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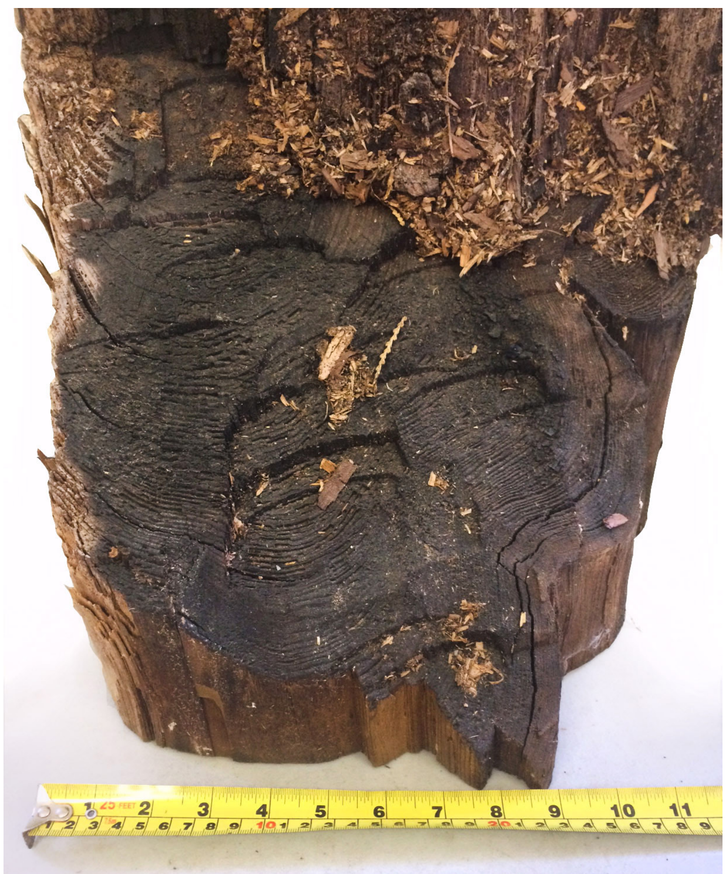
Culturally Modified Trees
Part II



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Cover: *Sample of Aboriginally Logged Cedar recovered from Heiltsuk Territory, thanks to Elroy White.*

"The trees you do not need…":

Culturally Modified Forests and the Tsilhqot'in Ruling

by Jacob Earnshaw

Introduction

Culturally Modified Trees, or CMTs, are tangible representations of First Nations forest use throughout the Northwest Coast. At the landscape level, their temporal and spatial coverage hold immense potential for answering questions related to human use of forests in the past. They also provide conditions for the establishment of Aboriginal Title to the land as shown by the recent Supreme Court's Tsilhqot'in decision. Despite their inherent value, CMT investigations in British Columbia have rarely broadened beyond site specific studies and are largely confined to archaeological inventory. In this paper I make an argument for the importance and true extent of cultural forests by giving an overview of the current record of CMTs within Nuu-chah-nulth territories on the west coast of Vancouver Island. The data collected from this area provided the basis for themes set out in my Master's research at the University of Victoria (Earnshaw 2016).

The post-contact history of Nuu-chah-nulth forests is one of dispossession of people from their land; This transfer of control was predicated on the mistaken perception that the forests of local First Nations were insufficiently used. Today we see that the harvest of cedar resources was a continuous and essential practice for communities on the west coast of Vancouver Island and many other Northwest coast First Nations. Forest management systems left their mark in the form of CMTs and are abundantly visible in coastal forests. These features, recorded in the archaeological record, reveal important connections with contemporary issues of occupation, ownership and land rights.

Origins of Misunderstandings: Early European Perspectives

How it is that the cultural forest landscapes of the Northwest Coast have been considered 'empty lands'? Early accounts of explorers and newcomers on the Northwest Coast are riddled with expedient misunderstandings about indigenous use of the land and the origins of local anthropogenic landscapes (example see Lutz 1995). The complex uses of the land by local people have only recently entered Western scientific knowledge systems. To introduce these misconceptions I quote some opening passages of Gilbert Sproat (Sproat 1868) in his Scenes and Studies of Savage Life set in Alberni Channel and Barkley Sound in the 1860s. Ahead of establishing one of the first sawmills on the west side of the island, Sproat–a colonial official-evicted the local Tseshaht Nation from one of their primary villages with a show of military force. While rationalizations in his manuscript for their removal crystallize the logic of dispossession taken by colonial governments and settlers, they also reveal something of the longstanding indigenous assertions of the inalienable nature of their ties to the land. He records the "chief of the Sheshahts" saying

> *"We do not wish to sell our land nor our water; let your friends stay in their own country."*

To which I rejoined: "My great chief, the high chief of the King-George-men, seeing that you do not work your land, orders that you shall sell it. It is of no use to you. The trees you do not need; you will fish and hunt as you do now, and collect firewood, planks for your houses, and cedar for your canoes. The white man will give you work, and buy your fish and oil" (Sproat 1868:7).

In a later reflection on colonial attitudes towards indigenous property rights, Sproat wrote of American and British settler logics,

The American woodmen…. considered that any right in the soil which these natives had as occupiers was partial and imperfect, as, with the exception of hunting animals in the forests, plucking wild fruits, and cutting a few trees to make canoes and houses, the natives did not, in any civilized sense, occupy the land.

…. My own notion is that … we might justify our occupation of Vancouver Island by the fact of all the land lying waste without prospect of improvement…. Any extreme act, such as a general confiscation of cultivated land, or systematic personal ill-treatment of the dispossessed people, would be quite unjustifiable (Sproat 1868:7-9).

Sproat's reflection is loaded with assumptions about indigenous land use. The understanding he and other newcomers held of land management systems were based in the familiar bounded agricultural landscapes of Europe: fields of crops, animal pastures and cleared forests. To the European perspective, activity of local peoples was that of hunters and gatherers largely confined to coastal margins. Sproat and his contemporaries were debating principles of common land tenure, in which the notion of 'occupancy' is a key measure of ownership. Their particular Eurocentrism prevented them from considering what occupancy means from an Indigenous perspective. This matter was recently clarified by the courts as an essential to Indigenous land rights and title, as I will discuss below.

Anthropological literature often favours the social and economic significance of fishing and hunting on the coast over that of the forest. Anthropologist Philip Drucker was among many who thought Northwest Coast populations largely avoided the deep forest:

The woods, seen from the water, seem to form an impenetrable mantle over the irregular surface of the land. After one finally breaks through the luxurious growth along the margin, he finds himself in a dark gloomy moss-covered world. Huge trunks rise straight and branchless.... It is scarcely to be wondered at, what with the ruggedness of the rockbound mountainous terrain and the dense tangle of vegetation, that the native population for the most part frequented the woods but little…. The land was forbidding, difficult to access. It is entirely possible that in recent times restless white prospectors, trappers, and timber cruisers, may have explored areas in the interior of the island that no Indian ever trod… (Drucker 1951:8-10)

Drucker's description here is speculative and not grounded in long-term empirical observation. It reflects his own bias and experience rather than that of his Nuu-chah-nulth informants. Had he ventured further afield his experience may have been different (see Chittenham quote, Eldridge 2017, this volume). Many written descriptions of the coast at this time illustrate a European ideal of the untouched 'Forest Primeval', fringed with scattered villages and campsites. This vision of a wilderness devoid of human interference remains a canon of Canadian identity. In British Columbia this view of the land still casts a shadow over interpretations of Indigenous rights and title to the land.

Coastal Historical Ecology

The proliferation of salmon and abundant marine environments on the Northwest Coast has long been used to explain the region's rich human history of large populations and highly stratified social organization. Recent ecological and archaeological studies suggest other processes are at play. Many traditional resource collection sites on the coast were modified to maximize harvests over the long term in ways that mimicked ideal natural processes (see: Deur 1999; 2002; Deur and Turner 2005; Lepofsky 2004; Mobley and Eldridge 1992; Stryd and Eldridge 1992; Turner et al 2013). Clams were dug in most natural beaches, though due to local resource pressures some coastal groups created monumental clam gardens which produced greater harvests of particular shellfish species (Groesbeck et al. 2014). Likewise, while camas, clover and other root crops were dug in natural prairies throughout southeastern Vancouver Island and the south coast, human induced fire allowed for more expansive prairies in which to manage harvests and hunt game (Beckwith 2004). Similar land management and intensification regimes are noted in hillside berry patches (see Forney 2016), shoreline estuarine gardens (Deur 2005) and wapato ponds (Darby 2005).

Cedar, more so than any other forest resource, was con-

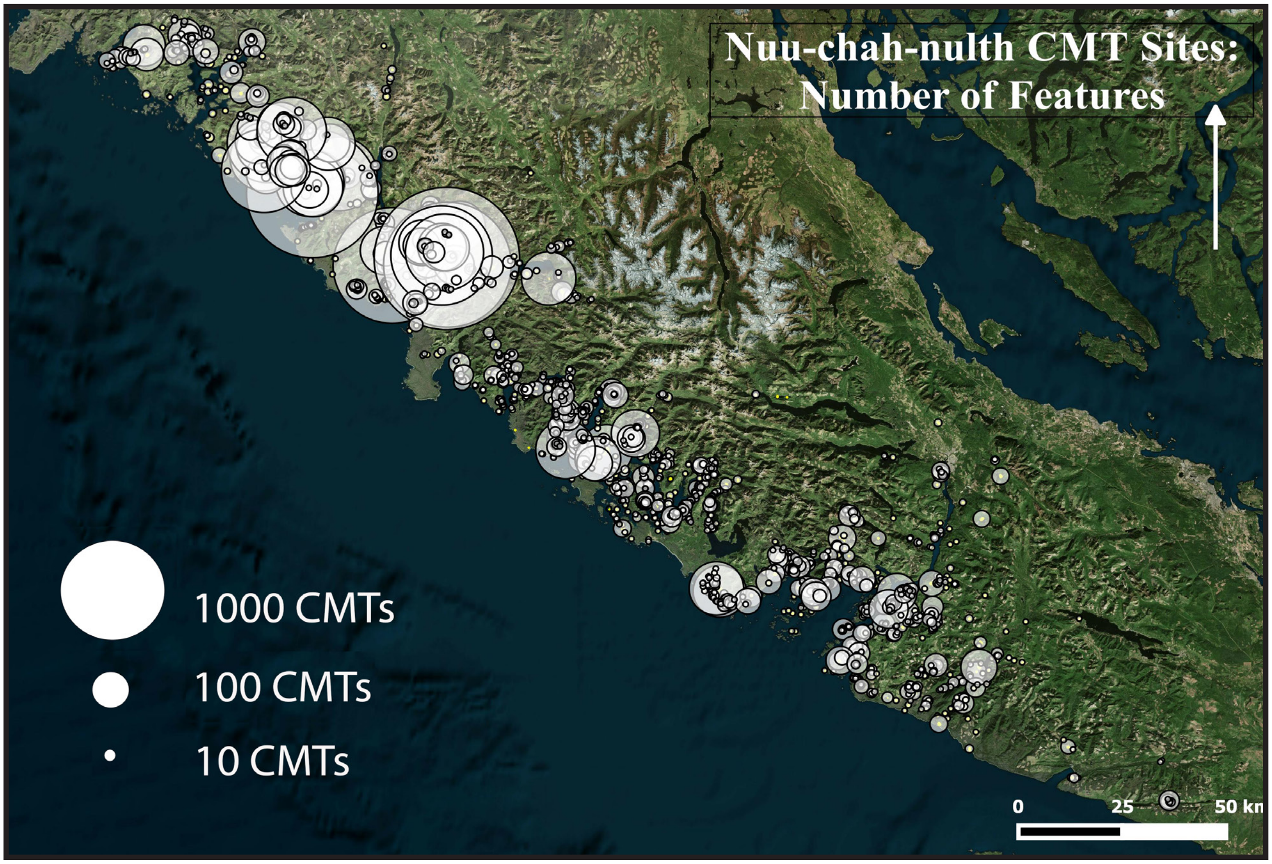

Figure 1: Numbers of CMT features found, per site, in Nuu-chah-nulth Territories.

sistently in demand, and was arguably universally managed across Northwest Coast landscapes (Stafford and Maxwell 2006; Eldridge 2017, this volume). Few could downplay the importance of Western Redcedar (*Thuja plicata*) or Yellow cedar (*Cupressus nootkatensis*) to Northwest Coast cultures (see Stewart 1984a). Every cedar item ever created and used on the coast had its extraction scar or 'photo-negative' (Rautio et al. 2014:138) somewhere within Northwest Coast forests. Every bark napkin, rain hat, cord, basket, robe, mat, headband, and fishing net, every wooden paddle, canoe, plate, arrow, storage box, plank, mask and pole has its removal scar mark in the coastal forest landscape. As with other resources, regional demands on cedar resources led to harvesting practices that would extract the highest possible sustainable yield from trees (Eldridge 2017, this volume). Single trees were harvested for their bark repeatedly over generations, with older healing lobes repealed decades later. Almost all medium to large CMT stands show evidence of multiple harvesting and intensive use (example see Sanders 2017, this volume). Often up to half of modified cedars in large CMT stands exhibit multiple harvesting events of bark on single trees (See also Arcas 1999; Eldridge and Eldridge 1988; Eldridge et al. 1989). These intensively used anthropogenic stands of cedar exist entirely within the realm of human modification and intent, harvested consistently by untold generations (Ingold 1993; Oliver 2007).

The Growing Record

The counterintuitive dichotomy of First Nations people as recipients of forest resources but not people of the forest is slowly being dispelled by the extensive accumulation of CMT records in the realm of Cultural Resource Management (CRM). These data substantiate indigenous oral histories and are logical given the dominance of wood products in Northwest Coast material culture . Today CMTs are the most common archaeological site type in coastal regions of BC by a factor of about two to one (RAAD 2017). The vast distribution of sites is the culmination of only about three decades of archaeological survey, and show that CMTs may be found at any distance from water bodies within intact forest environments (Stafford and Maxwell 2006:9, Stewart 1984b. reprinted this volume).

A review of CRM site forms and reports for just Nuu-chah-nulth territory on Vancouver Island's west coast reveals there are well over 53,000 CMTs contained within 2226 CMT sites (Figure 1, as of March 2017;[RAAD 2017]). Over three quarters of these were (or are) repeatedly visited, multiple use stands of cedar, 152 of which are large stands of over 50 CMTs. The 15 largest sites contain

Figure 2: Embedded tapered bark strip scar, Barkley Sound

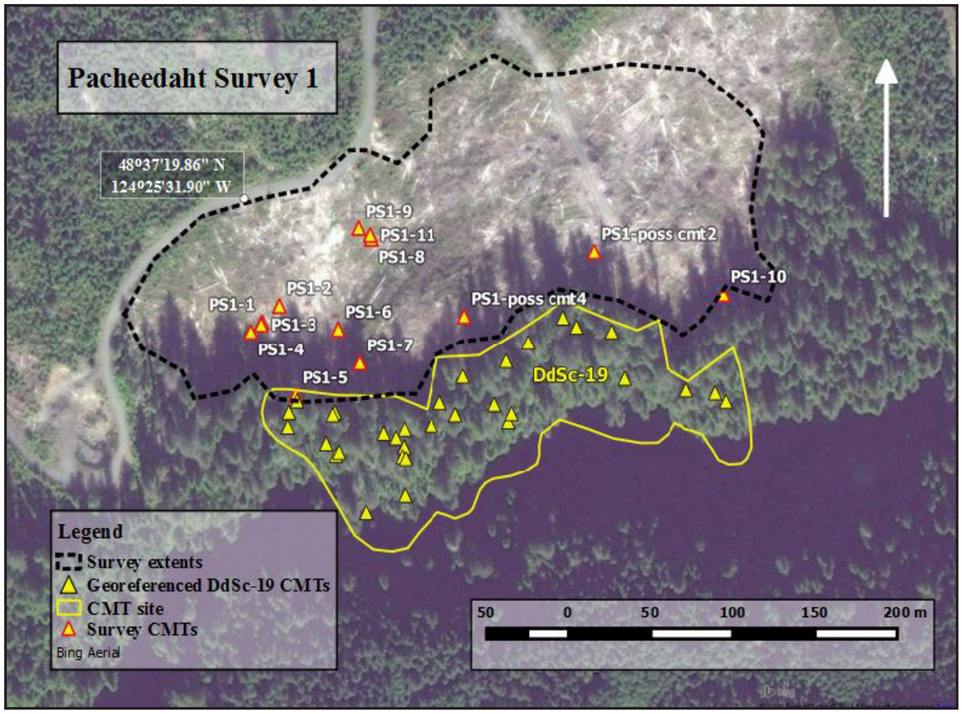

Figure 3: Example of distribution of overlooked CMTs in majority of my post-impact surveys.

500 to over 3000 CMTs, representing forest use areas that cover entire mountains sides and interconnect with each other across whole watersheds. However, it must be noted that this growing record of cultural forests is only the remnant traces of a much larger anthropogenic landscape. The current record of CMT sites does not include:

- Old growth forests erased of their cultural heritage due to over a century and a half of industrial clearcut logging prior to CMT protections of the 1990s.
- The cultural stands left unsurveyed and undiscovered at the edge of cut-block boundaries that are out of the scope of project budgets, or within the few remaining un-'developed' forests.
- All the embedded scars overlooked in surveyed forests over the last three decades. Embedded scars are those that have become sealed in, or obscured within their healing lobes and no longer identifiable in a standing tree (Figure 2).

Though yet unpublished, the findings of my thesis work within Nuu-chah-nulth territory found that over 50% of CMTs are systematically overlooked in AIAs due to embedded or overly degraded cultural features. All revisited CMT sites surveyed during my post-impact assessments contained unrecorded and thus logged ancient bark strip features (Figure 3). Primarily due to embedded or obscured scars, it is likely that fewer than half of all existing cultural bark harvest features are actually identified by archaeologists within cut-block boundaries using only pre-impact assessment methodologies (Earnshaw 2016).

Though the distribution of CMTs within recorded archaeological sites is extensive across the province, the archaeological database suggests these cultural use sites have clear and tight boundaries (Fig. 4). As noted above, these protected zones only represent current and historic industrial logging activity, arbitrary protection buffers, and visible scarring on cedars. How confidently can we consider these boundaries as true outlines of indigenous forest use? In areas where cedar was prominent and stands accessible, it is likely that many harvesting sites had few distinguishable "boundaries" at all. To trek outside of a marked cut-block boundary or identified archaeological site surrounding CMTs today, more often than not, is still a walk through a cultural forest housing evidence of indigenous use. The only true boundaries of sites may have been along the blurred lines of forest type, accessibility, and the temporal boundaries of ownership and memory, related to the intergenerational periods of visitation by harvesters. While evidence shows that not all stands of cedar were regularly utilized, consistent management of particular cedar forests occurred over great swaths of land all across Vancouver Island and elsewhere on the coast.

CMTs, as evidence of longterm cedar harvesting, forcefully demonstrates the land was not "lying waste" (Sproat 1868:8), but was part of a system of ownership, stewardship, and sustainable resource management that improved harvests for human use and maintained forest resources.

