The Significance and Management of Culturally Modified Trees

Final Report

Prepared for Vancouver Forest Region and CMT Standards Steering Committee

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January 13, 1997

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Acknowledgements

This paper benefited from the assistance of four individuals in particular: Sharon Hadway of Vancouver Forest Region, who funded and guided the project; Michael Nicoll Yahgulaanas of the Haida Nation, who maintained an extensive and extended dialogue on the content, and agreed to disagree on several major points; Alexander Mackie of the Archaeology Branch, who contributed his extensive knowledge of the subject matter, Archaeology Branch policy, and his attention to detail; and Arnoud Stryd of Arcas Consulting Archaeologists. The staff at Millennia Research also contributed greatly.

The following persons provided information used in or commented on drafts of the Significance Assessment Guidelines:

Barry Banford, Ministry of Forests
Michael Blackstone, Kispiox First Nation/ University of Northern British Columbia
Vicci Fedema, Arcas Consulting Archeologists Ltd
Dianne Good, Ministry of Forests
Sharon Hadway, Ministry of Forests
Dave Hobbs, Ministry of Forests
Rick Howard, Heritage Consultant
Al Mackie, Archaeology Branch
Rick McLure, US Forest Service
John Maxwell, Millennia Research
Charles Mobley, C.Mobley and Associates, Alaska
Heather Moon, Heritage Consultant
Cindy Nixon, Ministry of Forests
Wilma Robinson, Nuxalk Nation/Ministry of Forests
Arnoud Stryd, Arcas Consulting Archeologists Ltd./ B.C. Association of Professional Archaeological Consultants
Morris Sutherland, Ahousaht First Nation/Ministry of Forests
Kevin Twohig, IR Wilson Consultants Ltd/ B.C. Association of Professional Archaeological Consultants
Julian Wake, Ministry of Forests
Garry Wessen, consulting archaeologist, Washington State
Robert Whitlam, Washington State Historic Preservation Office
Jack Woodward, Woodward and Co. lawyers
Michael Nicoll Yahgulaanas, Haida Nation

PURPOSE

- To provide guidance to archaeologists, foresters, First Nations and others assessing the significance of culturally modified trees;
- To provide an objective and standardized method for the recording and management of CMTs. This paper is intended to be a companion to the Culturally Modified Tree Handbook issued by the Vancouver Forest Region.

PREAMBLE

As one of the more visible, widespread, and distinctive signs of First Nations resource utilization, culturally modified trees constitute an integral part of the archaeological and historical record of Indigenous peoples. Also known as a CMT, a culturally modified tree is defined as a "tree that has been intentionally altered by Native people participating in the traditional utilization of the forest" (Arcas Associates 1984:1).

CMT analysis provides everyone with valuable insights into the nature of pre-historic forest utilization. The study of traditional forest utilization has been used as a means of inferring data on many aspects of aboriginal society, ranging from subsistence patterns, through technological innovations, to social organization and population movements. In many cases, CMTs are the only physical evidence to bear witness to aboriginal use of the land, and therefore have considerable significance to land claims, jurisdictional disputes, and other related issues.

As development, commercial forestry, and urbanization spread throughout British Columbia, significant portions of this archaeological record were destroyed. Although destruction of "traditional" archaeological sites such as villages and human burial sites has been long recognised, huge tracts of prime coastal and riverine forests were cut with no study of CMTs. By the time CMT studies began in the late 1970s, much of the information once present had already been destroyed. As a living organism with a finite life span, CMTs can only preserve evidence of indigenous forest use for a few centuries. The fact that they are themselves part of a primary economic resource makes their management more complex than that of other site types. It becomes increasingly important to respect the knowledge inherent in CMTs and to manage the ways that we interact with these living archaeological sites.

BACKGROUND

In precontact times, CMTs must have been so common as to form part of the normal environment of aboriginal people, and probably seldom elicited comment. CMTs, especially bark-stripped trees, are very obvious in the first few decades after bark-stripping, and the use

of a particular area would have been very noticeable to other people. More specifically, previously stripped cedar trees were probably returned to at regular intervals to re-strip bark from the scar lobes. CMTs must have been discussed in day-to-day life, but direct references to such matters are generally absent from the ethnographic literature. CMTs occasionally are noted in traditional stories, such as one from the Klemtu region where a woman bark-stripped a line of cedar trees to mark a trail to relocate sasquatch-like inhabitants of a remote area (Freeman 1973). In the Interior, James Teit recorded that people sometimes bark-stripped trees (and painted the resulting scars) in remote areas as a sign that people had been there, or as part of puberty training (Teit 1906:265; 282; 1909:789).

CMTs have received at least passing attention throughout British Columbia's written history. The first European land explorer noted the large number of scarred hemlock trees along the route he followed in 1793 and described the edible bark harvesting and processing that made the scars (Mackenzie 1801). Many bark-stripped lodgepole pine, aspen, and birch trees were recorded in the Nechako area by archaeologist Charles Borden in 1951 (Borden 1951). Subsequently, CMTs in B.C. were occasionally recorded by other archaeologists (e.g., Fladmark 1971; Robinson 1973). The first systematic study of CMTs was by Thain White, an American forester who studied the history of ponderosa pine harvesting revealed by CMTs in western Montana (White 1954). It took an additional twenty years before Russel Hicks, drawing upon White's work, pioneered the first formal studies of CMTs in B.C., recording cedar tree modification along the coast (Hicks 1976). Although publication was delayed for several years (Hicks 1985), Hick's work sparked considerable interest in the field of CMT documentation among archaeologists. Then Michael Nicoll, Yahgulaanas, working with the Council of Haida Nations and MacMillan Bloedel in the early 1980s, independantly began to systematically record CMTs on Haida Gwaii (Nicoll 1981). Nicoll introduced traversing and mapping to forestry engineering standards and developed a typology and recording form, and presented his work to the archaeological community.

First Nations, the provincial government and a major licensee implemented a number of pilot studies, encouraging more detailed inventory and analysis. Researchers such as Mackie (1983) and Bernick (1984) introduced systematic inventory, and Arcas Associates (1984) brought in probabilistic sampling, and formal criteria to distinguish cultural from natural scars, leading the way for a "second generation" of research that focused upon aspects of dendrochronological analysis, distribution, and classification (Mobley & Eldridge 1992:56). Mobley (1992: 56) calls some subsequent work a "third generation" of CMT research, where the focus had shifted to the analysis of CMTs as a "cultural resource of substantive anthropological value". Such work includes the large-scale diverse research of Meares Island (Arcas Associates 1986, Volumes 1-4; Stryd and Eldridge 1993) and the intensive investigation of a single cutblock on northern Vancouver Island (Eldridge and Eldridge 1988).

