. Similarly, whether or not a proposed

development constitutes an infringement needs to be determined through consultation with the First Nation in whose asserted traditional territory the proposed development is located. In either case, consultation should follow the Ministry of Forests Protection of Aboriginal Rights Policy.

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 native Indians 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.

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 which 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.

Cultural or culturally: Synonymous with “human” or “humanly”.

Culturally modified tree: A tree that has been intentionally altered by native 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.

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 level or sloping top on one plane.

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, probably 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 10X hand lens or low-power microscope to be viewed.

Missing annual ring: An annual ring that did not form as is, therefore, 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.

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.

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

Test hole: A four-sided hole chopped into a standing tree, usually 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 color 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.

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 generally 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 a register of recorded CMT sites, but access to this information is made available only under certain conditions.

Two 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)

Possibly more easily available are 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 Katherine 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 native 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:

- *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 1: Coastal Peoples* by Nancy Turner, 1975, Handbook No. 34, Royal British Columbia Museum, Victoria
- *Food Plants of British Columbia Indians Part I1: 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. A source used by archaeologists in British Columbia is:

- *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.

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

- *British Columbia Archaeological Impact Assessment Guidelines (Second Revised Edition)* edited by Brian Apland and Ray Kenny, 1995, Archaeology Branch, Ministry of Small Business, Tourism and Culture, Victoria

APPENDIX I. CRITERIA FOR IDENTIFYING CULTURAL TAPERING 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 native 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 native people, these natural forces and agents include fire, lightning, falling trees, breaking branches, animals, fungi, sun scalding, standing water, 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, unless the tree dies as a result of the damage.

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.

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. 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 at their tops to the tree.

Annual Ring Characteristics

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

(i) expanded growth-ring width caused by increased production of both earlywood and latewood;

(ii) the presence of high density latewood and the absence of low density latewood; and, sometimes,

(iii) 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 tool marks 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 tool marks 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. Scar shape should not be confused with the shape of the scar window.

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 can be determined on a standing tree only when lobe growth is minimal or when scar face deterioration has exposed the sides of the original scar. 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 removed bark from the unstripped portions of previously stripped trees, and people also removed more than one bark strip from a tree at one time. Both would 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. Traditionally, people revisited the same stand of good cedar trees. Presumably, they preferred 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 and standing water). 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.

Relative Age

The presence of multiple bark scars of similar age on one tree or on adjacent 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.