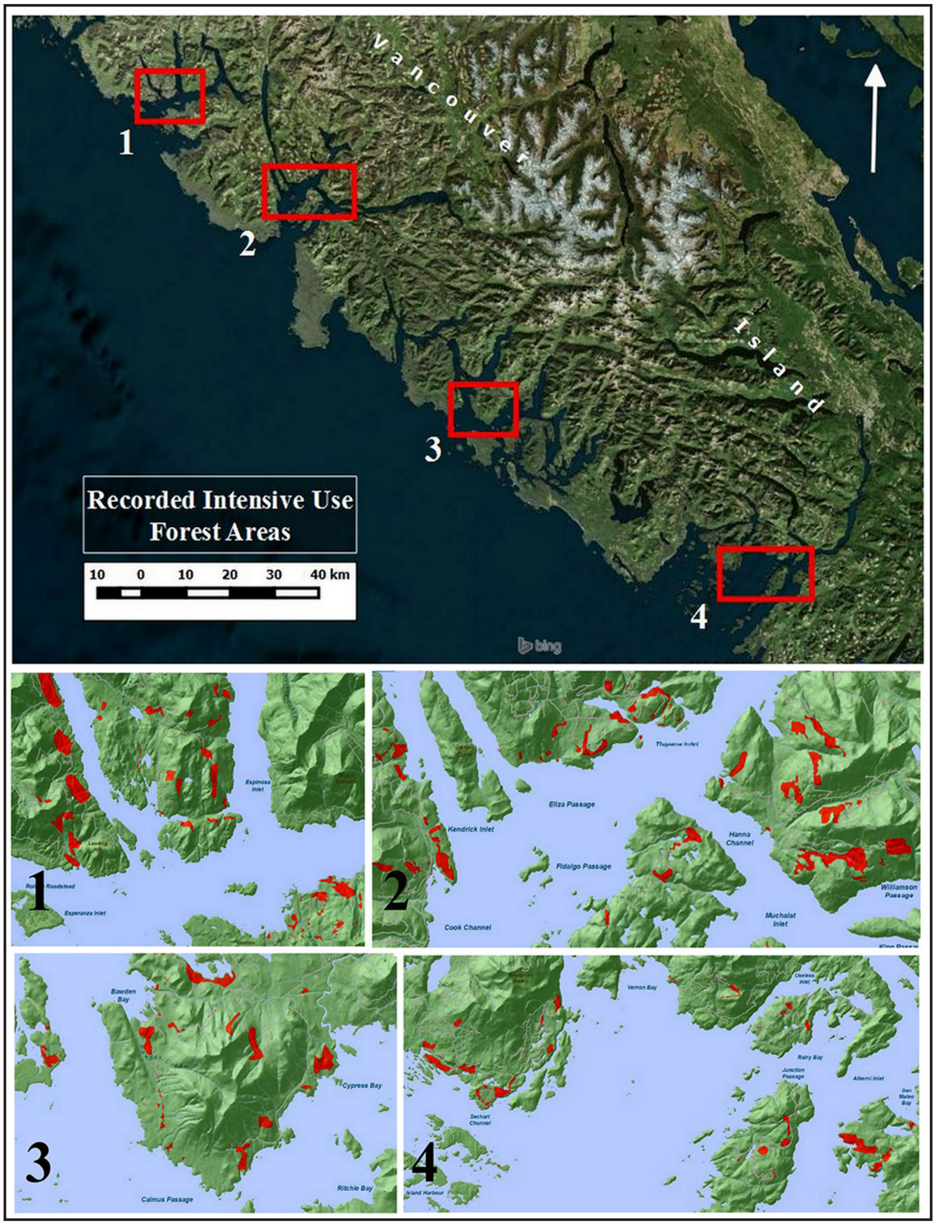

Figure 4: Screen captures of recorded CMT sites in heavily logged regions of Nuu-chah-nulth Territory.

Along with the other intensively used environments on the Northwest Coast, forest landscapes were carefully managed to maximize harvesting for large Indigenous communities and populations who faced the risk of resource depletion (Deur and Turner 2005:14; Eldridge 2017 and Sanders 2017 this volume) prior to population declines due to European-introduced diseases. This intensive use and management of the land is significant in revealing Indigenous perspectives on 'occupancy', which, as I discuss below, is now a fundamental principle to establish aboriginal title under the common law.

Tsilhqot'in

> *...[A]lmost no treaties had been established with BC First Nations. They still claim an unbroken ownership and use of their traditional territory and few claims regarding land use have been settled. In fact, virtually all forests under government tenure are subject to ongoing native claims.* (Nathan 1993 cited in Angelbeck 2008:124)

The recent Tsilhqot'in decision of the Supreme Court of Canada gave a clear declaration of what constitutes sufficient evidence for proof of aboriginal title to the land. The significance of CMT research is highlighted when viewed in the context of these legal principles, particularly in British Columbia where aboriginal title is largely unextinguished.

> *In my view, the concepts of sufficiency, continuity and exclusivity provide useful lenses through which to view the question of Aboriginal title. This said, the court must be careful not to lose or distort the Aboriginal perspective by forcing ancestral practices into the square boxes of common law concepts, thus frustrating the goal of faithfully translating pre-sovereignty Aboriginal interests into equivalent modern legal rights. Sufficiency, continuity and exclusivity are not ends in themselves, but inquiries that shed light on whether Aboriginal title is established* (Tsilhqot'in Nation v. British Columbia 2014:para 32).

To elaborate on the importance of CMT research, it is instructive to briefly summarize the common law principles of how aboriginal title may be demonstrated by revealing aboriginal perspectives on sufficiency, continuity and exclusivity of occupancy of the land.

1. Sufficiency of occupation

The activities that demonstrate occupancy (rather than mere use) must be seen as sufficient to give rise to Aboriginal title; the traversing or passing use of grounds is not seen as sufficient. *"The common law perspective* *imports the idea of possession and control of the lands. At common law, possession extends beyond sites that are physically occupied, like a house, to surrounding lands that are used and over which effective control is exercised"* (Tsilhqot'in Nation v. British Columbia 2014:para 36). Sufficiency of occupation is context specific, and the frequency and intensity of use may vary with the characteristics of the Aboriginal group (Tsilhqot'in Nation v. British Columbia 2014:para 37). In order to occupy the land sufficiently to gain title, the group must have historically acted in a way that it would communicate to a third party that it held the land for its own purposes (Tsilhqot'in Nation v. British Columbia 2014:para 38). There must be signs of appropriation that indicate an intent to use and control the land for one's own purposes. *"Apart from the obvious, such as enclosing, cultivating, mining, building upon, maintaining, and warning trespassers off land, any number of other acts, including cutting trees or grass, fishing in tracts of water, and even perambulation, may be relied upon. The weight given to such acts depends partly on the nature of the land, and the purposes for which it can reasonably be used"* (McNeil 1989:198-200 quoted in Tsilhqot'in Nation v. British Columbia 2014:para 39).

2. Continuity of occupation

There must be evidence of continuity between present and pre-sovereignty occupation (Tsilhqot'in Nation v. British Columbia 2014: para 45). This doesn't necessarily mean unbroken continuity, but rather evidence that the present occupation must have a pre-sovereignty antecedent (Tsilhqot'in Nation v. British Columbia 2014: para 46)

3. Exclusivity of occupation

The group must have had both intent and capacity to exclusively occupy the land. This may be proved by evidence that others were excluded from the land, or that access was granted only by permission by occupiers (Tsilhqot'in Nation v. British Columbia 2014: para 48). This exclusivity requirement does not preclude multiple First Nations from holding joint title.

Discussion

The use and management of cedar forests on the Northwest Coast is closely aligned with the common law prerequisites for establishing aboriginal title. CMTs are physical evidence of intensive resource use within forest environments; they show clear 'sufficiency' of use, and not just mere traversing of the land. Documenting intensive use and management of cedar forests can establish a pattern of occupancy beyond the bounds of local village sites and into larger forested territories asserted by First Nations. Regional CMT chronologies provide spatially-specific frequencies of use from early periods, through the contact-era, and, in some cases, into modern times. These data sets establish continuity of use of whole territories over millennia (Earnshaw 2016), and often substantiate Indigenous peoples connection to their traditional lands. It is this connection which creates a sense of place (Basso 1996) by which First Nations come to know landscapes as their traditional territories.

As for exclusivity to the land there is ample evidence of Nuu-chah-nulth concepts of ownership, transfer of rights, and conflict over infringements of rights in resource areas. On the northeast coast of Vancouver Island, Eldridge and Eldridge (1988:55) found that CMT use patterns on Newcastle Island (border of Kwakwaka'wakw and Straits Salish territory) suggested boundaries of ownership and use patterns in which hard to access inland areas experienced intensive use while nearby shorelines were untouched. Many of the contact-era inter-group conflicts are thought to have been instigated through high population pressures on resource areas and disagreements over land ownership and resource rights (McMillan 1996:60). The ownership of resource extraction sites is well established through studies in the region (Deur and Turner 2005; Drucker 1951). Historical accounts make specific record of this. For instance, when Captain Cook and his crew began cutting trees on Bligh Island in Nootka Sound he was confronted by locals who demanded he obtain permission first (Angelbeck 2008:125). He also spoke of the Nuu-chah-nulth's entrenched conceptions of ownership stating, *"Here I must observe that I have no where met with Indians who had such highly developed notions of every thing the Country produced being their exclusive property as these"* (Beaglehole 1967:306 quoted in Deur and Turner 2005:161). Drucker (1951:247) reiterates a similar commentary,

> *The Nootkans [Nuu-chah-nulth] carried the concept of ownership to an incredible extreme. Not only river and fishing stations close at hand, but the waters of the sea for miles offshore, the land, houses, carvings on a house post... names, songs, dances, medicines, and rituals, all were privately owned.*

No doubt these owned areas incorporated managed areas of forest as well. Drucker describes Nuu-chah-nulth concepts of ownership in terms of economic and ceremonial rights and privileges that can be acquired or transferred through inheritance or as reward (Deur and Turner 2005:161). These rights of exclusive ownership refute the incomplete and ethnocentric views of Sproat and others quoted earlier. Ahousaht Elder Roy Haiyupis is cited as describing this concept of private ownership, or *Hahuulhi*, at the Scientific Panel for Sustainable Forest Practices in Clayoquot Sound in 1995 by explaining *"the hereditary chiefs have the responsibility to take care of the forests, the land, and the sea within his ha hoolthe, and a responsibility to look after his mus chum or tribal members"* (described elsewhere as rights of tupaatis) (Deur and Turner 2005:163).

Figure 5: Example of windblow in protected CMT site, Nootka Island

Figure 6: Destruction of sites during Site Alteration process, note visible bark stripped trees.

Where aboriginal title is to be established, the Tsilhqot'in decisions confirms First Nations may enjoy full beneficial interests in the land, including *"the right of employment and occupancy of the land; the right to possess the land; the right to the economic benefits of the land; and the rights to pro-actively use and manage the land"* (Tsilhqot'in Nation v. British Columbia 2014: para 73). The restriction placed on this title is that as it is collective title, it must be held for all future generations. As such, ownership cannot be transferred away from the group to anyone other than the Crown or changed to the degree that it would be unusable to succeeding generations (Tsilhqot'in Nation v. British Columbia 2014:para 74.). The establishment of Aboriginal Title to CMT forests should lead to restoration of First Nations management of forest resources and the economic advantages and control that come with such ownership. The stipulation that lands must be used in such a way that does not *"substantially deprive future generations of the benefit of the land"* (Tsilhqot'in Nation v. British Columbia 2014:para 74.) would suggest the adoption of more efficient forestry practices than extant land use, ones that are in line with long term forest management strategies traditionally practiced by First Nations for millennia.

Anthropogenic Forests: Removing the Evidence

Ancient forests on Vancouver Island have been logged by over 70% (Sierra Club BC 2009). While much of this occurred prior to heritage protections for CMTs when fewer hurdles stood in the way of industrial logging in BC, little has slowed the expansion of old-growth logging and the continued affect on cultural forests. Since protections for CMTs were put in place in the 1990s about 30% of old growth forests have been logged on Vancouver Island, a rate three times that of tropical deforestation elsewhere in the world (Smart 2017). This overharvesting of ancient forest timber is occurring within a dwindling stock of cultural sites. We might consider ourselves lucky that CMTs at least are (sometimes) noted and protected, but more often than not this means nothing for the fate of the surrounding old growth stand: the setting of forest utilization. Unfortunately, the scattered stands of cultural forests remaining on this coast continue to be under-recorded, under sampled and often logged despite protections (Earnshaw 2016).

BC archaeological protections which currently focus on individual CMTs devalue forest utilization sites by regarding resource extraction features as isolated historical occurrences, outside their broader context within larger and more complex managed forests. Current policies

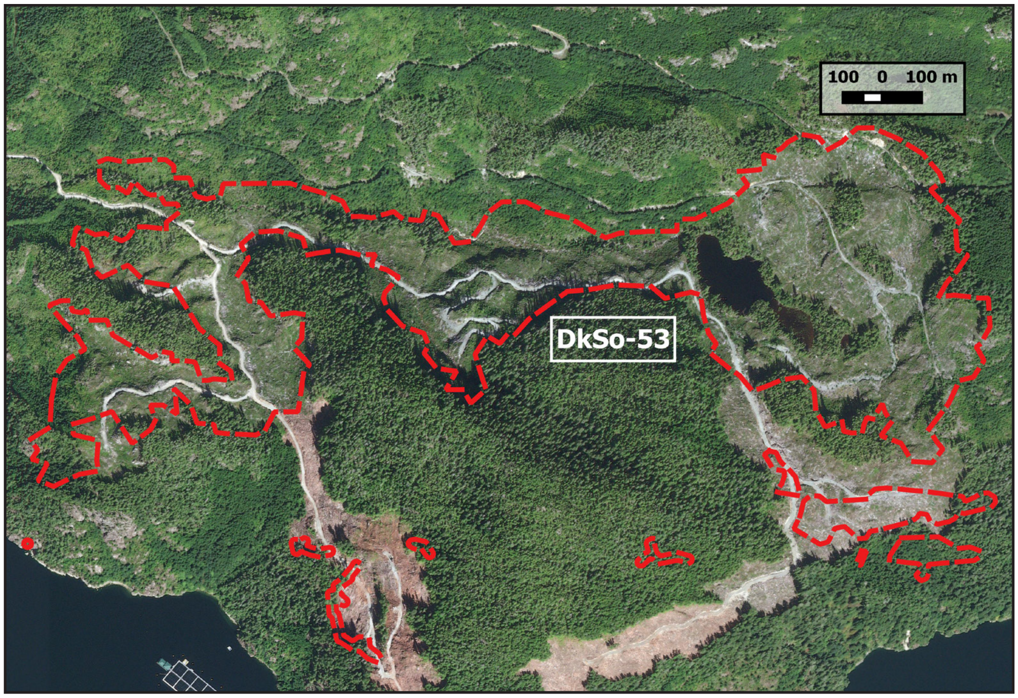

Figure 7: DkSo-53 Forest Utilization Site of 2391 CMTs, 89% removed following accepted Site Alteration Permit.

only allow for a 10 metre protected boundary around pre-1846 modifications, which often creates CMT 'islands' within large cutblocks that are exposed to greater risk of windthrow in storms (Figure 5). Such damage (which is basically universal to exposed CMTs) both negates the value of their protection and wastes the opportunity to recover temporal data. Site Alteration Permits (SAPs) regularly authorize the removal of individual CMTs, and often entire sites (Figure 6). At least 20 percent of existing identified CMT features have been destroyed this way in Nuu-chah-nulth territory (RAAD 2017; not including embedded scars or trees that fall years later due to exposure). One such site in Nuu-chah-nulth territory, DkSo-53, was found to be one of the largest forest utilization sites ever discovered on the coast containing at least 2391 bark stripped CMTs. It was diminished by 89% in which only 23 samples were dated (Figure 7). DkSo-69, a site of 903 bark stripped CMTs was completely removed by logging activity and produced only eight dated samples. These are not exceptions; 13 of the 15 largest CMT sites in Nuu-chah-nulth territory (>500 CMTs) have been affected to some degree by logging within site boundaries. It is unclear when, if ever, SAPs of CMT sites are rejected by the BC Archaeology Branch. In most cases it appears that the simple act of filling out an SAP is all that stands between a cultural forest's preservation and it's destruction.

The material evidence of First Nations title to the land is actively being erased from forests, and the majority of the accompanying archaeological data is slipping through our fingers. Without the incentive of a strict auditing system the condition of many recorded CMT sites after timber harvesting remains largely unknown. Logging activity in and around recorded archaeological sites should be followed up with post-impact assessments for more thorough data recovery of embedded scars to ensure the documentation of CMTs that only become visible after timber harvesting. The failure to revisit destroyed sites or to recover additional samples from unrecorded trees is to assist in the erasure of local First Nations title.

The Provincial Archaeology Branch focus on CMT features should transition towards a recognition and protection of the heritage values of Culturally Modified Forests. Given their clear value as evidence of occupancy in a post-Tsilhqot'in reality, documenting these forest landscapes takes on an urgent and practical legal and political dimension. CMTs are only features within more expansive archaeological site networks and forest use archives. Taken as a whole they strongly reflect long term conceptualizations of place, dwelling, and ownership across entire landscapes, not just a fringe of shoreline. As such, when evidence of repeated use and multiple scarring is present, the focus of their protection should be at the stand level, involving larger site boundaries.

In the face of continued old growth logging we must acknowledge the strength of CMTs contribute towards establishing First Nations title to coastal forests. The Northwest Coast is a landscape of human management, and was never "*lying waste without improvement*" (Sproat 1868). Prior to European colonial incursion, the forest, beyond the coastal fringe, was shaped and managed by the labours of ancestral First Nations people. It is a landscape that we appear to be hurrying to erase. We must not lose sight of the forest for the trees: a landscape shown to be sufficiently, continuously and exclusively occupied in its entirety.

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Was Cedar a Finite Resource in the Late Prehistoric of the Pacific Northwest?

by Morley Eldridge (Millennia Research Limited)

Introduction

Almost all those who live or work in the Northwest Coast culture area (definitions for which are remarkably similar in Drucker 1955; Suttles 1990b; Suttles 1990c) as ethnobotanists, archaeologists, ethnologists, or members of contemporary aboriginal communities know that western redcedar (*Thuja plicata*) and yellow cedar (various synonyms including *Chamaecyparis nootkatensis* and *Cupressus nootkatensis*) products were integral to traditional aboriginal cultures of the region. This special relationship between a tree species and culture has been explored by a wide range of researchers and others such as botanists (Hebda and Mathewes 1984), ethnobotanists (e.g., Turner 1988, 2001), an author writing for the general public (Stewart 1984), and archaeologists researching for environmental organizations (e.g., Stryd and Feddema 1998). The relationship between species was acknowledged by the Haida with a kinship term: "cedarbark is said to be every woman's younger sister" (Swanton 1908: 571).

Hebda and Mathewes may have been the first to note the almost perfect geographical match between the distribution of the western redcedar and the Northwest Coast Culture Area. The northern groups of Tlingit lived just beyond the range of cedar and obtained cedar by trading with their southern kinsmen (Drucker 1955:61). The southernmost people commonly recognized as 'Northwest Coast', the southern Oregon Athapaskans, used the Port Orford cedar (Chamaecyparis lawsoniana) for many of the purposes and products that people further north used redcedar for. While almost everyone in these fields is familiar with the relationship of people and cedar, few have considered the possibility that local scarcity of cedar may have been a powerful motivating force to both adopt practices and principals to manage the resource and to trade with neighbours with access to more cedar. One notable exception is Lepofsky, et al (2003: 126) who wrote:

> *Despite a well-developed system of ownership and management of trees (Stewart 1984:36-37; Turner and Peacock in press), the ethnographic record suggests that local forests could not supply the amount of wood or the particular species of wood needed by North Pacific Coast groups for fuel and technology…Further: when specific woods for technology could not be obtained from forests within a group's territory, people traded for wood or the finished products (de Laguna 1972;35,413; Drucker 1955:61; Singh 1966:27, Turner 1998:43-44; Wennerens 1985:59). The archaeological record of culturally modified trees indicates that North Coast peoples also travelled considerable distances from their settlements to harvest wood for technological purposes (e,g., Lepofsky and Pegg 1996).*

This paper seeks to explore the idea that cedar shortages may have been present even in 'core' Northwest Coast areas, the historical reasons why most researchers and the general public thought otherwise, the implications of shortages, and presents archaeological evidence for an extraordinarily high rate of cedar harvest (and concomitant shortages?) in several local areas of the Northwest Coast. The causes for the origin of a conservation ethic in Northwest Coast are explored.

The Colonial View

The European emigrants on first viewing the forests of the Northwest Coast typically assumed that the forests here, along with almost all resources, were effectively inexhaustible (a view shared at first by my parents, who emmigrated from Britain in the 1940s; see also Canadian Encyclopedia 2012). The view from a railway carriage or steamship showed serried ranks of forest-covered mountainsides for hour after hour. While this gave rise to a common impression that the forests were inexhaustible then (and certainly must have been in precontact times), interestingly, the colonial government and investors in forest companies already knew differently. By the early 20th century, these two groups were locked in a tug-of-war between the government who looked to obtain revenue for an extremely cash-strapped treasury, and investors who tried to lock up rights to timber that they knew would become extremely valuable as much as three decades in the future, when supplies from eastern forests were predicted to dry up (Pearse 1992). It also became clear early on that truly huge trees were actually quite limited. In an early example of a conflict over conservation, Governor-General Viscount Willingdon during a 1928 visit named "Cathedral Grove" near Mt. Arrowsmith and Parksville, Vancouver Island. It was only after a long period of public pressure to preserve the giants that HR MacMillan (former Chief Forester of BC and head of one of the dominant forest companies of the mid 20th century), very reluctantly, donated 136 ha to become a public park (Joy 2005).