In the 1990s, much of the work on CMTs has been at a small-scale, simply recording CMTs within individual cut blocks or cutting permits. Little analytical work has been

completed, and the data is often presented only in consultants reports and is not standardized and very difficult to collate (Maxwell *et al.* 1996). A few large-scale inventories have occurred (such as the Haida CMT survey, Michael Nicoll Yahgulaanas 1996, personal communication) and there have been two notable analyses of collected data and CMT management strategies in Washington State (Green 1994; Mack 1996). CMT analysis has been incorporated into a number of impact assessments and inventories in Alaska (e.g., Lewis and Mobley 1994). Two CMT overviews were published in scientific journals in the 1990s, one generalizing throughout the Pacific Northwest (Mobley and Eldridge 1992) and one focusing on studies done on Meares Island (Stryd and Eldridge 1993).

First Nations have maintained a great interest in CMTs since the earliest studies. As noted, the Council of Haida Nations assisted in funding and instigating early work on Haida Gwaii (Nicoll 1981; Wilson 1983). The Nuu-chah-nulth Tribal Council contributed to funding and provided logistical support to several projects on the west side of Vancouver Island, including the first Meares Island systematic inventory of CMTs and other sites (Mackie 1983), while the Ohiaht Band contributed funds to a survey in Barkley Sound (Mackie 1986). The Nuu-chah-nulth Tribal Council later funded the second, larger Meares Island CMT study as part of a legal case (Arcas Associates 1986). First Nations individuals have had an important place in research, both conducting independent research (e.g., Nicoll 1981, Wilson 1983) and in participating as research assistants on almost every CMT project since their inception. First Nations have also contributed some of the major academic work to date (e.g., Blackstone 1996).

CMT Management in the United States

In other jurisdictions, CMTs are sometimes fully considered and managed, and sometimes virtually ignored. In Washington State, the Gifford Pinchot National Forest has a Programmatic Memorandum of Understanding between the US Forest Service and the Federal Advisory Council on Historic Preservation (Mack and Hollenbeck 1985). This MoU has been in place for 11 years and has resulted in a large inventory of CMTs and the preservation of one-third of the known population for future research. Over 5,000 CMTs have now been inventoried in the Forest (Rick McLure 1996, personal communication). A masters thesis has examined the work done to date and the management techniques used (Green 1994). Some of Green's criticisms are valuable for others embarking on large-scale inventory and management: a lack of recording standards, an inaccurate model of CMT potential biasing survey results, and a lack of a tracking system to ensure that harvested CMTs are dated. Another comment reflects the paradox over preservation and significance. Green concluded (1994:163) that natural decay will destroy most CMTs before logging enables collection of a large enough number of dating samples to allow analysis of land use patterns.

A publication by the US Forest Service (Mack 1996) provides an important summary of the work in Gifford Pinchot National Forest. Correlations of CMTs are noted with trails,

camps, huckleberry patches, and huckleberry processing trenches. Analysis of stripping dates has clarified the history of berry patch management, epidemics, acculturation, and cultural continuity.

In Washington State the State Historic Preservation Office is slowly moving to implement legally-binding agreements similar to Gifford Pinchot throughout the state (Whitlam 1996, personal communication; McLure 1996, personal communication). CMT studies have taken place in a number of other National Forests in Washington State, and in Oregon, Montana, Colorado, Utah, and New Mexico (Davis 1992.)

In Alaska, the Tongass National Forest has a draft CMT management plan (Mobley and Eldridge 1992), but it has never been finalized and CMT research is sporadic (C. Mobley 1996, personal communication).

CMT Management in British Columbia

In British Columbia, government procedures regarding CMTs have evolved and continue to do so. Some of the key early research was done with Archaeology Branch funding (e.g., Bernick 1984) or because government strongly encouraged licensees to conduct research (e.g., Arcas Associates 1984). CMTs received attention and in some cases protection through goodwill and pressure, as the original *Heritage Conservation Act* provided no automatic protection for these features.

The ways CMTs are dealt with have changed with the amended *Heritage Conservation Act* (1994), the Protocol between the Ministry of Forests and the Ministry of Small Business, Tourism, and Culture, the *Forest Act* (1994), the *Forest Practices Code Act of British Columbia* (1994), agreements with First Nations, and court rulings. There are Draft Guidelines for managing CMTs on the Queen Charlotte Islands/Haida Gwaii (Ministry of Forests 1995, 1996). An interim agreement between the hereditary chiefs of five First Nations of Clayoquot Sound and the Province includes a provision not to cut CMTs without the consent of the First Nation within whose traditional territory the CMTs are located. The Agreement in Principle between the Nisga'a, Canada, and British Columbia states that British Columbia and the Nisga'a Central Government will each develop processes to manage impacts on heritage resources from development ("Cultural Artifacts and Heritage" Paragraph 23), and that processes developed by the Province will apply on Nisga'a lands until such time as the Nisga'a develop their own processes (Paragraph 24). The Meares Island and Stejack Logging injunctions prohibit removal of CMTs and are amongst the longest-standing injunctions in Canadian legal history (Jack Woodward 1996, personal communication).

The Heritage Conservation Act

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 (December 1996), one CMT site has been protected through designation as a Provincial heritage site (Midway Entwined Trees), 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.

Management Roles

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:

- 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
- Archaeology Branch Operational Procedures for Culturally Modified Trees
- 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)

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.

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 (inspection and documentation), an evaluation of the significance of any sites present, an assessment of potential impacts to sites present by proposed development, and the recommendation to the Archaeology Branch of measures to manage adverse impacts. AIAs are conducted under *Heritage Conservation Act* permits. 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 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 practice

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 to the Forest Practices Code of British Columbia Act* (sections 26 and 63) state that an AIA must be carried out for a proposed forestry development (timber harvesting, road construction, etc.) "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 practice must (a) modify or stop any forest practice 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.

A permit or order issued under section 14 authorizes an archaeologist 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 7 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 7 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.

A permit issued under section 12 authorizes a developer 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 12 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 5 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 practice of an Aboriginal Right protected under the Canadian *Constitution*. A proposed development that could affect a CMT may constitute an infringement of an Aboriginal Right where harvesting will remove the type of tree necessary to the practice of that 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.

CMT SIGNIFICANCE

The following section moves on to the discussion of significance. CMT management by foresters must address three forms of significance: scientific or archaeological values; cultural values; and Aboriginal Rights.

Some general statements concerning the scientific significance of CMTs are followed by operational assessment criteria for particular trees or clusters of trees (sites). Cultural significance and public significance are also discussed in separate sections. Scientific significance is considered most important by the Archaeology Branch when managing CMTs as archaeological features. However, for the purposes of **managing forests**, cultural significance and the Aboriginal Rights that may be linked to CMT presence, is equally or more important.

General Statements Regarding Scientific Significance of CMTs

CMTs are significant because:

- CMTs permit rapid, large scale assessments of traditional land use patterns that are less destructive and costly than other forms of archaeology;
- By providing science with accurate and easily accessible data, CMTs permit archaeologists to make inferences about aspects of First Nation's resource utilization, settlement patterns, technological developments, population concentration, and in some cases ritual events (Mobley and Eldridge 1992);
- CMTs are easily recognizable and sometimes associated with the co-occurance of other buried archaeological resources (Mobley & Eldridge 1992: 105);
- CMTs can be viewed as a resource with a high interpretive value and economic potential, of inherent interest to archaeologists, First Nations individuals, and the general public (Mobley & Eldridge 1992: 105)
- CMTs contain a wide range of evidence regarding the application of technical procedures of great interest and application to the increasing numbers of indigenous peoples actively exercising traditional skills, such as the building of large canoes;
- CMTs can verify oral histories, trail locations, and early historic documentation;
- CMTs have the potential to shed light on (at present) poorly understood methods of traditional forest utilization and management, and this could have further implications for current reforestation science.

CMTs are limited in their scientific significance because:

- they do not have the time depth of other archaeological sites, being mostly limited to the late precontact through historic period;
- they often cannot be preserved in the long-term because of the life span of the trees on which they occur. This is not as great a factor for western red cedar, yellow cedar, and Douglas-fir as for other species (since a 400 year old tree could potentially live another thousand years);
- apart from their form, toolmarks, location, and ability to be dated to calendar year, CMTs have limited additional scientific data. The few subsurface excavations around CMTs have met with mixed success. There are potential avenues of research into the effect of aboriginal logging and bark-stripping on micro-environments and adjacent tree

growth, although the possible effects would be extremely difficult to separate from natural causes; and,

- the link between CMTs and conventional archaeological sites needs further study.

Most original CMT research has been conducted by consulting, student, or government archaeologists, rather than faculty-member academics. This could lead to a perception that CMTs are not significant enough for academics to be interested in them. This is not the case. The academic community has directed graduate student work, participated in CMT inventory, and provided peer review for journal articles dealing with CMTs. It seems likely that academics will soon use their research capabilities and interdisciplinary networks to devise fresh approaches to CMT research. One such recent example is that of Lepofsky and Pegg (1995), who studied CMTs in the Kowesas watershed.

Operational Criteria for Assessing Scientific Significance

A temporary rating scheme is given, for use in Districts with no or very small populations of recorded CMTs. A more comprehensive guide follows for Districts with larger existing CMT inventories.

Interim Scientific Significance Guidelines

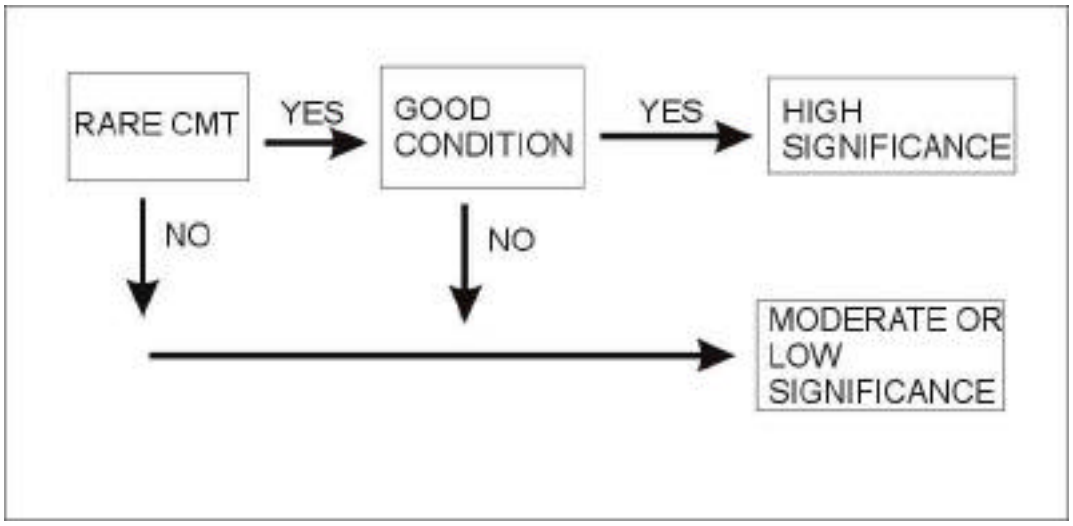
In some Forest Districts, there may be too few recorded CMTs for the detailed rating scheme to work. In this case, a simple scheme is given, with **presumed** common CMT feature types listed by Forest Region (Table 1). A presumption is made that any types not listed as common are rare. As the inventory for individual Districts grows, a switch to the more refined rating scheme is appropriate, since additional types will be found to be common.

Table 1. Presumed common CMT feature types by Forest Region.

Region	Presumed Common Types
01 Vancouver (most Districts have good existing inventory)	Tapering and Rectangular Bark-Strips on western red and yellow cedar. Flat-top, step-top, unclear, and barberchair top stumps and notched or plank-stripped logs (Port Alberni and Port McNeil Districts only).
02 Prince Rupert Coastal Districts (North Coast has good inventory)	Tapering and Rectangular Bark-Strips on western red and yellow cedar.
non-Coastal Districts	Tapering and Rectangular Bark-Strips on western red and yellow cedar. Bark-strips on lodgepole pine. Bark-strips on hemlock trees
03 Kamloops	Bark-strips on lodgepole pine.

04 Prince George	Bark-strips on lodgepole pine.
05 Nelson (almost no inventory to date)	Bark-strips on lodgepole pine.
06 Cariboo	Bark-strips on lodgepole pine.

Figure 1. Temporary Scientific Significance Rating Scheme.



CMT Scientific Significance Rating Scheme

CMT scientific significance criteria are presented as a generalized site significance scheme covering all CMTs within a cluster or "site". However, it may also be necessary to rate significance of individual trees at times, such as when considering altering a cutblock boundary, changing a road layout, or establishing a buffer around a specific tree. Table 2 presents the scheme on a site-by-site basis, while Table 3 should be used for evaluating individual trees.

This scheme provides for a maximum score of 39 and a minimum of 3 for sites, while for individual CMTs the values range from 36 to 1. It allows for sites to be compared to each other over a large area.

The break points between significance levels should be developed and adjusted as projects are completed and the inventory becomes larger. Tentatively, sites scoring more than 30 should be considered highly significant, while those scoring less than 16 should be considered of low significance. For trees, those scoring over 24 would be considered very

significant, while less than 9 would be of low significance. It should be emphasized that the more complete the inventory of CMTs in any District, the more confidence can be placed on significance rating and management decisions.