The government gave no consideration to the rights and title of the people who had managed the resources for millennia, often explicitly designing the tenure system to exclude aboriginal people from access to resources, other than as wage labourers (Menzies and Butler 2008). Even when Indian Reserves were set aside to accommodate aboriginal logging practices (as at Ahuk IR1 in Ditidaht territory) the Reserve Commissioners created a tiny reserve that included the camping and canoe-finishing location at this remote lake, but explicitly did not include any of the surrounding timber lands needed to supply the trees to make those canoes (Royal Commission on Indian Affairs for the Province of British Columbia 1913-1916, 1916). For these early colonial regulators to have even contemplated that the resources were indeed managed in pre-contact times would have a given a moral and legal claim to ownership of those resources to the people who had a history of managing them.

When I first began to study culturally modified trees in the early 1980s, I like so many of my contemporaries, had preconceptions arising from the colonial assumptions that the forest resources for aboriginal people must have been nearly infinite and inexhaustible. Even today, many critics of industrial practices *"decry the impact of industrial resource extraction upon the landscape, they typically do so by referencing an Edenic, pre-contact sitting in which the indigenous people – if they are mentioned at all – co-existed with nature outside the movement of history"* (Menzies and Butler 2008: 131). I was certainly influenced by anthropologist/archaeologists such as Philip Drucker, who in his introductory texts implied the immensity of coastal forests, using phrases such as *"the forests of the Northwest Coast were amply supplied with an abundance of readily worked woods"* (Drucker 1955: 8) and *"These forests grow in dense stands from the water's edge to timberline….Individual trees attain great size"* (Drucker 1965: 5).

The relationship of coastal people to the primeval forest was also considered by the newcomers to be rather adversarial, and even now I meet non-Native people who think that aboriginal people on the coast prior to contact lived almost exclusively on the shores and on the water, and that the forest was both nearly impassible and considered spiritually dangerous by aboriginal people themselves. Even writers such as Emily Carr, despite being one of the most empathetic "white" people of her time, in her painting and writing emphasized a brooding malevolence of the forest and its spirits, writing "Indians forbade their children to go into the forest, not even into its edge" (Carr 2003[1941]: 40). While travel through the coastal forest requires agility and an order of magnitude more effort compared to interior parkland, it is by no means impenetrable, yet I continue to find that many people, in professional or casual contexts, continue to have this attitude.

The Possibility of a Finite Resource

Clues that the forests might not be limitless in preindustrial times have always been present in the historical literature, however. As Stewart (1984: 49) summarizes

> *…the northern canoes were a valuable trade item. Indeed, the canoe was the most important item of trade for the Haida, who towed newly made craft over to the mainland to trade for eulachon grease and other commodities not available in their homeland. The Tlingit, too, found a ready market for their canoes, which even in 1888 were reported to be their chief source of revenue*

Dawson (1989: 572) wrote:

> *The Haidas are great Canoe-makers. At this season [August 21st, 1877] many occupied roughing them out in the woods on the Masset lakes & rivers here & there. Bring them down to the villages later on & work away by little & little in winter. They frequently take canoes over from here [Haida Gwaii] to Ft. Simpson for Sale, getting the coveted oulachen grease, & other things in exchange, together with an old canoe to return in.*

The Yakoun River (which empties into Massett Inlet) was a particularly good source of canoe trees: "The Yakoun Valley was the canoe manufacturing centre of the Northwest Coast, because of its high quality cedar." (Council of the Haida Nation 1990). In the south, the Ditidaht and Nuu-chah-nulth traded canoes to the Makah, Central Coast Salish, and others (Suttles 1990a; Turner, et al. 1982), and these were traded onwards as far as the Columbia River. In fact, in the western United States, the "Chinook style" canoe named by early explorers to the lower Columbia was not actually made (at least not in quantity) by the Chinook, but were largely Ditidaht or Nuu-chah-nulth in origin, and had been traded to the Chinook (Ruby and Brown 1976: 18-19). Hajda writes: "All canoes except the shovelnose were based on Westcoast design… All types [of canoes] were locally made, but most of the larger ocean canoes and many others were made by more northerly people and

traded to the south" (Hajda 1990: 507). The two most intensive areas of canoe manufacturing in the south were Ditidaht territory and Clayoquot Sound (Arima 1988).
But why were canoes such a valuable export and trade item if they could have been made almost anywhere along the coast? Surely, they could have been carved from those giant redcedars that grew in such profusion? Certainly, the skill and design brilliance of the West Coast and Haida people would have played a part; but this entire Northwest Coast culture area was steeped in woodworking excellence. Apart from local exceptionally skilled workers, I believe it is likely that suitable, accessible trees for large canoes were simply not very common in most areas. I have further begun to believe that perhaps even cedar bark was in short supply in some places at some times.

Cedar bark boards are large sheets of cedar bark (typically 2 to 4 m long and a metre and a half wide) used by North Coast peoples. Swanton (1905:105) recorded from John Sky that *"Cedarbark roofing was formerly traded to the Nass River people (Nisga'a) at a price of one blanket per two sheets of bark"*. This value seems extraordinarily high for a commodity that can be harvested from very modest sized cedar trees, which should have been available almost anywhere. Certainly it is surprising that the large, heavy, cumbersome sheets would have been transported by canoe across the Hecate Strait as this cargo could easily result in a canoe becoming unstable if sea and wind conditions deteriorated. These cedar products must have been valuable to risk lives and goods in transport. They are of particular interest because of the clear recognition of their harvesting sites archaeologically, which I will be discussing more at length below.

Newton Chittenden (1884) left some valuable direct observations about traditional forest use in Haida Gwaii during the middle to late nineteenth century that have bearing on the question of a finite resource. The American explorer was tasked by the BC Government to travel to Haida Gwaii (then known as the Queen Charlotte Islands) and to circumnavigate by canoe to explore and assess the resources there, paddling into each inlet and bay and going up each river, leaving a record that is unusually detailed in its description of resources and the aboriginal use of them. He assessed agricultural potential, timber supply, fish resources, and minerals. In his description of the rivers, he notes (1884:6) that *"Upon the banks of the Ya-koun, Naden and Ain Rivers. [sic] the natives have obtained their choicest specimens of red cedar for their canoes, carved poles, and house building. Numerous bear, and marten traps, in the last stages of decay, were found upon them."* On the suitability of commercial logging, he notes (1884:8) *"With the exception of [Skidegate and Masset Inlets], I have seen no place upon the islands, where the available quantity of these woods [spruce and red cedar] is sufficient to warrant the erection of mills for their manufacture for exportation. There are fine specimens of yellow cedar of very scattered growth…"*.

In a later part of the report (1883:58), subtitled 'Correspondence' he gives a description of the canoe and pole harvesting areas:

> *…I made my interior excursions alone. Indian trails were almost invariably found, extending from one to three miles along the water courses, terminating at or near bodies of the finest red cedar, which they had cut for canoes and poles, for carving and building purposes. Upon some of these trails considerable labor had been expended in bridging over ravines, corduroying marshy places, and cutting through the trunks of great fallen trees. Only a few of them showed much use of late years, being obstructed by logs and overgrown with bushes.*

On page 57 he describes *"Massett is the shipyard of the Hydas, the best canoe makers on the continent, who supply them to the other coast tribes. Here may be seen in all stages of construction these canoes which, when completed, are such perfect models for service and of beauty."*

Chittenden's is one of the only first-hand early account of aboriginal logging or its remains on the Northwest Coast of North America, and the only one I know of to have noticed and recorded the engineered trails used to extract the logs from the forest. It is very significant that trails up to 5 km long with bridges and corduroyed sections were constructed. The extraordinary time and resources required must mean that equally suitable trees were not available closer to the coast or river.

The Progression of my Understanding of Cedar Resource Limitations

When I first worked on the Skeena River, as part of an archaeological impact assessment of a proposed transmission line in 1982 (Eldridge 1982, 1983), the thought of climbing the mountains to inspect the higher parts of the route never even occurred to me. I assumed CMTs would be restricted to an easy stroll from the Skeena River. I did know CMTs existed and I did record them during that survey where the route was at low elevation. When I returned to work in the area 20 years later (Eldridge 2002; Owens, et al. 2002), we had to climb lower slopes, then fight our way through the accumulated slash of the transmission line before reaching proposed cutblocks higher up the mountain. Yet well above the mid-slope power line, nearly every cedar was a CMT, and I realized with chagrin how many CMTs I must have missed in the transmission survey. These must have been subsequently been destroyed when the line was cut. I will return to describe more fully and discuss these blocks and others below.

In the meantime, I had worked with many aboriginal people doing CMT inventory work over much of the coast. Many stripped bark themselves, either for their own use or for relative's use (the main uses of inner bark nowadays seem to be basketry, traditional clothing or hats worn to community events such as feasts, potlatches, or official openings, and for components of masks and other carvings, both for ceremonial use and for sale to the art market). Discussions regarding CMTs (as a subdiscipline of ethnobotany) went into great detail during long truck rides, long days in the bush, and long evenings after work. The people who educated and influenced me are too numerous to mention them all; but those most influential in my thinking included James Stanley (Haida), Clarence Thompson (Haida), Sean Young (Haida), Morris Sutherland (Ahousaht/Ditidaht), Fred Seiber (Ditidaht), Mike Windsor (Heiltsuk), Jennifer Carpenter (Heiltsuk), Alan Bolton (Kitsumkalum) and Marven Robinson (Gitga'at). These people helped me understand how cedar continued to be used by the communities, and how the spiritual connection to cedar endures. We also discussed all the subject matter presented here, often in the context of working in dense stands of CMTs.

The intensive CMT inventory work I field directed on Meares Island in the mid-1980s showed me that some areas had been so intensively logged by aboriginal people during the precontact and early historic time periods that the stump distribution appeared similar to a clearcut – but with the harvest spread over so many years, the forest retained 'old growth' character (Stryd and Eldridge 1993). Furthermore, we found that aboriginal logging sometimes occurred hundreds of metres from the shore, and intensive bark-stripped areas could be several kilometres inland. Yet some small areas adjacent to the ocean showed untouched stands of 'gunbarrel' cedar, causing us to speculate that these might have been owned and managed for the long-term; after all, a single bark harvest will effectively ruin a cedar tree as a potential canoe for all time, even if it lives for another 600 years. There are few explicit references to ownership of trees for future canoes in Northwest Coast ethnography and history. This is in marked contrast to New Zealand, where there is abundant evidence that Maori chiefs owned individual trees and stands, marked them, and reserved them for their children and grandchildren as heirlooms, even retaining their ownership in some of the early land sales to colonists (Best 1925). Perhaps the differences in the amount of record arises from the much larger Maori population size and the resultant greater power the Maori had during potential conflicts with settlers. Maori conflicts with colonists over land also began earlier, before populations plummeted due to disease, compared to those of the Northwest Coast and so they negotiated terms of land sales with more power.

As I then continued to work all up and down the BC coast, I realized that there was increasing evidence that cedar trees could have been, at least locally, in short supply. From the wheelhouse of Drucker's small launch as he went up the Inside Passage in the early 1940s (Drucker 1943), the trees would indeed seem to stretch from shore to mountains. But viewed from a float plane or helicopter following those same channels, the distribution of trees is often very different. From the air, the forest is often revealed to be a relatively narrow strip of trees, backed either by muskeg swamps containing sparse dwarfs, scrub forest, or high elevation mountain forest where redcedar is scarce or absent. I realized that the supply was not limitless, and in high population density areas might have resulted in a very high demand during the late precontact and early contact period. This was particularly so in places such as the Nass Valley, the Skeena River, or Prince Rupert Harbour which had large populations and limited forest lands. Further south, redcedar becomes somewhat rare (and yellow cedar completely absent) in the dry ecosystems of the Gulf Islands and southernmost Vancouver Island. Much of the Columbia River and flanking Washington and Oregon coastlines are also not good for cedar growth being either too dry and warm or too exposed to storms, resulting in few trees with clear straight grain.

Through four decades, I have walked through a substantial proportion of the old growth cedar forests remaining along the BC coast. It is often surprising to me how varied the density of CMTs will be in these forests. It is particularly remarkable how few trees seem suitable candidates for large canoes. Finding such a tree in the late precontact or early contact period within easy reach of the 'saltchuck' must have been rare in all but a few places. This may have been the functional reason that led to not only inter-generational ownership of trees for timber values but also trade in forest products and many of the now-familiar conservation aspects of Northwest Coast forest management such as leaving strips of living bark to regenerate. The patterns are muddied, however, because in some of the most heavily used areas these conservation practices are also matched by contrary practices such as tree-girdling (killing the tree)– perhaps an example of the "Tragedy of the Commons" (Hardin

1968), and perhaps accelerated by social and economic upheaval during the historic period. This paper provides some examples of extremely heavily utilized areas in various parts of coastal British Columbia, and by extrapolation, speculates on the situation that was likely in other areas (such as Greater Victoria and the lower Columbia River now lacking intact forests) where high aboriginal populations combined with limited accessible cedar resources.

Aboriginal Conservation Ethics and Resource Harvesting

Aboriginal resource management on the Northwest Coast combined the prerogative of high-ranking individuals to determine where, when, and how much of a resource could be taken with an ethic that emphasized respect for the resource and conservation. Only the briefest of summaries is given here, as the subject has been described and discussed in detail elsewhere (e.g., Turner, et al. 2000). Well-known conservation methods are the strictures to open fish barriers when sufficient salmon have been taken, or to always leave a strip of bark on a cedar tree so it can regenerate. As part of this process the spirit of a cedar tree was always addressed to explain what the harvested bark was to be used for, or to ask forgiveness for cutting the tree down and for cooperation in where it should fall (e.g., Stewart 1984; Stryd and Feddema 1998; Turner 1979; Turner 2001; Turner, et al. 1982). Boas (1921: 131-132) recorded that a narrow strip of bark is "*what the people of olden times refer to as being left on the young cedar tree so that it should not be without clothes and to keep it alive*". Similar marks of respect can be found throughout ethnographic texts. Lack of respect to even simple animals could bring calamity, such as when boys needlessly tormenting fish brought about the Nass eruption that wiped out several villages just about the time of early contact (Ayuukhl Nisga'a 1993). The parable that is associated with this event is mirrored in other stories relating catastrophes and salmon or trout molestation by children in wide-spread places (see, for example Menzies 2012).

I believe it is of interest to ask the following questions:

1. Did the conservation ethic general amongst peoples of the Northwest Coast develop purely as a spritual or ethical paradigm?; or

2. Did the conservation ethic develop in a setting of necessity and shortages?

The Potential Cause of Cedar Shortages

Suttles (1968, 1983) explained much of the structure of Northwest Coast cultures as coping mechanisms for periodic resource failures, such as when the salmon runs failed or had low run-years, or when berry crops were affected by bad weather or fires.

Although I am aware that 'functional' explanations are long out of favour, the relationship between agency and the cultural and environmental structures is still of interest. I think that the 'respect for the resource' world view (and perhaps chiefly control of resources) stems from real experiences of shortages brought about by natural variation or overexploitation.

Demand

The uses of cedar bark on the Northwest Coast at the time of Euro-American contact was truly amazing; cedar bark was the principal component in everything from house roofs (in the north), camp tent walls, bedding, storage and collection baskets and boxes, clothing, ropes, to diapers and sanitary napkins. The list is almost endless, and there are equally ubiquitous uses for withes, roots, and wood. Stewart's excellent, reprinted book Cedar gathers a tremendous amount of knowledge on the uses of the tree, and is of continuing interest to the general public (Stewart 1984). How many bark-stripped trees would be needed for a family's yearly total use of cedar bark? Certainly, the total would be dozens; conceivably it could be in the hundreds.

Scheduling Conflicts

All cedar bark had to be collected in the few weeks the sap was running in the spring. Mountainous areas provided a little more flexibility as the seasons move up the mountainsides with higher elevations 'coming into season' later than lower elevations. The bark would need to be initially processed, and moved to locations where it would later be used. Some of the monthly calendar cycles mention bark gathering (as opposed to, say… "the month to gather seabird eggs"), suggesting some places bark stripping and processing may have been the principal occupation during that month. But what happened if this period conflicted with the harvesting of other important resources? If the cedar stripping season conflicted with the time to fish spring salmon, or to catch spawning surf smelt, or to dig clover roots? Likely, in this case the cedar trees nearest the resource locality were the ones that would be targeted. Splitting the workforce and travelling to a different area is an option, but this would have reduced the amount of both critical resources that could be collected and processed for storage. Long trips just to gather cedar bark in favoured locations may not have been possible for everyone.

In areas such as the North Coast, the cedar bark harvest would have happened about the time as a move from the coast to up the Skeena River to spring and summer salmon fishing camps. Likely, there were thousands of people moving up the Skeena River between tidewater and as far as modern-day Terrace about the time of the bark harvest. Coast Tsimshian tribes had their summer villages all along this valley, usually at the confluence of tributaries. This is quite a long stretch of river, but also the cedar forests are confined to the mid and lower mountain slopes. Furthermore, the tributaries are themselves confined to narrow straight valleys which would have had limited amounts of easily-accessed cedar. In this situation, scheduling dictates that people be in the area with the tightest geographic constraints to cedar harvest.

Scheduling logging for canoe making was likely not a major issue as much of this work was done during the winter and 'shoulder seasons', and the monumental cedar that are best suited for canoes normally grow in valleys sheltered from storm winds.

Local scarcity

How would Songhees or Esquimalt families in the area that is now Victoria get enough cedar for utilitarian purposes and for houses and canoes? The very high regional population density meant that tens or hundreds of thousands of trees needed to be stripped every year for bark, and that in turn would affect canoe material. Cedar does grow in the area, but not prolifically. It occurs mostly inland in wetter microenvironments. Despite substitution of materials (for instance, rush mats in the south substituted for cedar bark-board shelter coverings used in the north (Turner 1979), cedar was either required or preferred for so many purposes undoubtedly the rate of stripping was still very high. Suttles notes (1951:231) in his brief discussion on cedar bark that "Shredded cedar bark was used for towels, cradle mattresses, and no doubt other household purposes, as well as for ceremonial purposes. Evidently the Straits people did not use it as extensively for clothing as did some of their neighbours". Suttles also mentions other products made from cedar that were traded from other groups. These include several types of basket (Suttles 1951:242) and bags, for which "cedar bark was probably used far less frequently than cattails by all of the Straits people" (Suttles 1951:243-244).

If the cedar bark needs were sufficiently high even with substitution and trade, over centuries a large proportion of cedar must have been stripped, effectively ending their utility for most purposes needing clear-grained cedar, especially canoes. Likely, very few cedars in the capital region would have been suitable for canoes. A contrary observation may be Duff (1969), quoting from a letter by early Fort Victoria employee Charles French: "Their line of travel was centered at Cadboro Bay. Coming from Cordova Bay cedar forest after making their annual canoe supply, they crossed Telegraph Trail to Cadboro Bay, where a few shacks were situated." However, I expect the canoes they were making here were the small river and sheltered water types, which require a much smaller tree. This factor would explain the large number of canoes traded from the West Coast of Vancouver Island to the Victoria area (Suttles 1951:248-252).

Wood or bark? Choose just one.

If over decades a community required hundreds of thousands of cedar strips – and even millions considering the five hundred year typical lifetime of a cedar – and these were concentrated near ocean shorelines or rivers, then potentially most cedar over large areas would have been stripped at least once. If non-sustainable stripping techniques were used, this would eventually wipe out the resource. Even sustainable harvesting would have drastically reduced the number of potential canoe trees in that area. The cross-sections of bark-stripped trees have remarkably convoluted rings, areas of rot, and other hindrances to canoe making (e.g., Figure 1).

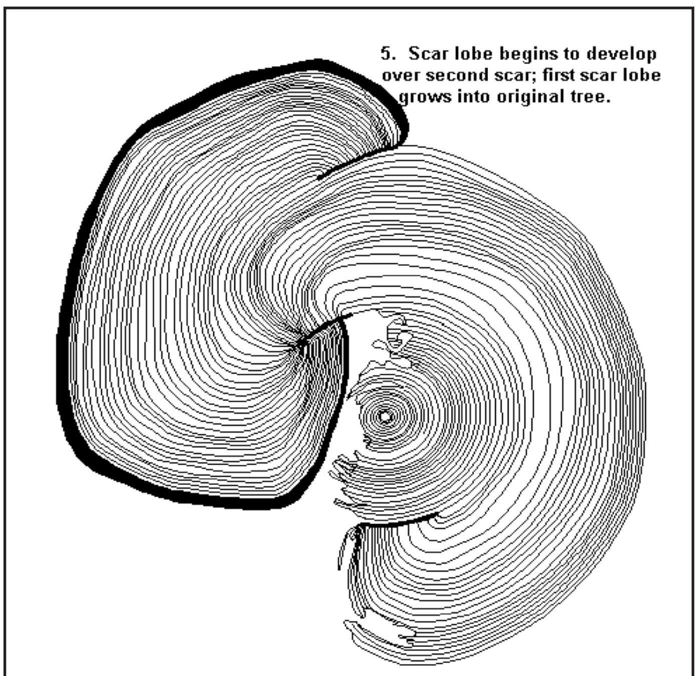

Figure 1. Western redcedar tree after two bark strip harvests. The remaining wood would be useless for canoe making or even plank splitting. From Millennia Research Limited website (accessed July 22, 2017).

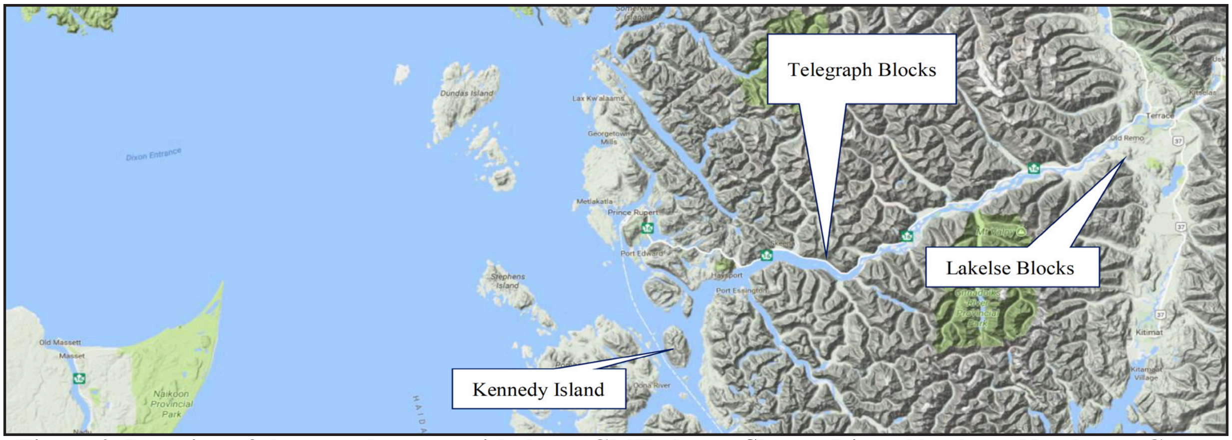

Figure 2. Location of three study areas with dense CMTs, lower Skeena River, Northern Northwest Coast.

Culturally Modified Trees: Archaeological Evidence of Intensive Harvesting in Tsimshian territory.

Some archaeological evidence for intensive harvesting has been previously discussed in the literature (Mobley and Eldridge 1992; Stryd and Eldridge 1993). The following provides a series of examples drawn from Coast Tsimshian Territory, spanning the coastal Skeena Estuary (Kennedy Island), the lower Skeena River (Telegraph Blocks), and the Skeena just below Hagwilget Canyon (Lakelse River) (Figure 2). These are spread over about 110 km of the river's course where, as discussed above, the nine tribes of the Tsimshian who wintered in Prince Rupert Harbour had their summer fishing villages. These three groups of proposed cut blocks were at the beginning of the new millennium some of the few remaining stands of old-growth cedar remaining on the lower Skeena. Historical commercial logging had removed old-growth cedar from much of the remainder.

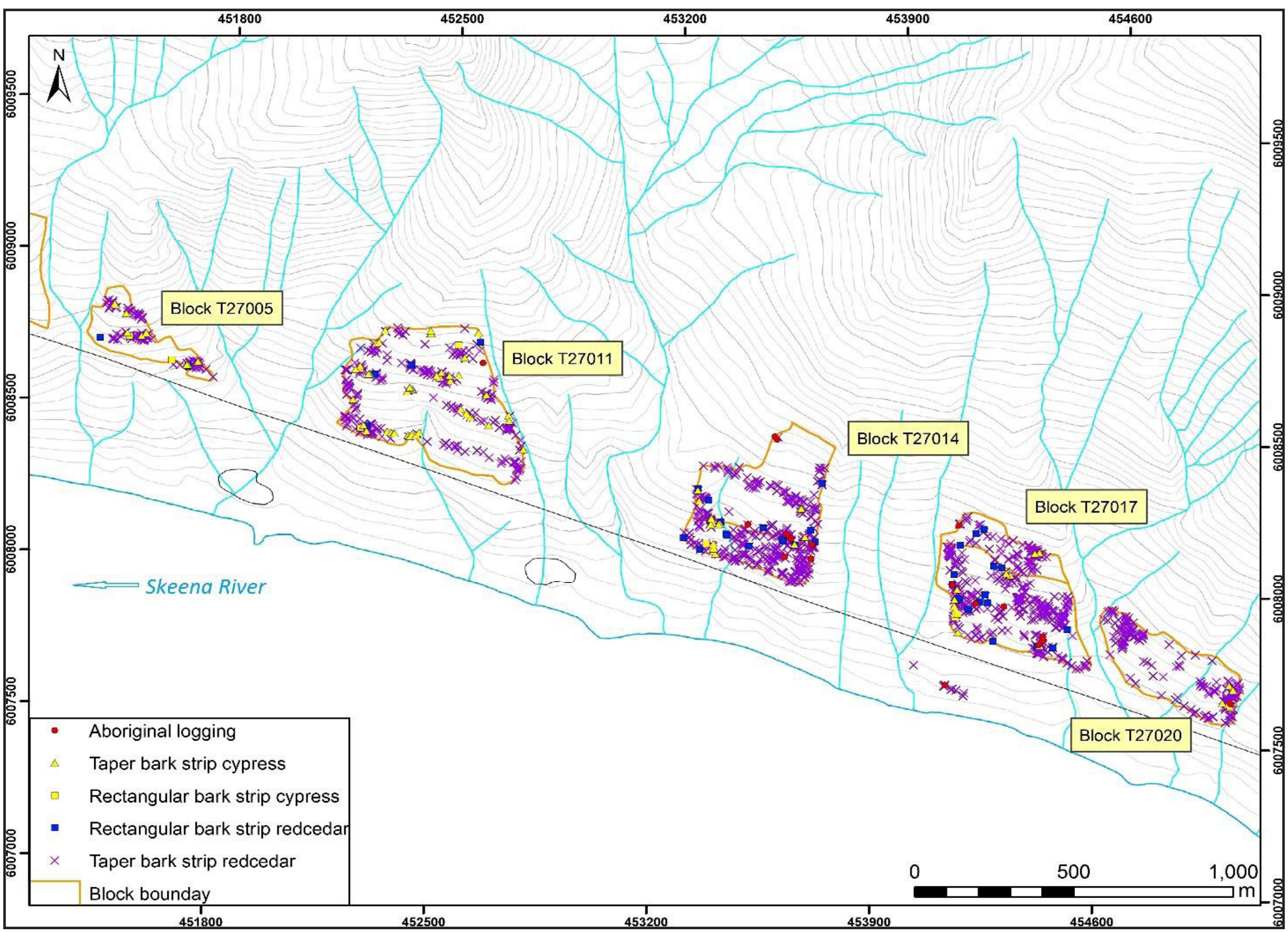

Figure 3. Overview of Telegraph Blocks, Skeena River

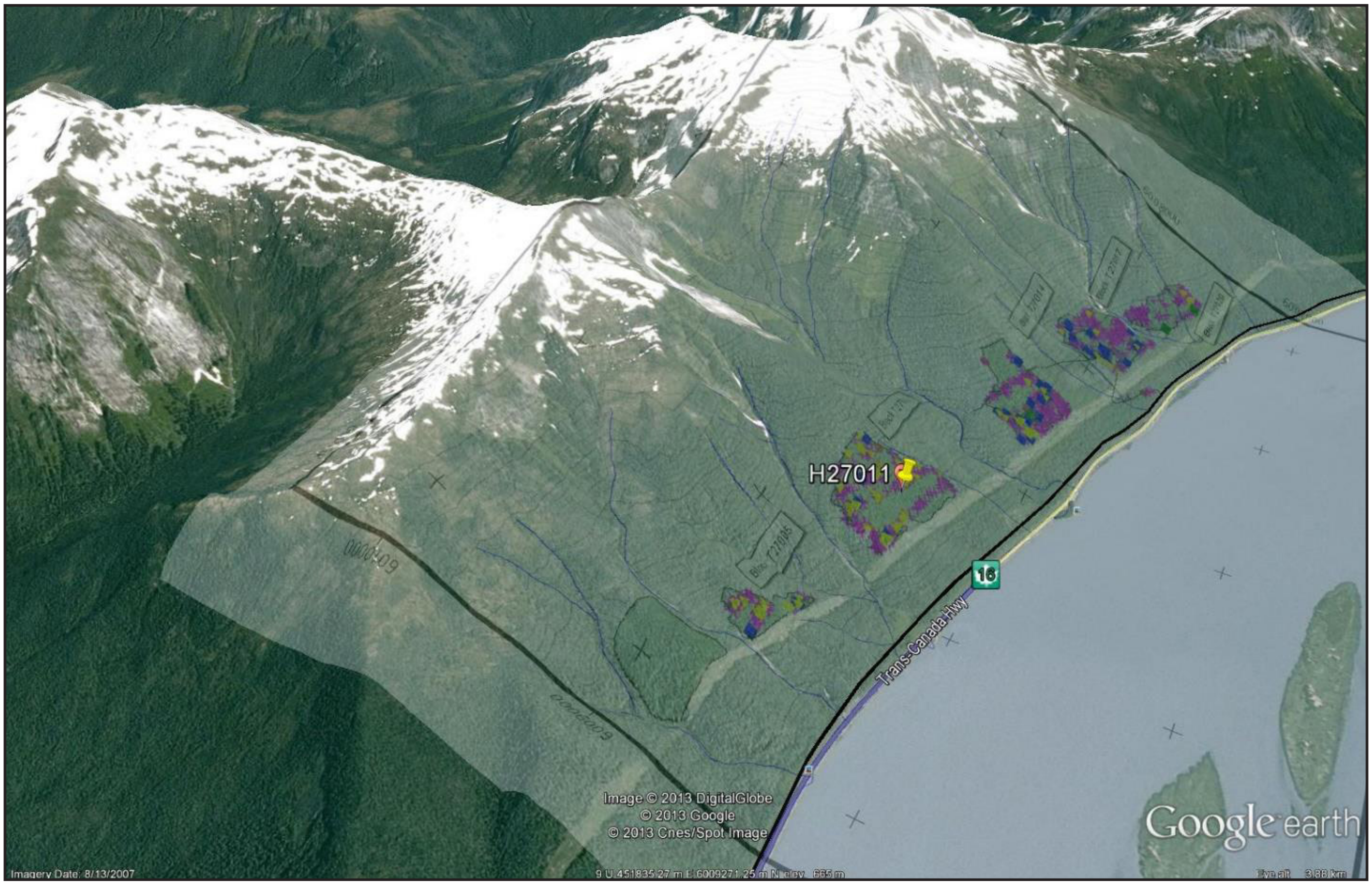

Figure 4. Oblique overview Telegraph Block Maps overlaid on Google Earth Imagery. Note that subalpine forest, lacking redcedar, begins shortly above these proposed blocks, and that alpine conditions occur at slightly higher elevation.

Telegraph Blocks

The Telegraph Blocks are a series of five (4 to 24 ha) proposed logging blocks never previously commercially harvested that are up to 450m above the Skeena River, about 5 km upstream of the confluence of the Khyex River (Figure 3). The Skeena River here is very wide and still tidal. The blocks were engineered within the best quality cedar available, between riparian reserves (centred on extremely steep gulleys) and avoiding lower-quality, scrubby forest (Owens, et al. 2002). Figure 3 shows an overview of the blocks and their features; Figure 4 shows this in 3-D perspective with photographic imagery. Note that subalpine parkland (lacking cedar) begins just above the upper end of the blocks. The blocks were not fully inventoried for CMTs; rather, strips about 30 m wide were surveyed, with additional CMTs recorded when convenient as the crews moved between transects. Examples below are mostly taken from one of the blocks (20017, Figure 5) that was completely inventoried. The overview maps (and indeed individual block maps) often cannot show the total number of CMTs recorded due to overlapping symbols.

The numbers of CMTs in these blocks are remarkably high; indeed, it seemed most cedars in the landscape were stripped. The large empty areas representing (besides unsurveyed areas) stands of hemlock, Sitka spruce, and balsam trees, where cedars were virtually absent (a few cambium-stripped hemlock CMTs were recorded). Over 1600 CMT features were recorded on 1340 trees in the blocks, consisting of taper and rectangular bark strips and aboriginal logging (Figure 6), with an estimated total of 2246 features (Owens, et al. 2002). The CMT density ranges from 27 to 46 CMT features per hectare, a high but by no means unprecedented value (e.g., Arcas Consulting Archeologists Ltd. 1991). A rather high proportion of taper strips to rectangular strips or aboriginal logging is found in the Telegraph Blocks in comparison to values elsewhere in the North Coast Forest District.

A pattern is observable in the distribution of stripped cedar trees that suggests regular revisiting, multiple sequential harvesting, and forest management. CMTs with two, three, and four stripping events definitely cluster within the block, and may represent the paths taken by bark harvesters who visited the area sequentially (Figure 7 & 8). Each harvesting event may have targeted a number of nearby trees, and if these trees had been targeted by a previous harvester, then many trees in the same area would

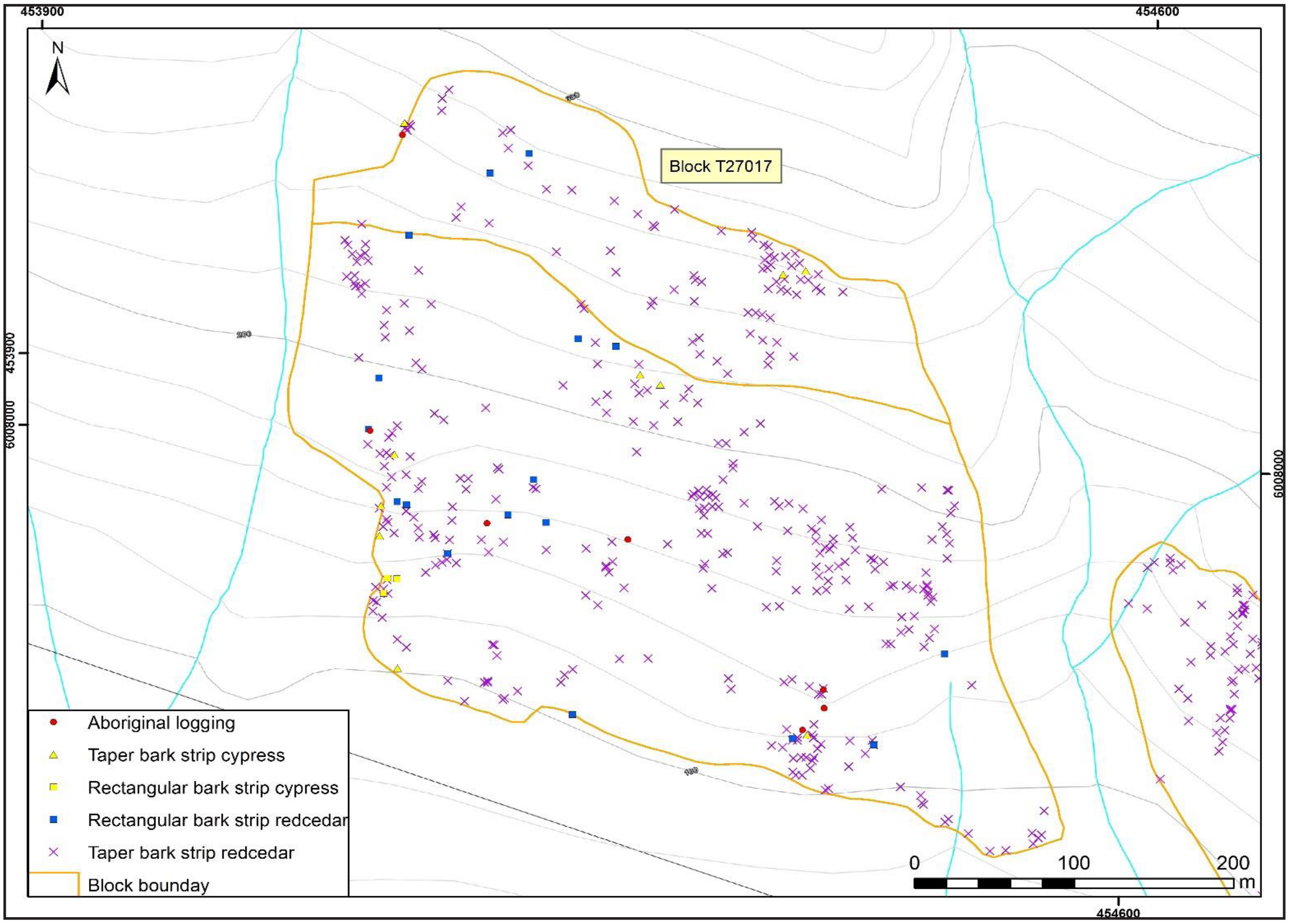

Figure 5. CMT feature types, Block 27017.

have two scars or more. By studying the patterns of multiple stripping, we may be able to tell the average number of strips taken. From these maps, it appears that perhaps a dozen would often be taken at once. If we were to obtain more dendrochronological data from these trees, we would be able to confirm this.

Figures 7 and 8 show a detail of part of block 27017. There are clear linear, but meandering patterns of CMTs, often more or less following the contour (the easiest walking) or going straight up and down (the easiest access). Since not every cedar was scarred, it appears from close examination that trees previously stripped may have been intentionally targeted, perhaps for a characteristic of their inner bark, or perhaps to preserve some trees for future logging use.

Recent Google Earth imagery shows that the plans to log these Telegraph Blocks were never carried out; leaving open a precious opportunity for additional study.

Figure 6. Standing plank-stripped tree with test hole and stone tool marks, Telegraph Block 20017.

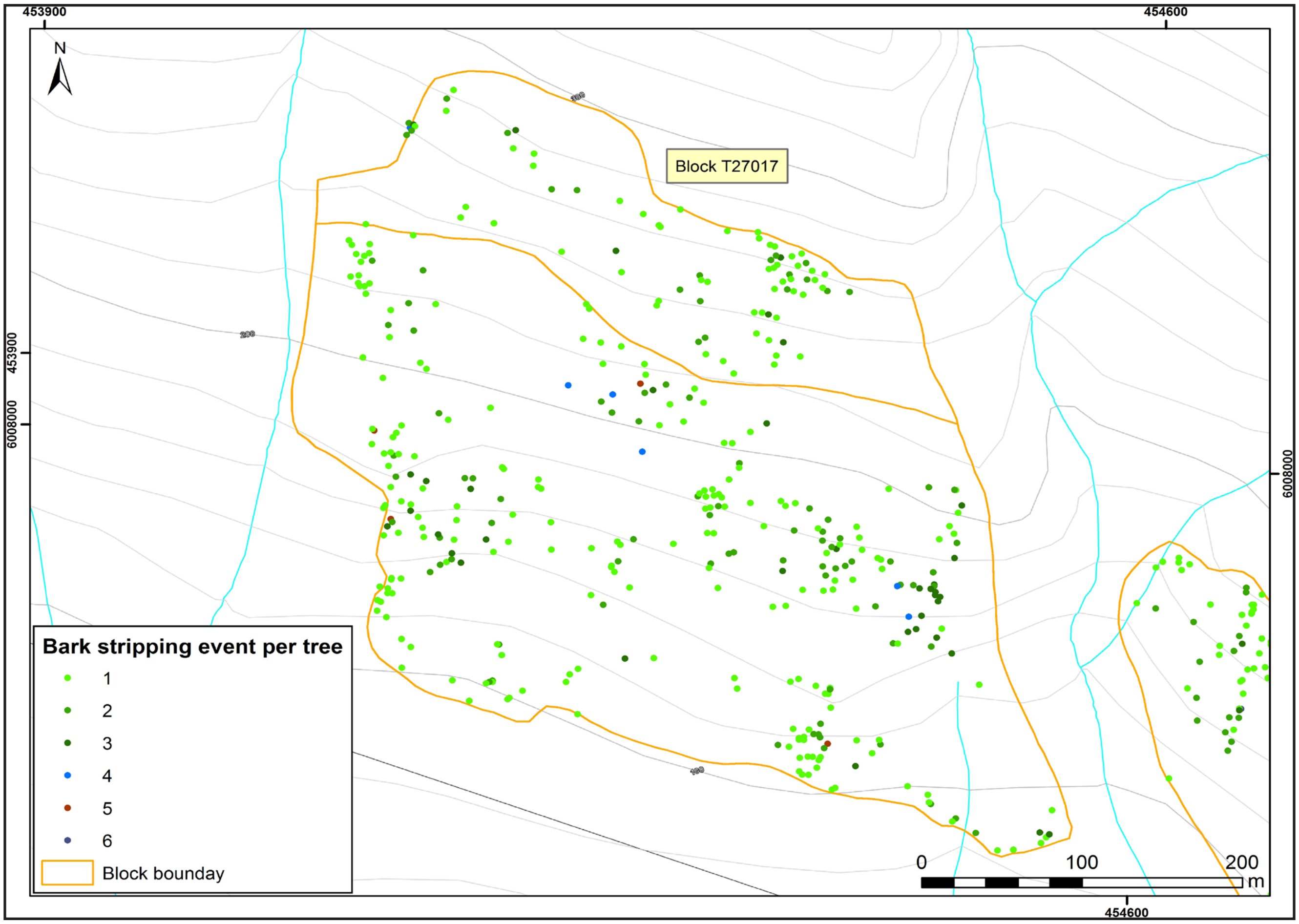

Figure 7. Bark-stripping event per tree, block 27017 (lightest=1, darkest=5).