Confidence in Cultural Origin

This criterion reflects the confidence in the modification having a cultural cause. Where clear toolmarks are present, the confidence would be "definite". A definite rating can also be given in cases where a combination of criteria that individually cannot verify a cultural origin, but together make a natural origin extremely unlikely. However, there are many features, particularly older cultural bark strip scars, that cannot be distinguished from natural scars in the field without falling the tree. Other cultural scars can only be identified from the cross-section revealed on stumps or bucked logs, since the scars have completely healed over. Uncertain scars can usually be redefined as either natural or definite following analysis of the cross-section. Uncertain ratings could also apply to indigenous logged trees where toolmarks have either rotted or been covered over by nursing trees.

Uncertain confidence will sometimes be revised to certain following stem-round analysis. In this case, nearby uncertain CMTs should be re-evaluated for this variable and the management strategy for dealing with these trees may need to be re-examined in light of higher significance.

Number of CMTs

This refers to the number of CMTs within a cluster that has been defined as an archaeological site.

Variety of Types

This category rates significance by the number of types of CMT **features** (as defined in the *Handbook*) present within a cluster that has been defined as an archaeological site. Some sites consist of hundreds of CMTs of only a single type and species (usually bark-stripped). However, a complex work station may consist of only a few trees that represent several different stages of plank removal or canoe construction where a large number of individual feature types are present. The latter site would rate 5 while the former would rate 1.

Condition of CMTs

This category takes into account the condition of the tree or log and the cultural modifications present. A very old stump may have rotted away until only a sliver of trunk remains standing. The stump may be clearly cultural, yet its poor condition suggests that its

significance should be reduced. This should not be confused with "Integrity and Context of Site" criterion.

Table 2. CMT scientific significance criteria for sites.

Criteria	Variable	Score
Confidence in Cultural Origin (Use for most definite feature if more than one present)		
	Definite	3
	Uncertain	0
Number of CMTs		
	more than 20	3
	10 to 20	2
	1 to 9	1
Variety of Feature Types (e.g., barberchair stump, plank notch. Count different species with same morphological type as two types) (use Handbook definitions)		
	more than 5	5
	2 to 5	3
	1	1
Condition of CMTs (tree health, general preservation of cultural features;)		
	Excellent	3
	Good	2
	Poor	0
Presence of Toolmarks		
	Present	3
	Absent	0
Rarity of CMT Types or Context in District (use values for Forest District inventory. High values can be rated for rare CMT types that are present (see Table 3), or for another rare characteristic. Also see temporary rating section below for guidance where Forest District population values are unknown)		
	Unique or Very Rare	5
	Rare	3
	Common	1
Dateability		
	more than 10 Good Candidates	3

	2 to10 Good Candidates	2
	1 Good Candidate	1
	Not Dateable	0

Integrity and Context of Site		
	Excellent: Vicinity undeveloped and has characteristics of old forest	5
	Fair: Vicinity partly modified, undeveloped stands remain	3
	Poor: Vicinity heavily logged commercially, old trees only occur as veterans or as very small stands	0
Direct Relation with Historic Documents or Oral History of Area Use		
	Present	3
	Absent	0
Relationship with other Archaeological Remains		
	Related	3
	Not related	0
Suitablility for Public Education		
	Good	3
	Poor	0
Maximum Possible		39
Minimum Possible		3

Table 3. CMT scientific significance criteria for individual trees.		
Criteria	Variable	Score
Confidence in Cultural Origin		
	Definite	3
	Uncertain	0
Condition of CMT (health, general preservation of cultural features;)		
	Excellent	3
	Good	2
	Poor	0
Presence of Toolmarks		
	Present	3
	Absent	0
Rarity of CMT Types in area (use values for Forest District inventory. This is of most use on a tree-by-tree assessment when deciding which CMTs should be avoided. Also see temporary rating section for guidance where Forest District population values are unknown)		
	Unique or Very Rare: less than 1%	10
	Rare: 1% to 5%	5
	Somewhat Rare: 5% to 10%	3
	Common	1
Rarity of Context (e.g., only known aboriginal logging site more than a kilometre from coast)		
	Rare	3
	Common	0
Dateability		
	Exact Date Probable	3
	"Prior to" Date Probable	2
	Cross-Date Possible	1
	Not Dateable	0

Integrity and Context of Site		
	Excellent: Vicinity undeveloped and has characteristics of old forest	5
	Fair: Vicinity partly modified, undeveloped stands remain	3
	Poor: Vicinity heavily logged commercially, old trees only occur as veterans or as very small stands	0
Direct Relation with Historic Documents or Oral History of Area Use		
	Present	3
	Absent	0
Suitablility for Public Education		
	Good	3
	Poor	0
Maximum Possible		36
Minimum Possible		1

Presence of Toolmarks

Toolmarks not only allow for CMTs to be identified as definitely cultural, but also provide valuable data for studies of traditional woodworking technology, etc. The date of introduction of metal tools and the rate of acculturation as reflected in the adoption of non-Native woodworking and falling techniques are two research questions that can be addressed through toolmarks. Toolmarks are often difficult to find and may be completely covered over by nursing trees or healing tissue.

Rarity of CMTs in Area

If some of the CMT types present are rare, or if the site itself is rare (such as CMTs found in an unexpected location), then this increases the significance of the site. For sites, the scale is judgemental. For individual trees, the numerical relative rarity of CMT Types (see *CMT Handbook*) in a Forest District is measured, and the value is strongly weighted. This measurement requires inventory data to be stored in a form where this information is accessible. It also requires that the harvesting of CMTs be recorded, so the **surviving** inventory is known. For some areas, summaries of the existing CMT database are available. Initially, as a Forest District inventory is built, some CMT types may appear to be more rare than they are in fact. Such CMTs should be assumed to be rare in lieu of more information. The Temporary Scheme (Figure 1) should be used at this stage (see below). The confidence in this rating increases with the size of the inventory.

Operationally, this rating will have a strong effect on management of individual CMTs. It is anticipated that very rare types will normally be avoided through cutblock redesign or buffering, unless poor condition and other factors combine to reduce the overall significance of such a CMT.

Dateability

This criteria assesses the potential for datable samples to be collected from the trees, whether or not such samples have been collected at the time of assessment. Dating samples are normally stem round, "wedge", or increment bore samples (see *CMT Handbook*). Some CMTs may not be dateable, such as an isolated and poorly preserved stump with no nursing trees. "Cross dating" is a complex procedure that uses the pattern of ring widths or densities to compare a dead wood sample to a "master chronology". These master chronologies are being constructed for many parts of the BC coast as part of climate change studies, and redcedar, once thought to be undatable by this technique, can often yield successful samples. CMTs where the exact date of cultural modification is likely to be directly obtained should be rated higher than trees where only an "earlier than" date from a nursing tree or an expensive cross-date can be obtained.