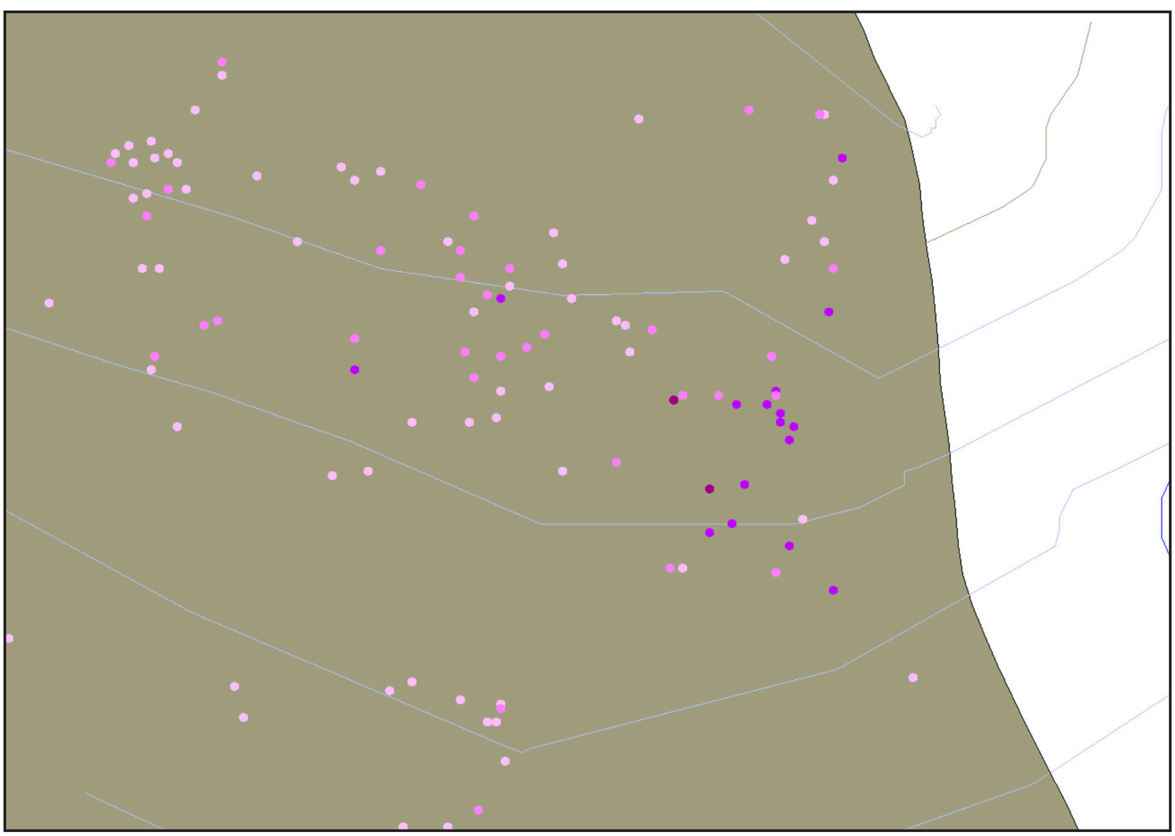
Figure 8. Number of strips per tree, detail of block 27017 (about 175 m N-S & E-W).

Kennedy Island

Kennedy Island is a moderate size island off the mouth of the Skeena River in Coast Tsimshian territory (see Figure 2). A number of small to medium sized cutblocks were surveyed there, recording 902 CMT features (Bonner, et al. 2000; Eldridge 2000). Figure 9 shows the distribution of CMTs in one part of the island. The proportion of rectangular strips was much higher on Kennedy Island compared to the Telegraph blocks: 16% of the total CMTs were rectangular strips, and many more aboriginally logged features are present. Of course, although the CMT symbols on the map look extremely dense, on the ground one sees many cedar trees with no evidence of use; some of these may indeed have healed-over hidden scars; but many more probably were never used, for one reason or another. However, very few of these were large 'unblemished' trees suitable for a canoe. The map shows a landscape that has been regularly and intensively used and managed over centuries.

Lakelse River

These blocks are on low hills near the confluence of the Lakelse and Skeena rivers, about 110 km upstream of the mouth of the Skeena. The confluence was the traditional summer salmon fishing village of Legaic, the most powerful chief of the Coast Tsimshian during much of the early historic period, and has become a Lax Kw'alaams Reserve. One block is about 1 km south of the confluence; the other about 2 km east (Figure 11). Some 1166 features on 1004 trees were recorded in Block 35-1; in 36-6, the totals are 718 features and 476 trees. The density of CMT features in Block 35-1 varied from 27 to 39 per hectare (different sub-blocks were calculated) and from 7 to 45 per hectare in the 36-6 block sections. The overall density may be about 3,000 CMTs per square kilometre.

While taper strips are the most common feature in both blocks, rectangular strips and, to a lesser extent, aboriginal logging, comprise a substantial portion of the total (Figure 12 & 13). This is perhaps a reflection of an increased requirement for construction wood and roofing, in the vicinity of the summer village.

Two interesting features of these blocks are a large num-

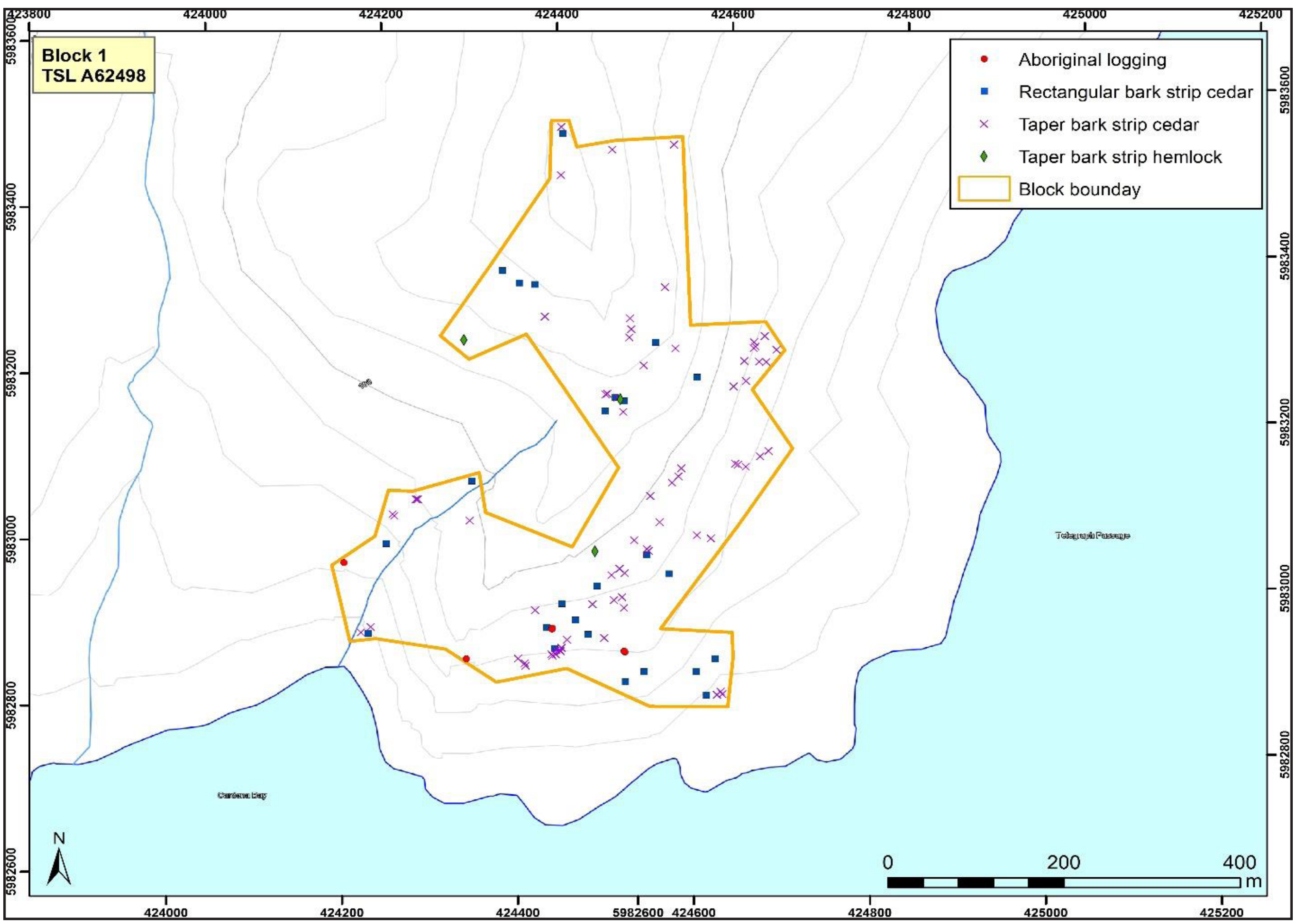

Figure 9. Kennedy Island, Block 1 CMTs

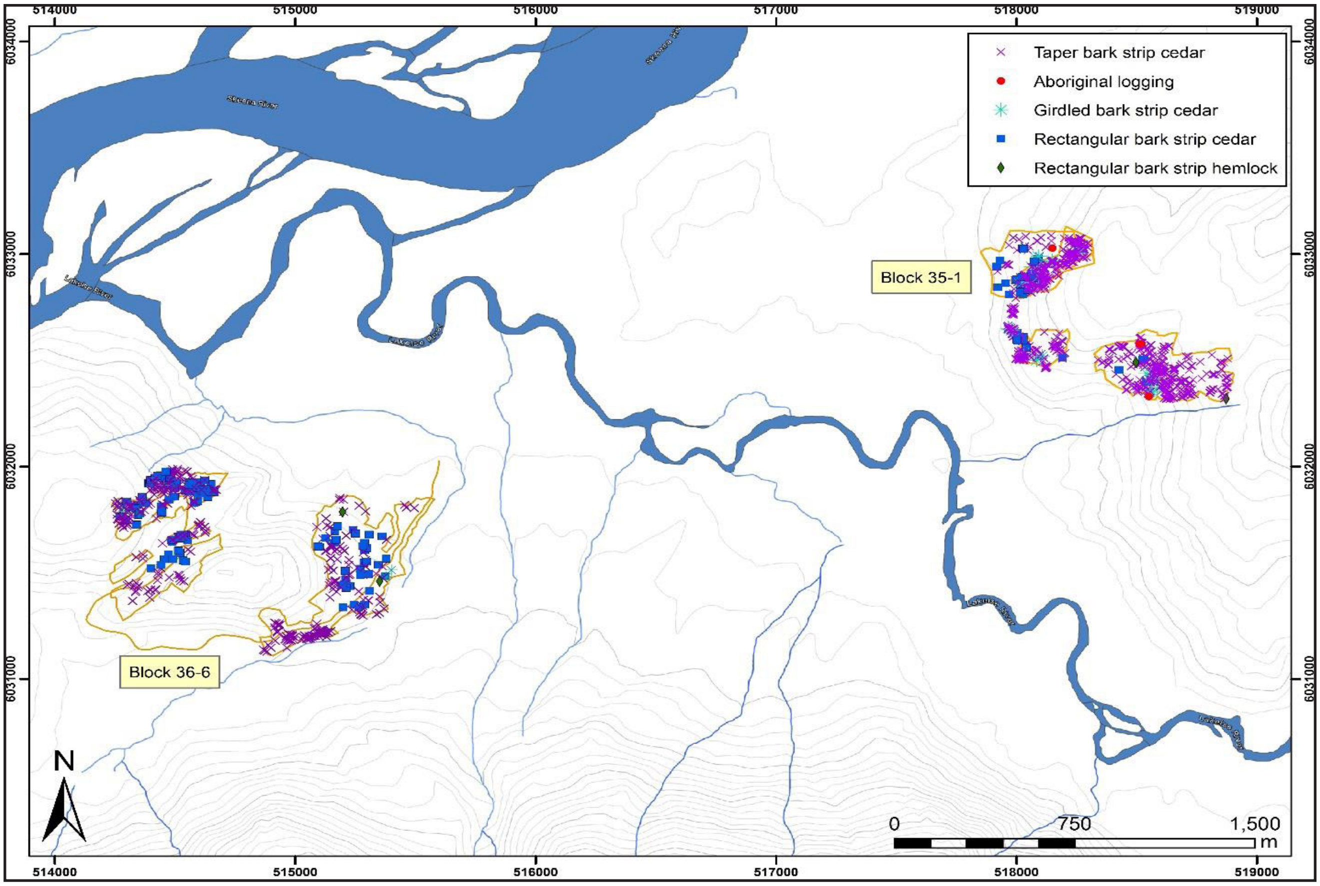

Figure 10. Block 35-1 (east) and 36-6 (west) at confluence of Skeena and Lakelse Rivers

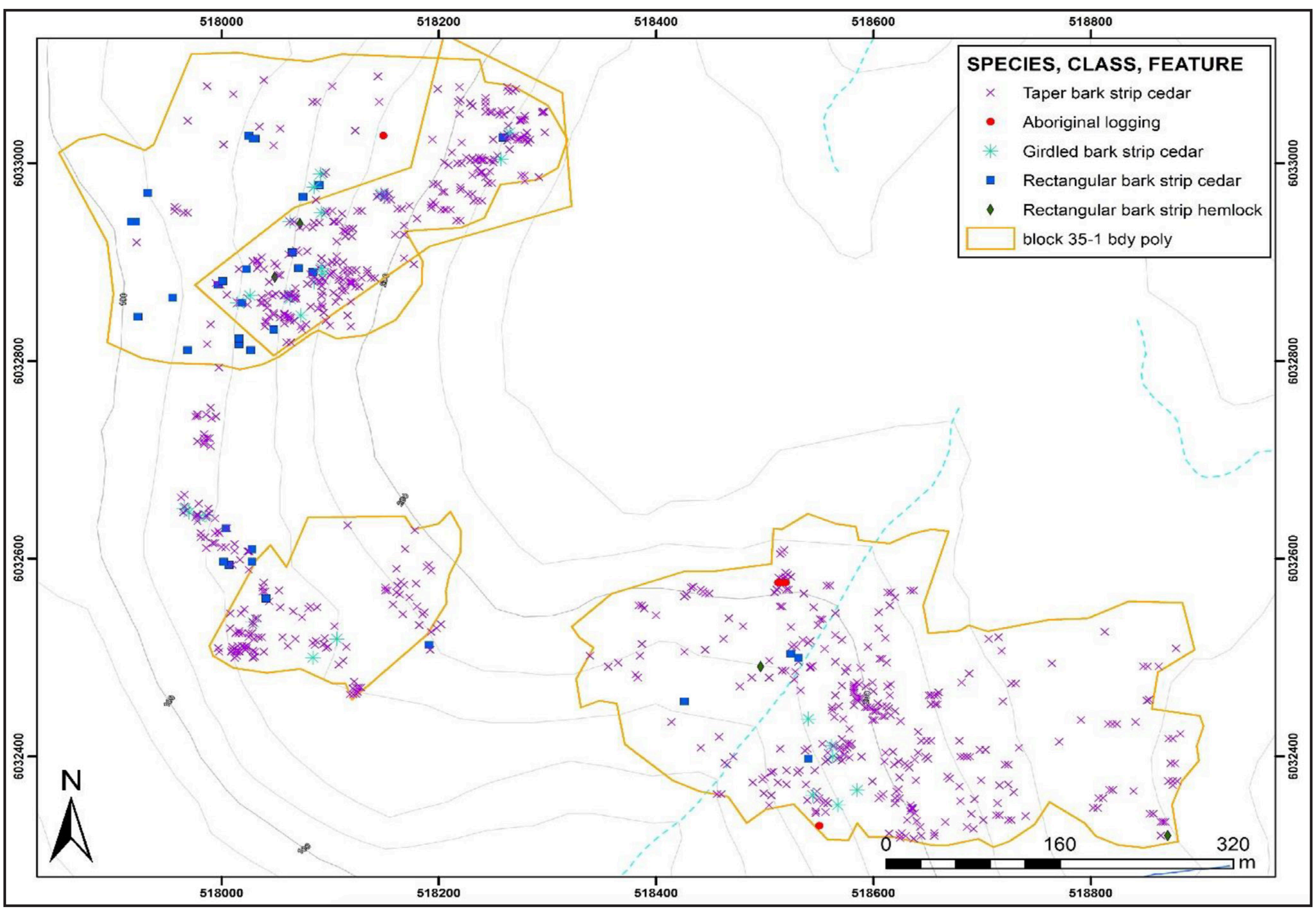

Figure 11. Block 35-1 CMTs by type.

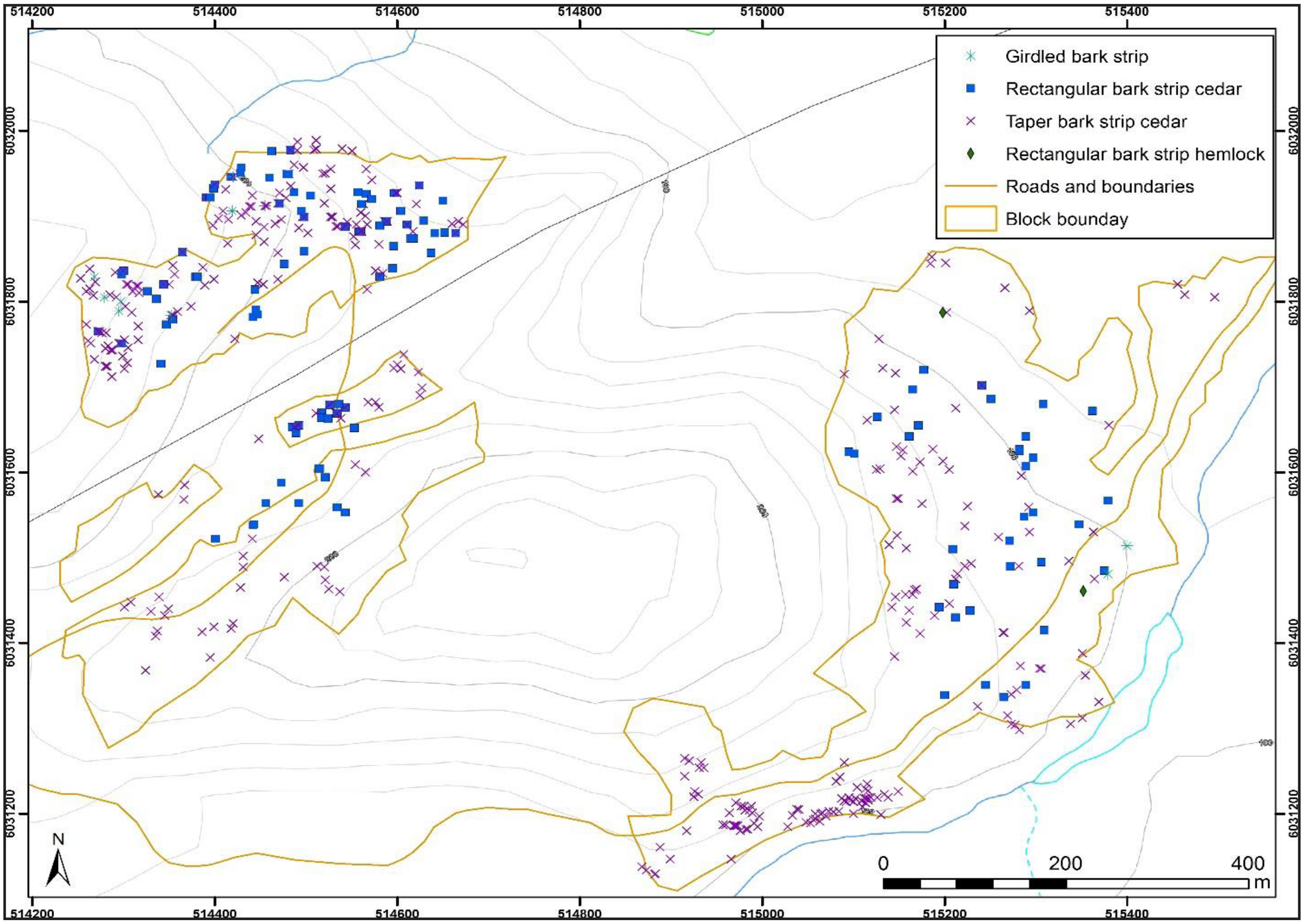

Figure 12. Block 36-6 CMTs by type.

ber of girdled trees, and the difference in average size of the CMTs between the two blocks. Girdled trees are a type of rectangular strip where all the bark is removed from the tree, killing the tree in the process. This is counter to the traditional Northwest Coast general principal of conserving cedar bark by trying to leave a strip for the tree to continue growing, as discussed above. Girdled trees are rare generally on the North Coast. They are most common in the Terrace area (with 38 trees with 47 features in the Lakelse blocks, some trees having have multiple features), Portland Canal (Owens 2002; Owens, et al. 2002), and near Naden Harbour on Haida Gwaii (Jim Stafford, personal communication); all these are areas of intensive bark harvesting and aboriginal logging. Perhaps, the demands for large bark sheets in these areas exceeded the supply of appropriate sized trees, and resulted in an occasional failure to follow 'best practices' in terms of resource conservation.