Integrity and Context of Site

Many research questions, such as the effect of very long term selective harvesting on the forest ecology, can only be answered if the site itself is intact and the surrounding area has had minimal commercial alteration. The integrity and context of the site also affects the suitability of the site for public interpretation and for inclusion in other reserves, such as wildlife corridors or winter range.

Direct Relation with Historical Documents or Oral History of Area Use

This criteria is scored for those sites where the CMTs have a direct relationship to historical documents or oral history relating to aboriginal use of the area. The CMTs may assist in understanding or verifying the history, or the historical information may assist in interpreting the data from the CMTs. If the site scores high here, it will also score high in the parallel variable for rating cultural significance.

Relationship with other Archaeological Remains

This parameter is scored when the CMTs are associated with other archaeological remains, such as a shell midden, lithic scatter, or trail.

Suitability for Public Education

The significance of sites or trees that are suitable for public education, such as those with easy access and with well-preserved, inherently interesting features, is considered in this variable. When rating the significance of individual trees, the suitability and potential of removing (in conjunction with falling) a section of the tree for use in a museum or interpretative centre should be considered.

Cultural Significance

Cultural significance is the value placed on the CMT by the indigenous community. The First Nation may place scientific values on CMTs, but may also state spiritual and other complex values. Other values may derive from Aboriginal Rights. In this case, the CMTs may not necessarily be seen as significant in and of themselves, but the activities which produce them may be protected as an Aboriginal Right. Cultural significance as distinct from archaeological significance must be considered by the District Manager in his or her role of determining which management strategies are best suited to balancing the needs of all forest users. Consultation should follow the Ministry of Forests Protection of Aboriginal Rights Policy.

Opinion has been solicited from several First Nations during AOA and AIA work to acquire statements of significance regarding CMTs from the affected communities. In addition, some policies and research directives issued by First Nation representatives are appended to this report. It should be cautioned that these may not be static positions, and that change and evolution of such documents is expected.

The author has perceived several common themes in what most First Nation representatives have stated regarding CMT significance in correspondence and discussions. One is reluctance to rate or rank significance of individual trees for management purposes. Although this is often partly due to unfamiliarity with the specific trees under discussion, I believe there is a more profound aversion to the process of ranking in order to determine which features might be expendable. Many Native people feel that all features that represent their ancestor's physical presence are sacrosanct. There is also great reluctance to remove what many believe to be potentially legal evidence in land use cases or land claims negotiation. In addition, some Native people believe that trees, in particular western red cedar and Douglas-fir trees, have spirits of their own, made more powerful by being associated with ancestor's use.

A second reason to avoid ranking CMTs comes from a holistic ecological view, where all things and people using them are seen to be interrelated. Ecology is seen to be the intersection of known and even unknown variables that are presumed to exist. One of the dangers of conducting archaeological impact assessments is that small parcels of land are examined in isolation, and that the interrelationships of archaeological sites to each other and to the land are often ignored in this type of work. A request to rate significance of individual CMTs is often seen as missing the "big picture."

Another strong theme in the First Nation comments is an understanding of the potential scientific significance of CMTs, especially as related to issues of concern to their community. They are generally supportive of recording and saving as much data as possible from trees that are cut down. It is more common that the greatest effort is primarily directed

to preventing the destruction of trees. Where they are cut down or even cored without consultation, tensions increase and there is a serious loss of working relations.

Despite the general aversion to cutting down CMTs, many First Nations representatives have been flexible when dealing with specific trees. Trees that pose a danger to workers, such as a standing CMT isolated in an area of cable yarding, are often approved for falling if avoidance is shown to be unreasonable, with the admonition that all scientific data be recovered from the tree. Again, the District Managers should follow the Ministry of Forests Protection of Aboriginal Rights Policy and, if there is not an existing working relationship, try to develop one with the help of the list of questions presented below to assess cultural significance

In Washington State, First Nation representatives that were asked for comment regarding the Gifford Pinchot National Forest Peeled Cedar Management Plan in the mid-1980s. While at that time they had no comment regarding the CMTs themselves, they were concerned that suitable trees for future traditional uses were preserved and made available to Natives (Rick McLure 1996, personal communication). On the Makah Reservation, at the south entrance to the Juan de Fuca Strait, a study of CMTs was conducted on behalf of the tribe (Wessen 1995). Wessen states (1996, personal communication) that there are a range of opinions in the Makah community regarding the significance of CMTs and the appropriateness of commercial logging, but that the community had not discussed the issues in any depth, nor come to any consensus as yet.

Concerns over the scarcity of large cedar trees for carving canoes, poles, and ceremonial house beams has been expressed by a number of carvers (e.g., Carl Edgar Sr. [Ditidaht] 1995, personal communication; Kitsumkalum Band **in** Eldridge and Mackie 1992:117). In the past, Native people adopted stratagems in order to continue traditional practices that are probably aboriginal rights, but which conflicted with commercial forestry. For instance, First Nations stripped cambium trees on the sides hidden from roads to avoid censure by Ministry of Forests personnel (G. MacDonald 1982, personal communication to A. Eldridge; Turner *et al.* 1990:102). Concerns over continuing traditional use of trees is often linked to the presence of CMTs, with the CMTs regarded as proof of Aboriginal Rights by many members of indigenous communities.

Questions that can be used to evaluate cultural significance of CMTs are listed below:

- Do the CMTs have association with ongoing traditional harvesting in area? For instance, do CMTs continue to be created during the harvest of bark for ceremonial equipment, or for traditional-style roofing for a nearby fish smokehouse?
- Does this particular site have cultural significance, or is it the cultural activities carried out at the site that are significant?

- Are alternate sites available that would offer the same values necessary to carry on the traditional activities, or is this the only remaining stand of suitable trees in the vicinity?
- Do the CMTs have association with oral traditions about use of area? If ongoing harvesting has not been practiced for a time, are their stories about elder's or ancestor's use of the area? If so, then an argument for aboriginal rights may be weakened, but there is still a strong indication of cultural significance.
- Are the CMTs considered evidence useful for treaty negotiation? If so, will conducting an AIA to locate, map, and possibly date the CMTs be adequate to preserve evidence?
- Are the CMTs useful for educational purposes? Are they currently being used for such purposes? Do schools visit the site to learn about indigenous forestry? Is the site within easy reach of the community, and are there other sites with equivalent CMTs more easily available? In the case of canoe trees, have contemporary carvers expressed an interest in visiting the site to examine traditional methods?
- Do the CMTs represent an economic potential for guided tours? Are there ecotourism operators in the community who currently use, or plan to use the site?
- Do the CMTs have spiritual values, such as *in situ* testimony to ancestor's presence, or spiritual values attributed to canoe tree itself?

Pursuit of these, and similar questions, can lead to a dialogue in which the relative cultural significance of the CMTs become known to the District Manager. A table of significance values, such as provided for the rating of scientific significance, is not given, since the evaluation is expected to be made during a dialogue and may evolve into a wider or more complex assessment than provided above. Many of the questions will also enable an assessment of Aboriginal Rights represented in the area. If a Traditional Use Study has been prepared, the data collected may answer many or all of the questions. Direct access to this information may be limited by data sharing agreements between the Province and First Nation, but it would be expected that First Nation representatives could access the information themselves then make an interpretation to the District Manager.

If a First Nation completely refuses to discuss the matter in consultation with the District Manager, then people familiar with the local economy and community can answer many of the questions. Others questions, such as the presence and nature of any spiritual values attributed to CMTs, and a record of traditional use of the area, might be answered by an ethnographic study or Cultural Resource Overview of local published ethnographies and an examination of archival sources such as ethnographer's field notes. A qualified researcher should conduct any such study.

MANAGEMENT GUIDELINES

Management guidelines are tied to significance evaluation, both from scientific and cultural viewpoints. If CMTs have been identified within a given development area, there are several possible operations management options, depending on significance ratings and other factors:

1. Mitigate negative impacts through inventory of features prior to harvest, followed by collection of dating samples during or shortly after harvesting. Post-impact assessments could also mitigate impacts;
2. Avoid negative impacts by preserving most CMTs with boundary alterations or selective logging. This could be linked with a scheme to preserve a set percentage of CMTs;
3. Avoid negative impacts by delaying harvesting plans; or,
4. Avoid negative impacts by cancelling harvesting plans.

The order does not denote preference. The first and possibly the second option require the licensee to obtain a Site Alteration Permit under Section 12 of the *Heritage Conservation Act.* A Site Alteration Permit allows for disturbance to archaeological remains, whether they be shell middens or CMTs, without contravening the *Act.* Even under Alteration permits, mitigating actions such as the collection of dating samples are normally required.

The first option, unless combined with options two or three, preserves no CMTs for future study and public benefit. Moreover, it is often contrary to the expressed wishes of First Nations, and may not address cultural significance. It may be appropriate if all the CMTs under consideration are rated as "uncertain" under the significance rating guidelines and moreover if they are all "possible" bark-stripped CMTs (which are most likely naturally caused). In this case, the assumption should be, for the purpose of selecting management options, that they are natural features, although they still have protection under the *Heritage Conservation Act* until such time as stem round analysis shows they are definitely natural features. A Section 5 permit would be necessary in order to harvest them. Sites comprised of such features will almost certainly rate as having rather low scientific significance, and should be harvested according to the first or second option with subsequent analysis to determine if they are cultural or natural features. If some are analysed as definitely cultural, then nearby trees should be re-evaluated with a higher score for the "Confidence in Cultural Origin" variable and possibly also other variables. This may affect subsequent development plans.

If the individual CMTs or the CMTs as a whole are rated as having moderate or high scientific or cultural significance (and, almost by default, already be "definite" features), then options two or three may be most appropriate.

The first option can potentially best mitigate loss of scientific significance. Harvesting of the trees following a thorough inventory can allow for dating samples to be collected, which will in turn allow for assessment of cultural or natural origin of any uncertain scars. This aspect could be considered a positive impact, considering that the data would eventually be lost to decay or fire in their natural state.

When dating samples are collected as a mitigative action, stem round samples should be collected from all CMTs harvested in a cutblock (if less than 20), or a sample of 20 to 50 if there are more than 20 harvested CMTs. Fifty samples should be adequate to assess trends of aboriginal use through time if very large numbers of CMTs are present. If the cutblock is adjacent to one with a large sample of dates, the numbers of dated trees can be reduced without endangering significant data loss. Collection and analytical techniques of CMT dating are discussed in the *CMT Handbook.*

Mitigation under option one could also include subsurface excavation of intensive work stations to find additional remains of features and artifacts hidden from view. Post-impact assessments consisting of an examination of stumps for hidden (internal) scars or scars missed during the inventory, and of ground exposures created by logging, may also be considered mitigative. Artificial exposures from logging and logging roads are probably necessary to find the presently rare upland sites which are undoubtedly present through much of the province.

The second option preserves many CMTs for the future while allowing for a sample of dates from unavoidable trees. Small clusters of CMTs bordering cutblocks can usually be avoided by simply adjusting the boundary. In many areas, an inventory of CMTs will identify large areas where there are few if any CMTs or other archaeological remains, where harvesting could continue with no further archaeological concern. Many impact assessments allow time for only the block itself to be surveyed. Occasionally, a buffer survey will also be asked for by a client, to allow for boundary modifications while retaining overall timber volumes within a given block or group of blocks. Where CMTs are particularly abundant, however, it may be cost effective to survey much larger areas, allowing harvest planning to be concentrated in those areas with few or no CMTs and providing a large inventory on which to rate significance and base management decisions.

Avoidance of particularly significant CMTs by modifying a border or leaving a tree within a cutblock may also require a buffer around the tree for a sense of context and wind-firmness. Techniques to make a remaining tree windfirm after logging are relatively new and developing; the latest methods deemed suitable for the situation should be used. An archaeologist and a qualified member of the relevant First Nation should be actively involved in the planning of mitigative buffers to ensure that the buffers will protect heritage values.

Avoidance of CMTs in areas where selective logging is the norm should be straightforward.

The third and fourth options, to delay or cancel operations, may be appropriate for particularly significant CMT stands. In general, it is not the intent of the Province to halt development and harvesting of forest lands through protection under the *Heritage Conservation Act*, but rather to address heritage issues and manage impacts. The *B.C. Archaeological Impact Assessment Guidelines* states (Section 2.2, page 6):

> The role of the Branch is not to prohibit or impede land use and development, but rather to assist the Provincial Government in making decision which will ensure optimal land use. When the benefits of a project are sufficient to outweigh the benefits of archaeological preservation, the Branch's primary concern is to work with the proponent in determining how the project may be implemented with minimal loss to archaeological resource values. If appropriate impact management practices are adopted, it is usually possible to minimize the loss of archaeological resource values in a cost-effective manner. Where the loss of significant archaeological values cannot be adequately mitigated, the role of the Branch is to ensure that appropriate compensatory measures are implemented [British Columbia 1995.]