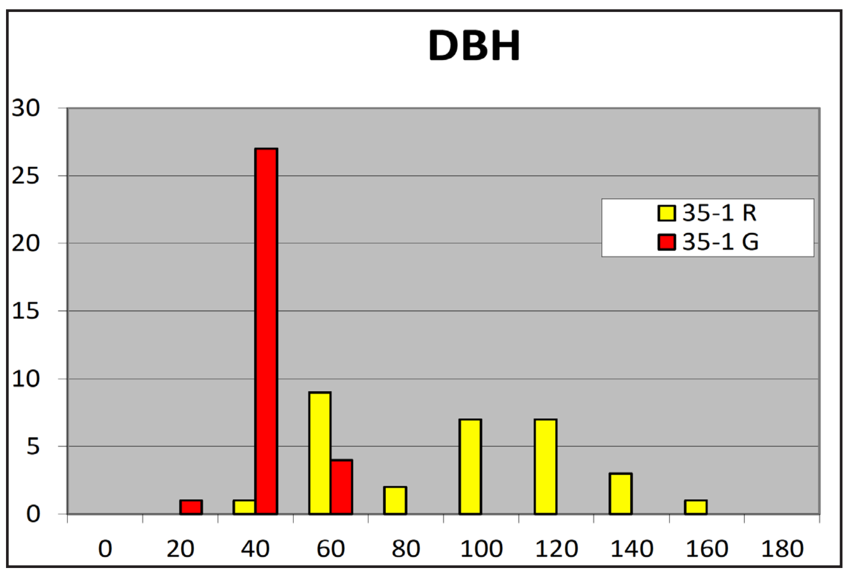

Figure 13. Diameter of rectangular and girdled CMTs in Block 35-1.

The current diameter at breast height (DBH) is the same as the DBH when stripped for girdled trees. Rectangular trees are generally much larger in size than girdled trees (Figure 13).

The difference in diameter between girdled and rectangular trees is attributable to the amount of healing lobe growth since the time of stripping. Healing lobe growth is of course absent in the girdled features. In both blocks,

Table 1. Size and growth indicators of rectangular and girdled trees.

	35-1	36-6
DBH mean Rectangular (cm)	86.1	111.5
HLT mean Rectangular	27.0	28.7
DBH-(2*HLT) Rectangular	32.0	54.2
DBH Girdled	30.9	49.6

This table shows that
(1)the average current DBH for rectangular stripped and girdled trees is greatest in 36-6,
(2)the average size of the rectangular trees was larger in 36-6 when aboriginally harvested, and
(3)the size of trees chosen for rectangular harvesting was very similar to the size of girdled trees in eachblock, but the trees were larger through time in 36-6.

the mean DBH of rectangular strips, subtracting twice the mean healing lobe thickness (HLT)(to account for growth both sides of the scar), is very close to the mean value for girdled trees in that block (Table 1).

Of interest is that the size of rectangular and girdled trees at the time of stripping was about 27-50 cm diameter. We have found from stem-round sampling large numbers of CMTs that taper bark strips were usually made on quite small trees, usually in the range of 10-25 cm in diameter, considerably smaller than the "one to two feet" usually given in the ethnographies as the typical size. Trees of the size reported ethnographically for taper strips were in fact more likely to be used for rectangular bark sheets. Modern taper-stripped CMTs in my experience tend to be on quite large cedars: 30 cm would be a small one and it isn't uncommon to see trees over 1 m diameter stripped in the last couple of decades. One seldom sees trees of this size of older CMTs. I suspect that the quality of inner bark desired was very different in precontact times. Early ethnographies report that larger trees produced coarser inner bark, suitable for cordage and like uses, but that the bark desired for clothing, basketry, and so forth had a finer, more supple quality. This difference in inner bark may be a reason that modern cedar bark weaving often looks noticeably coarser in appearance than do museum specimens.

As with the Telegraph blocks, the number of strips per tree provides some clues to patterns of harvesting. Figure 14 shows taper bark strip counts and Figure 15 shows rectangular bark strips.

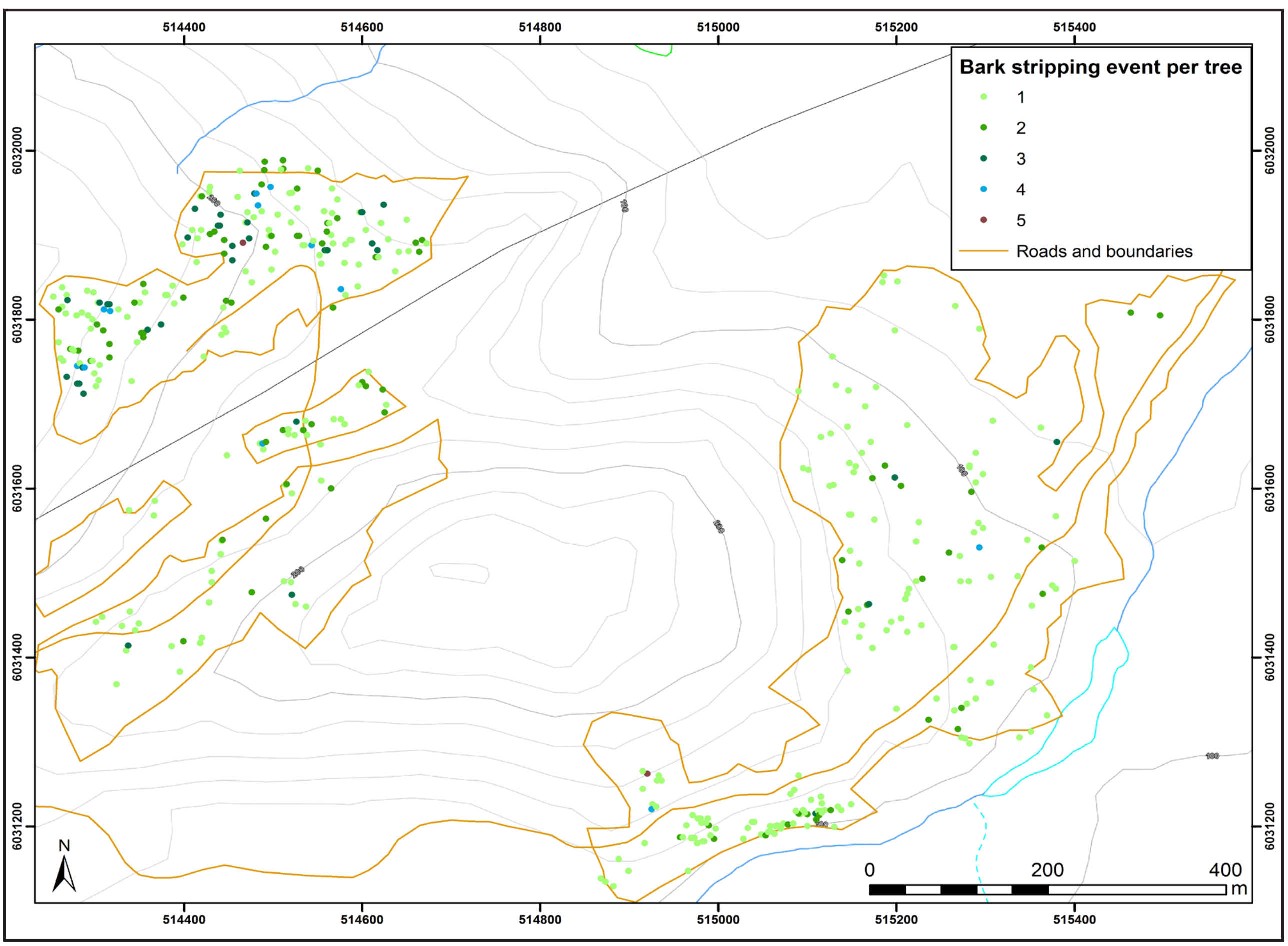

Figure 14. Number of taper strips per tree, 36-6 block.

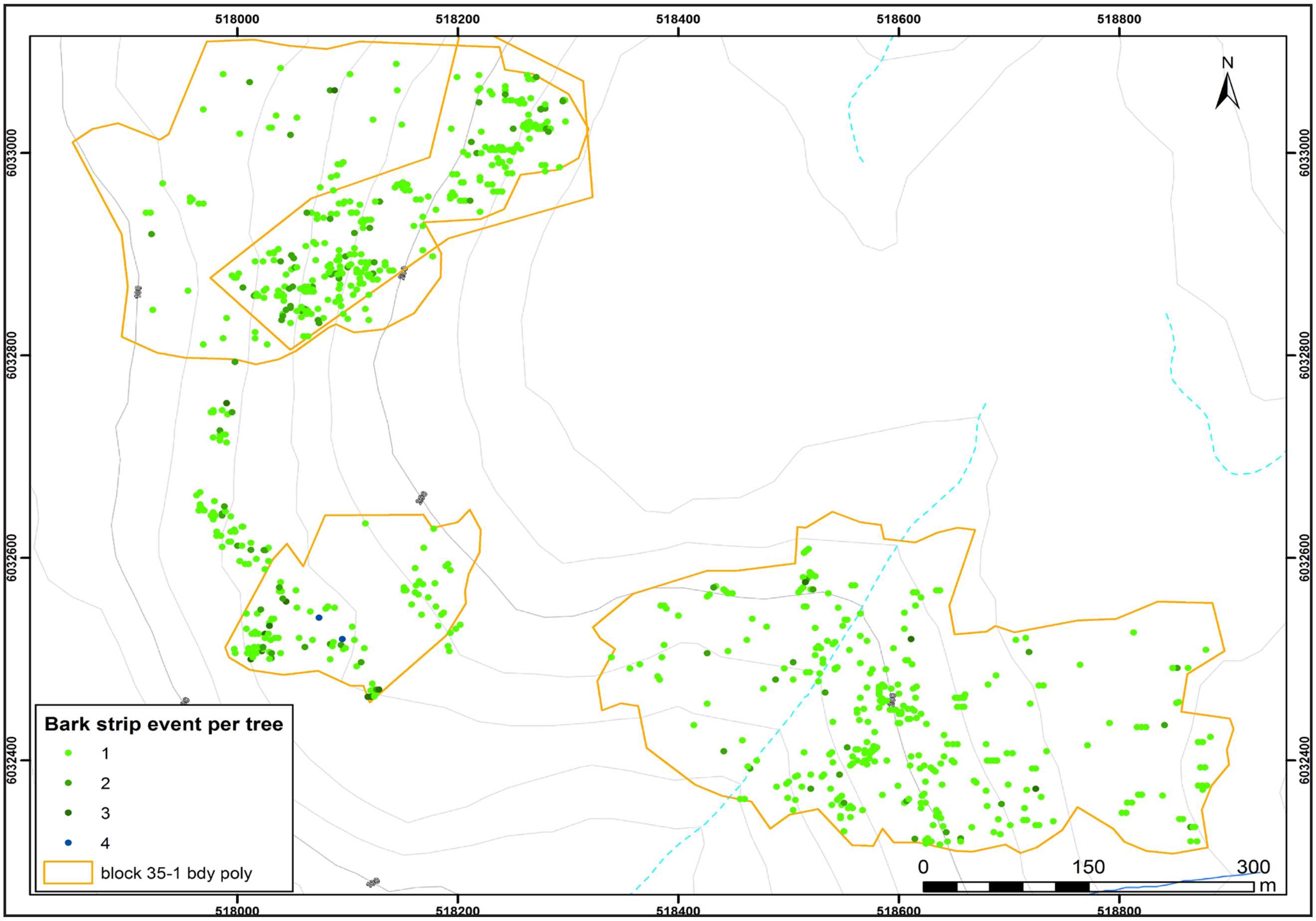

Figure 15. Number of taper strips per tree, 35-1 block.

These figures show consistency in the patterning of the two types of aboriginal use. Most multiply stripped taper scarred trees and almost all rectangular multiple stripped trees occur at the northern end of the 36-6 block, closest to the Lakelse and Skeena rivers' confluence. Further from the confluence, the density of multiple strips is lower, although the absolute density of CMTs continues about as high, but the incidence of multiple use drops. This strongly suggests that the area nearest the confluence was the most heavily utilized, with many trees being used more than once, and for different purposes (often taper and rectangular strips were mixed on one tree).

Conclusion

Brevity has prevented the inclusion of maps from many of the diverse cultural regions of the Northwest Coast. Suffice it to say that the very high densities of CMTs discussed above are not unusual for cedar stands within an hour or two walk of easy canoe access on the coast in areas of high population densities.

This cross-section of Coast Tsimshian territories, from coast to inland riverine, is perhaps sufficient to make the point that cedar stands were very heavily utilized, to the point that long-term sustainability would have necessitated conservation plans/measures. Cedar does not grow uniformly across even the lower elevations, and most local areas have large cedar-less areas. Much of the lower Skeena is forested almost exclusively by hemlock, the climax species of the biogeoclimatic zone (Krajina 1969). The elevation gain as one moves away from the river is so rapid that few forested areas are found more than a kilometre distant from the riverbank due to alpine conditions. As noted earlier, redcedar does not grow well at even moderately high elevations here. In addition, many of the forested areas are riddled with avalanche paths and so steep that foot travel is dangerous and slow. The number of cedar trees was limited and a high proportion of those available show signs of aboriginal bark or wood harvesting. With thousands of Tsimshian inhabiting this section of the river during the spring and summer salmon runs (e.g., Martindale 2006), the supply of cedar trees in the valley, especially those suitable for housing or canoes, was likely insufficient for the populations' needs.

A choice was posed above: was conservation purely an ethos or was conservation a necessity for long-term management? I believe a functional need from local or periodic shortages led to the development of this ethos, and that the high densities of CMTs along the lower Skeena are evidence that cedar was finite even in precontact times. Demonstrating the existence of long-term management is a powerful argument both morally and legally that the aboriginal people of BC can use in their struggles to regain powers in today's world.

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Morely Eldridge is the founder and President of Millennia Research Ltd. He has conducted archaeology in Western Canada and abroad since 1969, pioneering research in archaeological potential modelling, CMT and wet site recording and reporting, and resource management procedures.

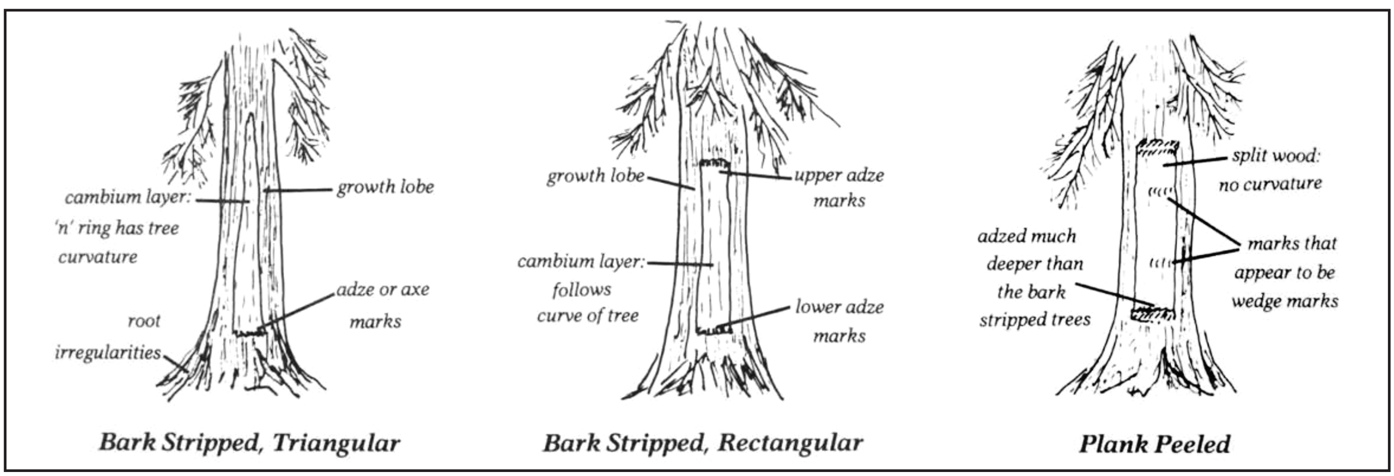

Illustration of types of peeled trees, taken from Russel Hick's article "Precontact Dates Revealed by Ring Counts: Archaeological data from culturally altered trees," first published in *The Midden* **16(5): 11-14.**

Yellow Cedar Culturally Modified Trees:

A summary of ethnographic uses and a close look at sites DiRv-9 to DiRv-15, located near Sechelt, BC.

by Amanda Marshall

Introduction

The coastal rainforests of the Pacific Northwest are home to yellow cedar (*Chamaecyparis nootkatensis*) culturally modified trees (CMTs), which are the result of modification to these trees for the collection of yellow cedar bark by coastal first peoples. This paper provides a summary of existing published information on yellow cedar CMTs, traditional uses of yellow cedar, and presents a controversial case study involving seven yellow cedar sites DiRv-9 to DiRv-15, located near Sechelt, BC.

CMTs are commonly found on western red and yellow cedar throughout the Pacific Northwest of British Columbia (BC), Alaska and Washington State. CMT scars are directly datable, with such dates having been gathered over the years confirming that coastal First Nations have been harvesting bark and wood from these trees for thousands of years, and continue to do so. Since the mid 1980s, archaeologists and researchers realized the importance of CMTs, and understood their vulnerability during normal forestry operations in the harvesting of cedar logs from our local forests. Thus, began an era of documenting and recording CMTs, by special interest groups, academics, First Nations, and environmental organizations advocating for their protection and retention. Despite the efforts of many, thousands of CMT sites throughout the Pacific Northwest have been destroyed, some documented and recorded by archaeologists and researchers, but sadly, many of them not. This article is about the lesser understood, and less frequently documented bark stripped yellow cedar CMT.

In the discipline of archaeology, taper bark strip scarred CMTs are often ambiguous and difficult to distinguish from many natural scars which, over time, can produce similarly shaped features. This results in often differing opinions between archaeologists, as the diagnosis is very subjective and sometimes based on 'opinions' and therefore can vary from researcher to researcher. Results can be different depending on researcher 'bias', experience, presence of natural or cultural scars in close proximity, or other factors. The majority of yellow cedar CMT features are taper bark strip scars, which compounds the difficulty in identification, given that they are not well understood. Archaeologists' experience recording redcedar CMTs, are relied upon when evaluating yellow cedar taper bark strip scars, which can result in differing opinions.

We present a case study from the Sechelt area, where two proposed forestry blocks, DK044 and DK045, were the subject of intense scrutiny by several archaeologists, who had differing professional opinions about the origin of these scarred yellow cedars and whether they are natural or cultural in origin. Several of these taper bark strip features were convincing enough, they were deemed 'probable' cultural scars and assigned Borden site numbers by the Archaeology Branch: sites DiRv-9, DiRv-10, DiRv-11, DiRv-12, DiRv-13, DiRv-14, and DiRv-15.