Understanding traditional aboriginal forest management and forest ecology requires CMTs to be studied in context with their surroundings. Isolated patches of trees (which might result from option 2) may not be sufficient to further our understanding. Additionally, small patches of forest coverage may have low survival rates; while the CMT may survive the initial impact, there may be secondary impacts, such as an altered ecosystem, a change in wind patterns that results in blowdown, ease of access leading to vandalism, etc. Sufficient CMTs should remain in a region to ensure that representative stands are left intact in parks, special management zones, and the like. This may be difficult to determine without some regional inventory or probabilistic sample survey taking place, and Option 3, (deferred harvesting), may be appropriate where the inventory of nearby protected areas is poor.

RECORDING STANDARDS

The Archaeology Branch currently is considering the adoption of two levels of recording, derived from existing policies and the *CMT Handbook*.

The Level 1 form is designed for reconnaissance surveys, which could be undertaken by MoF, Industry, First Nation, or archaeological personnel, but is especially useful for Timber Cruisers to use during forest inventory. This level of survey records a bare-minimum of site information (CMT presence, location, and types, with some descriptive account of density) and is intended to provide basic inventory on a broad scale.

Level 2 forms are standard B.C. Archaeological Site Inventory Forms, but a new individual CMT Feature Recording Form has been developed to accompany Level 2 and, where possible, Level 1 forms. The feature forms are suitable for intensive detailed recording, usually at the Impact Assessment stage. These procedures would include a numbering

system for individual CMTs, locational information, CMT classification, metric description of the tree and features, and details of visible tool marks, etc. Some dating, using an increment borer or chainsaw (on scar margins), may be appropriate to determine modification age of select CMTs. Forest type, slope, association with other features, photographs, and so on would also be recorded. In practice, areas with dense CMTs may have too much data to fully record each feature during the impact assessment process. For instance, large areas bordering Ucluelet Inlet have 25 CMTs per hectare (Eldridge 1988). A single 20 hectare high CMT density block could have 400-500 CMTs. During the impact assessment process, a sampling approach to such areas would be appropriate. However, if such high density areas are harvested, detailed recording of all CMTs as part of mitigative data recovery should be considered. As the number of CMTs with descriptive data grows large in a district, the requirements for detailed recording may decrease.

Detailed investigation including subsurface investigations at CMT sites could also occur as mitigative action. Such work would follow normal archaeological recording standards.

The following groups of people should have adequate training to complete Level 1 or Feature Recording forms, as required.

Ministry of Forests/ Industry

Forestry personnel (particularly timber cruisers, inspectors and monitors) should be trained to identify CMTs. The basic Level 1 recording forms should be used by these personnel. Feature Recording Forms should be used for unusual features. A study of the *CMT Handbook* supplemented by in-field workshops would assist this work.

Archaeologists and First Nations Cultural Inventory Technicians

All consulting archaeologists and First Nation Cultural Inventory Technicians should receive standardized training on the identification and recording of CMTs through workshops given by a training consultant, or those hosted by the B.C. Association of Professional Consulting Archaeologists. Separate workshops should be available for CMT identification and recording methods, and CMT dating and cultural origin confirmation methods. Any consulting company providing dating services should have available or on staff either a dendrochronologist or an archaeologist with CMT dating workshop training.

Consulting and academic archaeologists should use either Level 1 forms (in the case of overview, large-scale inventory, or reconnaissance surveys) or CMT Feature Recording forms (in the case of specialized CMT studies, impact assessments or mitigative studies). The latter forms will be used in conjunction with a B.C. Site Inventory Form. Government ministries should provide both CMT forms in both paper and electronic database formats.

Site Definition

The definition of CMT site boundaries, like those of large, dispersed lithic scatters or other widespread archaeological sites, are difficult to standardize, and must largely be left to the discretion of the researcher. In many cases, CMTs occur in well-defined clusters, that would correspond most closely to what archaeologists regard as a "site". In the case where foresters send in Level 1 forms for particular areas, the Archaeology Branch staff may decide which to combine into sites assigned Borden Numbers. The Archaeology Branch may also decide to lump or split standard Site Inventory Forms and their accompanying feature recording forms. As will be discussed below, the ideal situation is for each individual CMT to be entered as a record in a GIS.

Archaeology Branch Inventory

The Archaeology Branch's current electronic inventory is nearly impossible to use for CMT analysis. Some of the analytical requirements of management recommended above require easy access to the data (such as determining, in percentage, the frequency of a particular feature type within a Forest District). There is a real danger of collecting data on tens of thousands of CMTs and storing it in a manner that makes further analysis prohibitively expensive. Researchers in the future can be expected to increasingly want access to standardized data—so that one can quickly determine the average diameter of standing plank-stripped red cedar trees compared to those of felled plank-stripped trees or barber-chair cut stumps—for instance. Analysis of CMT locational data and environmental variables will also become more and more in demand. Therefore, the best method of inventorying and managing CMT data is to enter each Feature Detail Form as an individual record in a database linked to the digitized tree location. This could form a separate layer on the Archaeology Branch's ARC/Info GIS. Groups of CMTs could be assigned Borden Numbers which in turn could be cross-linked to a brief entry in the ARC/Info site layer.

This data could then be easily linked through the GIS to environmental and physiographic data available in TRIM and elsewhere. In order to minimize input time, permit holders would be required to submit data in dBase-type or spreadsheet formats, or as delimited ASCII "flat" files, using a standard database structure. A simple append command would then be all that was needed to add the data to the database. Unfortunately, accurate digitized locations could be more difficult to capture unless the researcher has access to a GIS, or if the Archaeology Branch agrees to digitize from 1:20,000 or 1:5,000 paper maps (this could be done even while the GIS base is at 1:250,000).

The CMT inventory, in this format, could be used as a management tool. In Gifford Pinchot National Forest, Washington, a legal agreement preserves one third of the CMTs in the inventory for future research, while two-thirds are available for harvesting (see appendix, Mack and Hollenbeck 1985). This requires having accurate information on counts of every

CMT in the region. If a similar approach is adopted in British Columbia, or parts of the province, then the only reasonable way of managing the resource is by using GIS.

REFERENCES CITED

Arcas Associates

1984 *Meares Island Aboriginal Tree Utilization Study.* Unpublished report prepared for MacMillan Bloedel Ltd., Vancouver B.C. (Copy on file at the Heritage Conservation Branch, Victoria, B.C.)

1986 *Native Tree Use on Meares Island*.(Four Volumes: I Summary: II Introduction and Background; III Archaeology; Ethnography and Final Remarks) Unpublished report prepared for Rosenberg, Rosenberg, and Woodward, Barristers and Solicitors, Vancouver B.C.(Copy on file at the Heritage Conservation Branch, Victoria, B.C.)

Bernick, Kathryn

1984 *Haida Trees: Remains of Canoe Manufacture in the Forest of Southern Masset Inlet*. (Prepared under permit #1984-5). On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Borden, Charles E.