Background

The yellow cedar *Chamaecyparis nootkatensis* is similar in many respects to the red cedar, as both belong to the *Cupressaceae* or *cypress* family (Stewart 1984:25). Most Canadians refer to the tree as a cedar, but some call it a cypress, which is why its popular names include these variations: yellow cedar, yellow cypress, Sitka cedar, Sitka cypress, Alaskan cedar, Alaskan cypress, Nootka cedar, and Nootka cypress (Stewart 1984:25). The first part of the botanical name (*Chamaecyparis*) is derived from the Greek word for an Old World shrub, the Ground cypress; the second (*nootkatensis*) refers to Nootka sound on the west coast of Vancouver Island, where the tree was first documented botanically (Stewart 1984:25).

Yellow cedar grows up to 50 m in height (typically 20-40 m tall), often with a slightly twisted trunk (which is buttressed in older trees) (Pojar & Mckinnon 1994: 43). The leader droops and the flattened branches tend to hang vertically and appear limp; the outer bark dirty white to greyish-brown, in loose ribbonous vertical strips; the whole trunk appears shaggy and almost white against the dark of the forest (Figure 1; Pojar & Mckinnon 1994: 43; Stewart 1984: 25).

The leaves of the yellow cedar are scale-like and aligned in 4 rows, 3-6 mm long, with similar leaves in all 4 rows, bluish-green with sharp pointed, spreading tips. The pollen cones are described as approximately 4 mm long; with seed cones starting out as round, bumpy, light-green 'berries' covered with a white waxy powder, less than 1 cm long, ripening to brownish cones with four to six woody, mushroom-shaped scales (Figure 2; Pojar & Mckinnon 1994: 43). They can be distinguished from redcedar by their leaves, as the yellow cedar leaves are found in 4 similar rows all the same; whereas, the redcedar have two opposing rows of folded leaves, and two opposing rows of non-folded leaves. Also the leaves of the yellow cedar are often distinctly darker green than the leaves of the redcedar. Crushed leaves of the yellow cedar have an unpleasant odour, with a slightly mildewy smell (Pojar & Mckinnon 1994: 43). Another way to tell them apart is to stroke the branchlets away from the tip (against the grain); the yellow cedar is very prickly and the redcedar is not. The inner bark of yellow cedar smells like raw potatoes; whereas, the redcedar smells quite pleasant (Pojar & Mckinnon 1994: 43).

The yellow-gold inner bark is exceptionally strong, smooth like stain to the touch, and has a fine fibrous content. The softness of the wood, makes it highly suitable for carving, since it does not split as readily as red cedar and is considered more durable (Stewart 1984: 25).

Yellow cedars are found in moist to wet sites; often in rocky areas, avalanche chutes, rocky ridge tops, to timberline; at middle to high elevations (of 610 m to 2130 m) from the western coastal mountains and islands northward from Oregon through BC to Alaska, but chooses subalpine elevations in the south, descending to sea level only from about Knight Inlet northward (Pojar & Mckinnon 1994: 43; Stewart 1984: 25). It thrives in cold, wet maritime climates, along streams,

Figure 1. Western redcedar on the left, and yellow cedar on the right, demonstrating the differences in physical appearance of the outer bark (Photo courtesy of Heather Pratt).

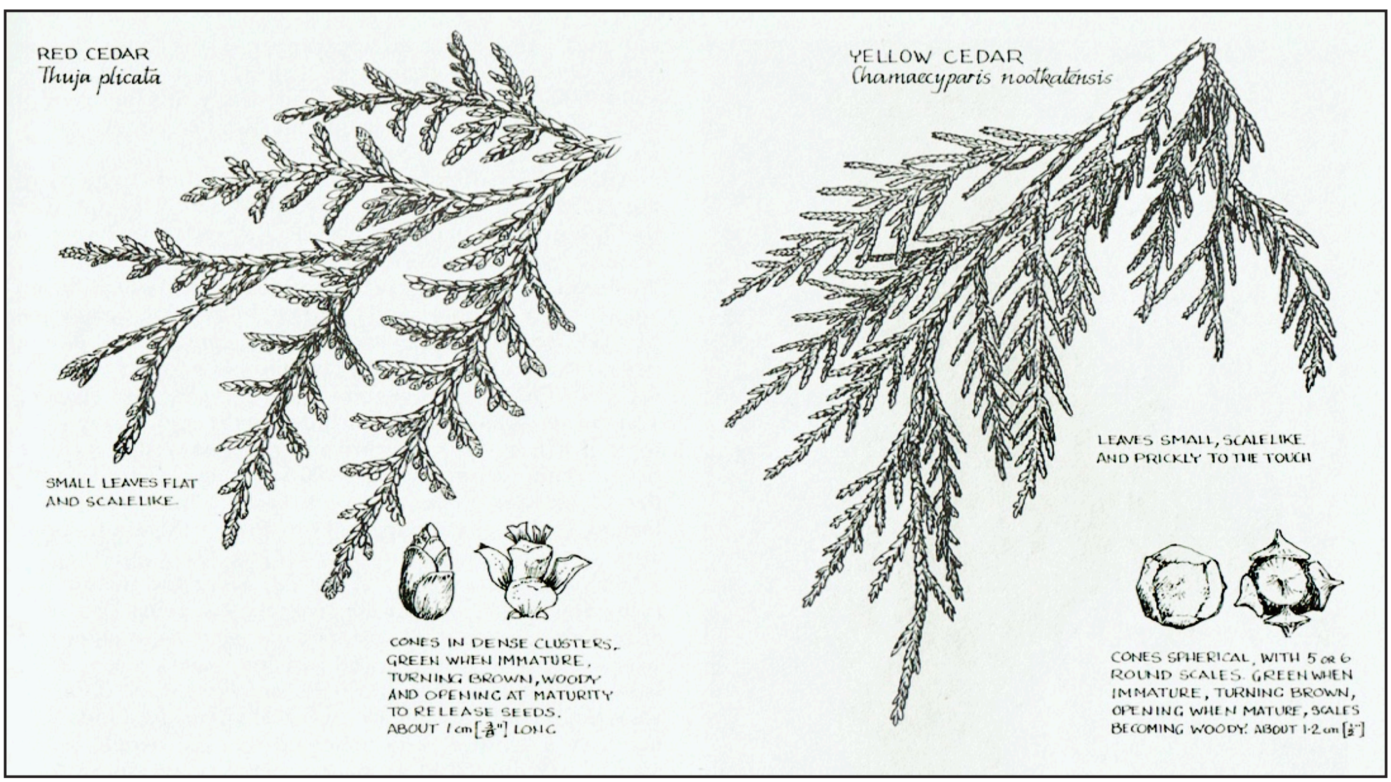

Figure 2. Illustration of red vs. yellow cedar boughs (courtesy of Stewart 1984:25).

in valleys and on mountainous slopes, preferring deep, slightly acidic soils, though it can grow on a thin layer of soil over bedrock (Stewart 1984:25).

In the next section, the article presents a summary of ethnographic uses of yellow cedar, with a range of First Nations uses from around the province. Specific Squamish and Sechelt examples are provided, although access to traditional use information was unavailable to the author at the time of this article.

Ethnographic Uses of Yellow Cedar

The soft wood of the yellow cedar was valued by First Nations for carving such items as digging sticks, adze handles, paddles, dishes, masks, rattles; and, in historic times, bedposts (Turner 2010: 80). The wood is valued by Haida carvers, who use it for ornamental paddles, wood sculptures and other items. The inner bark is still used today for weaving hats, mats and blankets (Turner 2010:81). Products of cedar bark were used in almost all aspects of life, from birth until death, and one could almost describe their culture in terms of it (Drucker 1951:93: McLaren et al. 2004:15). The Coast Salish, Squamish and Sechelt collected yellow cedar to make bows and paddles, and the inner bark was used for weaving (Turner and Bouchard 1976; Suttles 1990).

The bark of the yellow cedar is harvested in a similar manner to redcedar, but is considered finer and of higher quality (Turner 2010:81). Long strips of bark are pulled from standing trees, leaving a tapering scar on the outer bark. Then, the brittle outer bark is broken off and discarded, and the inner bark folded into flat bundles, which are tied with strips of the bark itself (Turner 2010:81). While the bark is still fresh, the brown outer layer is peeled off with a knife and the satiny whitish innermost bark is then dried in sheets or strips, for later processing (Turner 2010:81). Once dried, the bark is soaked in water to make it pliable again (Turner 2010:81).

It is plausible that the practice of collecting yellow cedar bark may be as ancient as 6000 years old, with a set of antler wedges recorded at the Glenrose site (DgRr-6), that may have been used as tools for splitting cedar (Stewart 1984:26).

Methods of processing of yellow cedar bark are described below.

Processing Yellow Cedar Bark

The inner bark of the yellow cedar is cut and pulled by the same method as for red cedar bark as soon as the sap began to run. The annual timing for collection varies by region depending on the climate. For example, in the south, people gathered it by the end of May, while in the north, the Haida went up in the high country in July to pull it. Florence Davidson said that there was only a two-week period when yellow cedar bark could be taken before the pitch came into it, making it sticky and difficult to work (Stewart 1984: 124).

After exposure to the sun and wind, approximately six to eight days, the yellow cedar bark was then soaked. According to Stewart (1984), the methods differ from region to region but the general theme is to submerge the bark under water for several weeks then process it with a whalebone bark beater and a flat stone, and then hang to dry. The bark was sometimes boiled to eliminate its pitchiness.

Jewitt describes the use of a whalebone or yew wood bark beater to mash the fibres. Because of the amount of oil in fresh whalebone, a beater of this material gave the tool the necessary weight and probably imparted some of the oil to the bark. When Stewart beat the bark with an ungrooved piece of wood that was handy, she found the bark kept sticking to the wood and concluded that the grooves on the underside of the beater would prevent this from happening by breaking up the implement's flat surface (Stewart 1984:126).

Healing Powers of Yellow Cedar

A deliberate use of yellow cedar, which strengthens the body, is evident in a number of cures for the sick (Stewart 1984:181). Stewart discusses a number of different treatments, one where an old yellow cedar bark blanket was burned, the ashes mixed with oil, were spread over the afflicted person. To relieve general pains people chewed yellow cedar branch tips and rubbed them on the afflicted parts (Stewart 1984:181). Painful legs and feet were soothed by a hot footbath of equal parts of fresh and salt water, to which the bark of elder and black twin-berry had been added, as well as the tips of four yellow cedar branches (Stewart 1984:181). Among old people, a painful back was sometimes rubbed with cedar branches until blood was drawn; the back was then smeared with a mixture of ground hellebore (Veratrum viride) and catfish oil (Stewart 1984:181). She also describes yellow cedar used in conjunction with a sweat or a steam bath.

There were many more ways of healing with yellow cedar among the various coastal cultures, but in general all remedies recognize the power of the tree, which they view as supernatural (Stewart 1984:181).

Now that we have discussed why yellow cedar were collected and processed, the following section discusses the resulting archaeological features, yellow cedar CMTs. Their general morphology is discussed, both external attributes and internal ring morphology. For a more detailed description of taper bark strip scar morphologies and field identification, please refer to Stafford 2017 (this volume).

Yellow Cedar Culturally Modified Trees

Similar to western red cedar CMTs, the yellow cedar tapering bark strip scars, over time form features that archaeologists refer to as culturally modified trees or CMTs. The CMT Handbook defines a CMT as, “a tree that has been altered by native people as part of their traditional use of the forest” (Archaeology Branch 2001:1).

The yellow cedar CMT (Figures 3 and 4) is less commonly recorded by archaeologists in the field, and because of this is poorly understood. As a result, there is very little published information on yellow cedar CMTs (Arcas 1984, 1986; Earnshaw 2016; Harrison et al. 2003; McLaren et al. 2004).

There is available published information on cultural tapering bark strip scars, but nothing specific to yellow cedar. Information is presented here for the reader to understand the morphology of the cultural tapering bark strip scars, and how the characteristics of yellow cedar may create features that appear to be anthropogenic.

The following information is adapted from the CMT Handbook, revised edition (Archaeology Branch 2001, appendix 1). 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. These scars are typically 5 to 8 m in length, and the width will depend on the diameter of the tree at the time of modification. Longer spirals, especially if they pass branches, are more likely naturally created scars.

In contrast, natural scars are either short (<3m) 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, or fires, and may have large branches on the scar face. The sides of cultural tapering scars are more-or-less

Figure 3. Tapering bark stripped yellow cedar, from Kingcombe Inlet (Courtesy of Stafford).

Figure 4. Tapering bark stripped yellow cedar, from Kingcombe Inlet (Courtesy of Stafford).

straight, where in contrast, natural scars are the result of die back, which cause bark scars with irregular sides (Archaeology Branch 2001).

Scars that have bases are likely to be cultural, because there are few natural processes that result in cedar bark scars that originate at a point above ground surface. Scars that do originate above ground are usually cultural as it was common to make the initial cut of bark at about waist height, but this was dependant on personal preference (Archaeology Branch 2001).

When bark is removed by natural means, such as falling rocks, breaking branches, and adjacent falling trees, the resulting bark scars often continue down to the ground surface. These scars are not likely to be mistaken for cultural scars because they do not usually display the other characteristics (Archaeology Branch 2001).

Cultural scars are typically located on the uphill or lateral sides of a tree, located on a slope and are seldom found on the downhill side. The uphill side is favoured due to the bark being more easily pulled from the tree when the ground is level or slopes uphill. The uphill side is also usually the shaded side, which will in turn have fewer branches that could impede bark removal (Archaeology Branch 2001).

When cedar trees are damaged, either by cultural bark stripping or by natural means, the trees undergo a process called 'compartmentalization'. Since trees are unable to move or retreat from a destructive force and are not capable of healing themselves in the same way that mammals can, they compartmentalize the wound by walling off the damage through strengthening existing boundaries in the wood (Earnshaw 2016:42). In addition to this, tissue is generated by the cambial layer in the form of new annual rings (Shigo 1979). This process results in the presence of traumatic resin canals, and regular phenol staining pattern around the injury.

The most definitive way to determine the validity of a cultural scar is to analyze the annual ring characteristics from a stem round sample, for the following attributes as described by Millennia and derived from the Meares Island study (Arcas Consulting Associates 1986; Millennia 2015):

1. Expanded growth ring width caused by increased production of both earlywood and latewood;
2. The presence of high density latewood and the absence of low density latewood;
3. Sometimes the presence of traumatic resin canals;
4. A squared angle of intercept, also known as a ring termination perpendicular to the scar crust;
5. Healthy growth in the years immediately prior and subsequent to injury;
6. Regular phenol staining pattern around the injury.

Typical tree ring features which suggest a natural scar are;

1. Parallel or obtuse ring termination (pinwheeling);
2. Poor, suppressed growth at the time of pre-injury;
3. Condensed ring width post injury;
4. Uneven phenol staining at the edge of the scar;
5. Irregular or wavy healing rings or scar crust; and,
6. Traces of bark on the scar face.

Millennia points out that although these criteria are used in mitigation projects, it is not clear how directly applicable they are to yellow cedars.

Natural causes of bark die back, such as over exposure to sun or bark bruising are possible factors which may cause wide circuit, tapering scars. However, these would result in obvious characteristics in a cross section, since the bark would adhere to the scar face in the early part of the scarring process (Millennia 2015:22). Bark remaining would prevent a smooth scar crust from forming, and would likely become 'trapped' in the layer leaving it visible. Bark die-back or partial circuit death is described as a slow process, which would initially display increasingly tight growth rings; following partial death, and then subsequent healing rings that would slowly curl around the injury resulting in a pinwheel effect as the tree compartmentalizes the dead area (Millennia 2015: 23; Shigo 1979). In trees that experience poor growing conditions prior to bark loss, they would display unhealthy and highly constrained growth rings prior to and subsequent to bark loss. Bear damage to the trees is also described as a possible injury resulting in tapering bark scars resembling cultural scars, but are described as relatively short in length (4 feet), and varying between a small patch to wider girdling. Millennia (2015:23) also suggests that yellow cedar, as it is slow growing, would seem unlikely to contain the sufficient high-sugar sap to be of much interest to bears. Also, given its pungent odor, yellow cedar is likely unpleasant to taste.

Consultants reports on the provincial library reveal a lack of dendrochronological analysis and supporting data on yellow cedar samples (Millennia 2015). Most of these reports provide only a list of dates, without any detailed descriptions or analysis of the tree ring morphology and characteristics observed (Marshall 2007). Millennia found only two reports on PARL that included photographs of yellow cedar samples, one is a study completed by Millennia of samples from Loss Creek near the Jordan River (Ramsay 2014). Millennia (2015) concludes that the dendrochronological assessment criteria that we as a discipline regularly use are currently inadequate for application to yellow cedar CMTs.

A scar crust will be present on a cultural scar, but will not always be visible on the outside of the tree. It is characterised by a 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 un-eroded scar face. On cultural bark strip scars, this crust is smooth and follows the regular curve of the annual ring exposed by stripping (see Figure 5). For as long as the scar face preserves, these smooth scar crusts will extend across of the scar (Archaeology Branch 2001; Earnshaw 2016).

'Scar crusts' are also found on natural scars, particularly those that form healing lobes in response to damage such as: windfall damage, rockfall damage and wind cracking. However, the 'scar crust' in these instances will likely follow the damaged wood surface (often with bark patches), may display healing rings that pinwheel against a highly irregular healing surface, and will not be smooth like those that develop over the sapwood of a cultural scar (Figure 6).

Yellow cedar CMTs are particularly difficult to identify and to distinguish from cultural bark strips scars versus natural scarring, because they are so poorly understood (refer to Stafford this volume, and Stafford and Maxwell 2006). Archaeologists have been known to disagree on the determination of scar origins on yellow cedar, resulting in controversies. A case study demonstrating such a controversy from several blocks in the Sechelt area are discussed below, in the saga that was DK044 and DK045.

Figure 5. A yellow cedar sample collected from a site near Port Edward, BC. Note the second internal hidden scar (both scars were chopped features, dating to AD 1965).

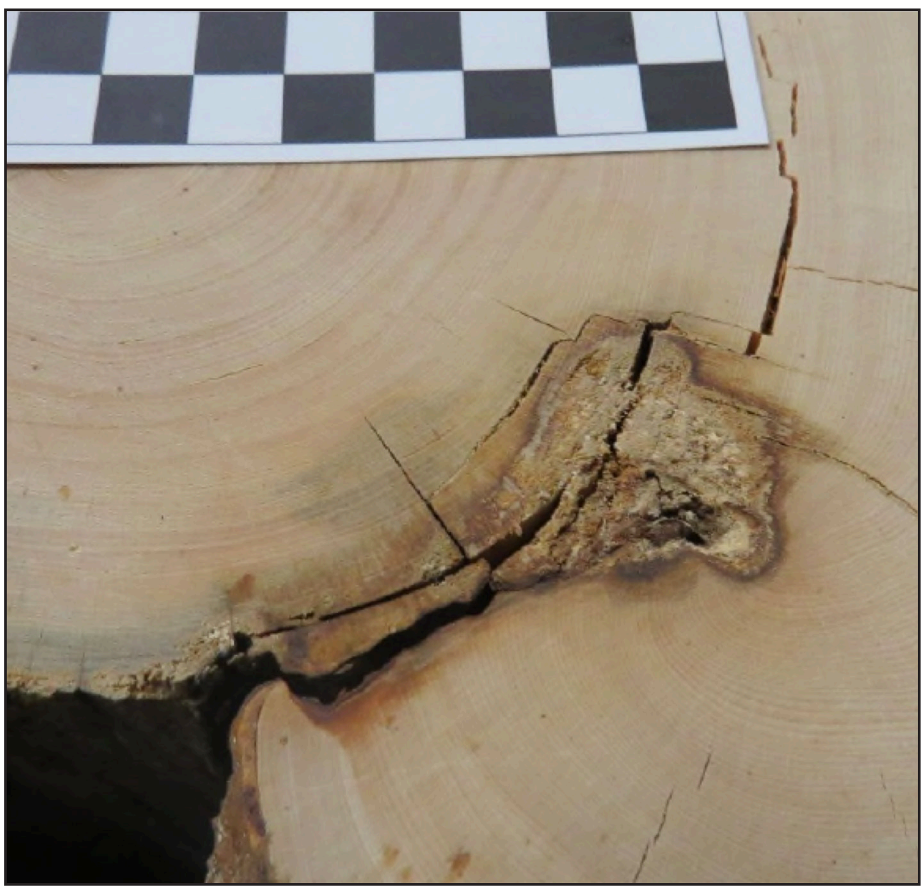

Figure 6. Right healing lobe of a natural scar, on a yellow cedar, displaying pinwheeling, irregular rot, and highly irregular 'scar crust' healing surface against an uneven face (courtesy of Millenna 2015).

Case Study: DK044 and DK045

Figure 6. One of the tapering scarred yellow cedar trees identified in the Roberts Creek area (DK 045) (Photograph courtesy of the AFA).