1951 B.C. Archaeological Site Inventory forms for Ootsa, Eutsuk and Whitesail Lakes. On file, B.C. Archaeology Branch.

Blackstone, Michael

1996 Painted tree sites in the Pacific Northwest. Draft MA thesis, on file with the author.

British Columbia

1995 *British Columbia Archaeological Impact Assessment Guidelines*. Second revised edition. Ministry of Small Business, Tourism and Culture, Archaeology Branch.

Davis, Jefferson D.

1992 Culturally modified tree working group. Information Handout. Copy in possession of Millennia Research.

Edgar, Carl Sr.

1994 Personal communication. Ditidaht elder.

Eldridge, Morley

1988 *Mercantile Creek, Ucluelet Inlet Heritage Impact Assessment* (Permit No. 1988-2). On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Eldridge, Morley, and Eldridge Anne

1988 *The Newcastle Block Culturally Modified Trees.* On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Eldridge, Morley and Alexander Mackie

1992 Overview Assessment of Heritage Values in the Kalum South Resource Management Area. Non-permit report submitted to Ministry of Forests and on file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Fladmark, Knut

1971 B.C. Site Inventory form for FkUb-2. On file, Archaeology Branch.

Freeman, William

1973 The *Pukwi'ss* comes to the Village of Kwee. *In* Susanne Storie and Jennifer Gould, eds: *Klemtu Stories*. British Columbia Indian Advisory Committee.

Green, Kellie

1994 *Peeled Cedar Trees in South Central Washington: Management Practices and Research Potential*. Thesis presented to Western Washington University.

Hennon, P.E., E.M. Hansen, C.G. Shaw III

1990 Causes of Basal Scars on *Chamaecyparis nootkatensis* in Southeast Alaska. *Northwest Science*, 64(1):45-54.

Hicks, Russell

1976 *Culturally Inflicted Injuries to Cedar Trees on the Northwest Coast.* Report on file with the Archaeology Branch, Victoria, B.C.

1985 Culturally altered trees: a data source. *Northwest Anthropological Research Notes* 19:1:100-118.

Lepofsky, Dana and Brian Pegg

1995 *Aboriginal Forest Use in the Kowesas Watershed.* (Permit report # 1995-156). Dept. Archaeology Simon Fraser University. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Lewis, Michael and Charles Mobley

1994 *Culturally modified trees at Bartlett Cove, Glacier Bay National Park, Alaska*. Report prepared for National Park Service Alaska Region by Charles M. Mobley and Associates.

Mack, Cheryl A.

1996 *A Summary of Archaeological Data Recovery at Twenty-Four Culturally Modified Tree Sites on the Gifford Pinchot National Forest.* US Department of Agriculture, Forest Service, Northwest Region, Mt. Adams Ranger District, Gifford Pinchot National Forest.

Mack, Cheryl and Barbara Hollenbeck

1985 Peeled cedar management plan. Manuscript on file, Gifford Pinchot National Forest, Pacific Northwest Division, USDA Forest Service.

Mackenzie, Sir Alexander

1801 *Voyages from Montreal, on the River St. Lawrence, through the Continent of North America, to the Frozen and Pacific Oceans, in 1789 and 1793.* Printed for T. Cadell Jr. , London. (Reprinted in the Journals and Letters of Sir Alexander Mackenzie, edited by W. Kaye Lamb, Cambridge University Press, Cambridge, Mass.)

Mackie, Alexander

1983 The l982 Meares Island archaeological survey: an inventory and evaluation of heritage resources.

1986 A closer look at coastal survey results. *The Midden* Vol xviii, No.1:3-5.

1996 *Personal Communication.* Archaeology Branch research officer.

Maxwell, John, Duncan McLaren, Robin Chattan, Tanya Hoffman, and Morley Eldridge.

1996 *Heiltsuk Archaeological Overview Assessment*. Prepared for the Archaeology Branch, Victoria, B.C. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

McDonald, George

1982 Personal communication to A. Eldridge. Canadian Museum of Civilization Director.

McLure, Rick

1996 Personal Communication. Forest Archaeologist, Gifford Pinchot National Forest, Washington.

Ministry of Forests

1995 Culturally modified tree guidelines for forest management activities on the Queen Charlotte Islands/Haida Gwaii. Sixth Draft incorporating CHN input up to March 24, 1995 meetings. Draft guidelines on file with Ministry of Forests, Queen Charlotte City.

1996 Culturally modified tree guidelines for forest management activities on the Queen Charlotte Islands/Haida Gwaii. Eighth Draft. Draft guidelines on file with Ministry of Forests, Queen Charlotte City.

Mobley, Charles

1992 An archaeological reconnaissance at Indian Point near Auke Bay, Juneau, Alaska, Including Six Timber Harvest Units. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

1996 Personal Communication. Consulting archaeologist, Alaska.

Mobley, Charles and Morley Eldridge

1992 Culturally Modified Trees in the Pacific Northwest. *Arctic Anthropology* 29(2):91-110.

Nicoll, T. Michael [Yahgulaanas]

1981 Report on a survey of Haida forest utilization, Masset Inlet, Queen Charlotte Islands, B.C. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

Robinson, Michael

1973 British Columbia Site Inventory Form for FkUd-1. On file, Archaeology Branch.

Stryd, Arnoud H. and Morley Eldridge

1993 CMT Archaeology in British Columbia: The Meares Island studies. *B.C. Studies* No. 99, Autumn, pp. 184-234, Vancouver, B.C.

Teit, James

1906 *The Lillooet*. American Museum of Natural History Memoir Vol 4 part 5 (AMS reprint).

1909 *The Shuswap*. American Museum of Natural History Memoir Vol 2 part 7 (AMS reprint).

Turner, Nancy J., Laurence C. Thompson, M. Terry Thompson, Annie Z. York

1990 *Thompson Ethnobotany: Knowledge and usage of plants by the Thompson Indians of British Columbia*. British Columbia Provincial Museum Memoir No 3.

Wessen, G

1995 *The Makah forest utilization study. Culturally modified trees on the Makah Indian Reservation*. Prepared by the Makah Cultural and Research Centre with support from National Park Service Historic Preservation Fund Grants to Indian Tribes and Alaska Natives Grant 53-93-NA-5302.

1996 *Personal Communication.* Consulting archaeologist, Washington State.

Wilson, Richard "Wanagan" (Council of the Haida Nation)

l983 Aboriginal forest utilization study Feb/June l983. On file with the Culture Library of the Ministry of Small Business, Tourism, and Culture, Victoria, B.C.

White, Thain

1954 Scarred trees in western Montana. *Montana State University Anthropological and Sociological Paper* 17.

Whitlam, Robert

1996 Personal communication. Washington State Heritage Protection Office archaeologist.

Woodward, Jack

1996 Personal communication. Lawyer, Woodward and Co., Victoria, B.C.