DK044 is a series of cutblocks located within TSL A78126, on the Sunshine Coast near Sechelt, BC. The blocks are located in an area known as the Dakota Bowl, near the headwaters of Dakota Creek, and on the northern flanks of Mt. Elephinstone. DK044, as well as other nearby blocks within the same TSL (DK042, 043, and 045) were proposed for harvest by BC Timber Sales (BCTS) (Ancient Forest News 2013). The blocks are located in the traditional territory of the Skwxwú7mesh and shíshálh First Nations. A series of surveys and assessments took place regarding the blocks in the TSL, by several different archaeological firms, which were eventually reviewed by the Archaeology Branch. A summary of these events are described below, and a table is provided (see Table 1).

In September of 2011, archaeological consulting firm Baseline Archaeological Services Ltd. (Baseline) conducted a preliminary field reconnaissance (PFR) of a portion of DK044, and determined the area to have low archaeological potential. Then, in August of 2012, Baseline conducted an additional PFR of blocks DK042, 043, 044 and 044b, and no cultural heritage or archaeological resources were identified.

In June 2014, Coast Interior Archaeology (CIA) conducted a PFR of block DK044 at the request of Elphinstone Logging Focus (ELF). ELF is affiliated with the Ancient Forest Alliance (AFA), a BC organization working to protect the endangered old-growth forests of BC, and is run by environmental activists. During the CIA assessment, tapering bark stripped CMTs were noted with the potential for further undocumented features, and an AIA was recommended of the entire TSL.

Baseline was then contracted by BCTS to conduct an AIA in 2014, initiated by a reconnaissance, followed by a sampling of scarred yellow cedars via a collection of nine stem round samples, which were taken back to the lab for analysis (Grant 2015:2). In August of 2015, ELF hired Millennia research to conduct a review of all of the studies, and to provide a second opinion on the analysis of the stem round samples (Millennia 2015).

In addition to the blocks in the TSL, DK045 was subject to several archaeological surveys and contradicting archaeological opinions as to whether-or-not the scarred yellow cedars represented cultural or natural scars.

CIA used the following criteria to identify cultural features: 1) the presence of long tapering scars with regular lobe development, 2) presence of multiple long tapering scars on one tree; 3) clustering of tree stems with long tapering scars; 4) presence of a scar crust; 5) presence or indication of a 'base' where the tree was cut for bark removal, and; 6) presence of multiple termination points at the top of a visible scar.

Key observations made in the CIA report (Stafford 2014:3) are summarised below:

> *Many scarred trees in DK044 appeared to be natural, assuming they result in part from bear use, many of the trees exhibit long tapering scars with straight healing lobes on stems suitable for*

Table 1. Comparison of studies and rationale for results of each.

Study	Timeline	Results	Rationale
Baseline PFR of DK044	September 2011	The area was determined to have low archaeological potential.	Nothing was found, and the corresponding AOA suggested the area was too far from shoreline for people to have traveled.
Baseline PFR of blocks DK042, DK043, DK044 and DK044b	August 2012	No archaeological resources were identified.	---
CIA PFR of a portion of DK044	June 2014	An AIA was recommended of the block and the entire TSL.	Tapering bark strip scars were noted with the potential for further undocumented features. Multiple strippings on trees were noted, landscape patterning, and the absence of scars on second growth cedars
Baseline PFR and AIA of DK044	September 2014	The scars were determined to be non-cultural in origin.	The evidence did not support a claim of cultural origin. Nine stem round samples were analyzed in the lab. Yellow cedar was not the dominant timber type (only 26%), and natural scarring was observed on all species.
Millennia Review of 9 stem round samples	October 9, 2015	4 of the 9 samples were considered from cultural scars, 3 displayed a mix of characteristics but are not unequivocally natural, and 2 were confirmed to be natural.	Yellow cedar responds differently to injury than western red cedar, however analysis of the stem round samples while not "classically" cultural, still conclude that there are observable morphological differences between the natural and cultural scarring.
Archaeology Branch conclusions	April 2016	The evidence supports the argument for the CMTs subject to protection under the HCA.	CIA's results, combined with Millennia's review and a forest pathologists opinion that the scars were not natural.

stripping for cultural use. Yellow cedar with several multiple long tapering scars were also noted including instances with multiple trees in close proximity. Many of the trees exhibited strips removed from multiple and opposing sides of the tree. A few examples noted that the tips of divergent taper strips could be identified at the top of the scars, another strong indicator of systematic bark removal by humans. They also noted landscape patterns, which in their opinion raised the confidence level of the CMTs, finding many clustering near creek margins and along ridges (Stafford 2014: 3).

Due to the number of scarred trees within the blocks, the level of confidence for assigning a cultural origin for the scars varied, but the overall theme was that many were confidently assigned a CMT status based on the attributes described above. Stafford also noted the absence of scars on smaller diameter, second growth cedars, which fit the pattern of decline for traditional harvesting practices in the area.

Stafford concluded that he was concerned we (archaeologists) were underestimating the use of the area and that a comprehensive assessment would continue to bring additional evidence, more features, differing use areas, and archaeological site types. He further notes that the occurrence of yellow cedar CMTs near the coastal mountain ranges has been under reported by archaeologists, and that it is important to acknowledge the native use of these mid and high elevation areas and potential for a variety of archaeological sites to include yellow cedar CMTs.

Baseline's AIA of DK044 included a reconnaissance of the block in September of 2014, and a sampling of selected scarred yellow cedar trees that were to be felled, selected for transverse stem round cross sections and taken back to the lab for analysis (Grant 2015:3). This was done by selecting scarred trees with characteristics bearing the morphological similarities to those of cultural bark stripping scars, as well as one natural scar for comparison (Grant 2015:3). Millennia 2015 notes that the trees selected for sampling were in close proximity to the helicopter landing area (for ease of collection) and were not the cluster of potential features observed by CIA.

Grant 2015, noted that yellow cedar was not the dominant timber type in the block, making up approximately 26% by volume. Further, he observed that natural scarring of various sizes and shapes is abundant on all species of trees, and provides multiple examples of possible causes of natural scarring. The report displayed photographs of each standing tree, adjacent to a photograph of the corresponding stem round sample, with a ring count for the year of injury. Two tables were included presenting the results of the stem round data, and ring counts. The report concludes with a statement that "while it is true a portion of the observed scars, including the above sampled trees, resemble those caused by the collection of bark, it is the opinion of this firm that ascribing these as cultural in origin is speculative and circumstantial at best" (Grant 2015: 26). Grant did not feel confident of a cultural origin of the yellow cedars within the block.

The subsequent Millennia (2015) report, summarises work completed to date within DK044 and 045, and goes on to critically analyze the existing data. Millennia points out that there is poorly understood data with regards to potential models for yellow cedar CMTs, and brings into focus the idea of 'remote' locations as an unreliable method to discriminate between natural and cultural scars, especially on yellow cedar CMTs. He points out that there is no archaeological potential model available for the project area, and suggests that the attributes used for western redcedar are not applicable. CMT potential assessments should not necessarily be the same with yellow cedar, as their ecologies are different. As mentioned earlier, yellow cedar is generally only present in mid and high elevations, and this is often further inland than western redcedar CMT site locations. He further points out that ease of access should not be used with yellow cedar models, because its considered value would encourage remote forages to obtain the resource regardless of location.

Millennia's report mentions Rudy Reimer's (2000:1) work, which challenges the notion that mountains are barriers to humans, and emphasises that they were not only traveled to get somewhere else, or as areas to seek refuge, but as areas to seek specific resources. From his research, the distribution of sites in many different mountainous regions, suggests that many sites are not only located high above nearby villages, but also in many areas that were once viewed as uninhabitable and remote (Reimer 2003:59).

Millennia goes on to provide a number of recorded and accepted high elevation yellow cedar CMT sites (Ramsay 2014; Stafford and Maxwell 2008; Bonner et al. 2001; McLaren et al. 2004). In summary, the Millennia report points out that CMT sites can, in fact, be found at high elevations, on steep terrain similar to DK044, and far inland; and that these factors should not eliminate them from being considered to be culturally modified.

A thorough review of the nine stem round samples collected by Baseline is then provided, with the following conclusions (Millennia 2015:18). In Millennia's opinion, the samples likely to be cultural do display different dendrochronological characteristics than the two definite natural scars collected. The two natural scars are described as lacking a definite scar crust, pinwheeling rings, and are described as fitting the textbook as natural scars. Whereas, in contrast, three of the samples all display scar crust, square angle of intercept, expanded ring width post injury, all attributes considered typical of cultural scars on red cedar. However, the three remaining samples display a mix of characteristics, but are not unequivocally natural and so are considered 'uncertain' in terms of origin. One of the samples displayed no scars.

Conclusion

The traditional and cultural uses of yellow cedar are well documented in the ethnographic record. However, there is a significant and problematic data gap in our understanding of the ways in which the response to cultural injury is expressed in yellow cedar as CMTs. It is clear that further research is needed around the use of, morphology, natural inflictions (scarring) and how the trees respond to scarring events, to accurately define whether they are naturally or culturally caused. More research is also needed regarding the distributions of yellow cedar CMTs, to understand where people preferred to gather this resource on the landscape to better archaeological predictive modeling for these feature types.

Millennia (2015) concurs that yellow cedar often reacts differently to injury than redcedar, and that further study of scarring on yellow cedar is needed. The examination of dendrochronological ring morphology and scar crust attributes on a sample of yellow cedar CMTs would prove extremely valuable; Millennia suggests doing this with several rectangular bark strip samples so there is no question of cultural origin.

The story of DK044 and 045 is unique in that we have the environmental activists on the one hand, whose goal is to protect the ancient forest, and on the other hand is the forestry company who aims to make a profit out of harvesting and selling the wood. Both hands hire two different archaeologists with two completely different professional opinions about both the archaeological potential of the area, and also the origins of the scars on the yellow cedar trees in the Elphinstone area.

Both sides produce fair arguments for their cases, which ends up being evaluated by yet another 3rd party, a firm with considerable experience with CMTs. According to Kira Kristensen (personal communication March 8, 2016) at the Archaeology Branch in Victoria, the story is not over, as BC Timber Sales awaits a final decision on their forest license for the area. The yellow cedars have been assigned archaeological site Borden numbers, awarded Heritage Conservation Act protection, and the area has been nominated for protection as an Ecological Reserve.

As a discipline, we need to approach yellow cedar CMTs differently, factor them in when establishing predictive models and assessing areas of potential where yellow cedars grow. We also need to be open minded and consider that when it comes to yellow cedar, we cannot apply the same criteria and body of knowledge that we have for redcedar CMTs. As a community, we should acknowledge and protect, not only the individual CMT features that are considered significant, but also the ancient forests that the features are connected to. As a province we only have so many of these unique archaeological sites left, and it is up to us to document what we have before these sites are logged and destroyed forever.

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Taphonomy of Culturally Modified Forests in Coastal BC:

Notes on Identification and Recording of Bark Harvested Cedar Trees

by Jim Stafford

It is clear that our common human history has included the modification of the environment to suit our needs and this has included harvesting bark from living trees (Stafford and Maxwell 2006; Turner 2014; Turner et al. 2009; Turner et al. 2013). Prior to industrial logging on British Columbia's coast, Indigenous peoples utilized and managed the forests sustainably for many thousands of years. The remaining old growth forests of the Northwest Coast preserve an archive of events imprinted into the biological landscape and demonstrate the interconnectedness between all things living and dead in such traditional forests. Bark harvesting scars found on cedar are associated with both long standing individual and group histories that are typical of a traditional landscape (Antrop 1997, 2005).

Archaeological sites are places where features and artifacts have been uniquely preserved and have survived previous impacts, be they natural (e.g., decay) or not (e.g., industrial development). Due to preservation and visibility, bark harvested cedar trees are the most common archaeological culturally modified tree (CMT) feature found on the BC coast, with the possibility to provide calendar dates for Indigenous use spanning the last thousand years or so.

The following description of cedar CMTs is mainly taken from a paper presented at the Canadian Archaeological Association meetings in 2006, entitled "The text is in the trees: Incorporating Indigenous forest practices into the archaeological landscape of the Northwest Coast" (Stafford and Maxwell 2006). Further data has been added from the author's recent experiences in the Nimpkish Valley ('Namgis Nation), Port Renfrew (Pacheedaht Nation), and Sechelt (Sechelt and Squamish Nation) areas.

Yellow Cedar CMT Age and Visibility

Yellow cedar (*Cupressus nootkatensis*) inner bark was sought out and highly valued more so than red cedar (*Thuja plicata*) inner bark by the Indigenous populations of the Northwest coast (Stewart 1984, Turner 1998, 2004; Stafford and Maxwell 2006). Despite this fact, the identification and recording of yellow cedar CMTs still appears to be less than adequate.

Archaeological sites associated with the procurement of yellow cedar have been located by the author great distances from the shore and other major waterways, near mountain tops on Haida Gwaii, 'Namgis territory (Nimpkish Valley), Kyuquot territory, Pacheedaht territory, and Sechelt territory. The author's experience suggests that small and large clusters of CMTs may be found any distance from a major water body in old growth environments (Maxwell 2000, Maxwell et al. 1998; Stafford and Maxwell 1998), particularly stands of culturally modified yellow cedar found at high elevations (McLaren et al. 2004, Stafford 2012, Stafford 2014, Stafford and Christensen 2003, Stafford and Maxwell 2008, Stafford et al. 2003). These sites are highly significant and indicate the use of the landscape by Indigenous peoples, from shoreline to mountain top. Further, bark harvest scars on yellow cedar may be visible for a very long time.

We know that red and yellow cedar can grow very old, up to 1500 years for yellow cedar (Pojar and MacKinnon 1994), and remain standing in the forest more than a hundred years (and for as long as 270 years) or on the ground surface for up to 1200 years (Daniels et al. 1997). Archaeologically, yellow cedar has the advantage over red cedar in preserving cultural modifications because it grows very slowly, thus not covering the scars with tree growth as quickly. The harsher climate associated with higher elevations may also affect the response yellow cedar have to scarring. Yellow cedar appears to be on the decline in some areas, with large stands of dead and dying yellow cedar being found on the coast of northern BC and Alaska (Hennon 1992, Hennon et al. 2005,). The reason for this is poorly known, although climate change is indicated as a factor (Hennon and Shaw 1994). Other researchers (Kellner et al. 2000) have focussed on the role the dead yellow cedar snag plays in high elevation old growth ecosystems, noting the persistence in the ecosystem as compared with other species.

With regard to site visibility, archaeological investigations at Ellen Cove, Kingcome Inlet identified 343 bark harvested features on 248 CMTs concentrated on a ridge near a known Hax'wamis (Ah-kwaw-ah-mish) habitation (Stafford et al. 2005). Of the 248 recorded CMTs, 72% are yellow cedar and 28% red cedar. What is most apparent about the scarred yellow cedar is close to half the trees (42%) appeared to be old dead barkless and branchless snags with many of the remaining modified trees in apparently poor health condition, while only a small number (14%) of the red cedar appeared dead. Observations made at Ellen Cove include the low numbers of large diameter yellow cedar as compared to large red cedar, which were found mainly in stands adjacent to the yellow cedar-dominated stands. Bark harvested trees were also absent or found in very low numbers in areas where fires, previous logging and landslides had occurred. The site boundaries for the visible features were therefore bounded by forest type changes, with high potential for 'hidden' features to be buried within healed-over healthy red cedar trees.

In comparison to yellow cedar, red cedar are relatively healthy and heal over cultural scars more effectively. The Meares Island study, on the west coast of Vancouver Island, included the dating of predominately red cedar trees, the researchers determining that the "gradual decrease in number of dates older than 200 years is almost certainly the result of decreasing preservation with increasing age" (Stryd and Eldridge 1993:216). This same pattern was also found for review of CMT dates from a Borden Block (DlSs) on western Vancouver Island (Stafford and Maxwell 2006).

Increment cores taken from culturally scarred yellow cedar in the Kingcome area (Stafford 2005, Stafford et al. 2005) provide growth estimates of 22 years per cm (over past 300 years) of lobe growth at two separate localities. Scar lobes associated with one bark strip, recorded as being 10 cm thick, provide an estimate of about 200 years before present. This can be compared with reported red cedar lobe growth rates of 6 or 10 years growth in 1 cm, which related to only 60 to 100 years age for the same sized lobe. At Ellen Cove, many of the bark-harvested yellow cedar trees have lobes greater than 20 cm and a few greater than 30 cm, placing the older ages of the visible cultural modifications to possibly 400 to 600 years old on the living trees. As many of the features were found on dead trees, there is potential to add 100 to 300 years based upon studies mentioned above (Daniels et al. 1997, Kellner et al. 2000). Lobe thicknesses combined with tree health suggests a record of use spanning between 200 and 900 years before present at Ellen Cove. Dates from the few yellow cedar sites recorded in BC have yielded similar data. Work in Pacheedaht territory on the southwest side of Vancouver Island (Stafford and Maxwell 2008) resulted in the identification of over 100 bark harvested high elevation yellow cedar trees with a subsequent visit and samples dated to 400 to 500 years old (Ramsay 2014). A small sample of high elevation yellow cedar bark harvest scars recorded near Sechelt (Stafford 2014) have also been dated to about 450 years old (Ramsay 2015).

Figure 1. Tapering top and cut base of recent taper harvested red cedar, Vancouver Island.

All Cedar Bark Harvest Scars

When a cedar tree has been scarred, each year a layer is laid down at the margin of the scar resulting in the growth of 'scar lobes' which can provide a basic indication of age visually and an approximate indication of age through increment coring (Stryd 2001). In healthy trees, this process will ultimately result in the scar being 'buried' or 'hidden' within the tree. As found by Eldridge and Eldridge (1988), internal scars (i.e., those that have been obscured by tree lobe growth) are common to cedar stands showing signs of cultural modification, with 1.6 internal scars being found for every visible scar. Eldridge (2002) also points out that identification of taper bark strip scars in BC has likely been heavily skewed towards healthy living trees where a long straight taper has been preserved and with an indication of a cut base (Figure 1). His identification of the dead snag and

Figure 2. Bottom of two taper harvested yellow cedar. At left, rare example of cut base intact, Chinukundl drainage, Haida Gwaii. At right, Ellen Cove, Kingcome Inlet, with slight kinks indicating cut base.

dead fallen CMT as the "archaeologist's friend" (Eldridge 2002:8) is apt. At all CMT sites recorded by the author, the identification of features as being cultural was aided greatly by the death and decay of the trees in the stand. In several instances at Ellen Cove, the tree (or portion of the tree) had perished not long after being harvested and the original shape and form of the original scar could be determined; in a few instances slight kinks or differential preservation indicated a cut base (Figure 2).

The majority of the dead snags, fire scarred trees and partially dead and gnarly CMTs have rotted faces which enable access to the lobe area to determine if scar crust (Figure 3, Figure 4), a primary cultural characteristic (Stryd and Eldridge 1993), is present. Common methods of old feature investigation include removing dead and rotted wood from the scar face in order to use a flashlight and compass mirror to inspect the inner portion of the lobe where the scar crust should be located. In the case of a "core popper" (Garrick 1998), where the healthy portion of the tree is pushing the dead stem out, a portion of the dead tree stem or core could be removed to find the scar crust, which may be found at the back of (far inside) the tree as dual bands of crust, indicating more than 75% of

Figure 3. Black ribbon of scar crust and rotted faces on two old, dead yellow cedar CMTs, Kingcome Inlet.

Figure 4. Hard scar crust layer preserved at center, as seen looking up rotted scar face, Kingcome Inlet.

Figure 5. Top and bottom of recent small rectangular scar, Vancouver Island. At left, note tree lobe growth at side and top of scar creating kinks. At right, note absence of lobe growth at base, discolouration due to rot.

the bark had been removed from the tree (another cultural characteristic).

Cut bases rarely preserve due to rot caused by water seeping beneath the bark. As well, some methods did not include cutting the base at all (Boas 1921:120). In situations where the tree is cut, a slight kink or parallel kinks are sometime present, especially on rectangular bark removal scars (Figure 5, Figure 6). Rectangular features differ greatly from tapering scars in that the bark removal features, and measurement thereof, may be used to infer the actual item made, be it a canoe bailer, berry bark basket, cooking container, roofing, or canoe (Stafford et al. 2008a). This is because the section of outer bark is being used for specific task. While cut marks may not be preserved in the wood, cut bark may be apparent at the top or bottom of the scar, even after it has healed to a crease (Figure 7). A 'bark shadow', or area with differential preservation, may also be present above and below rectangular scars, in areas where the bark eventually fell away from the tree many years after the original bark removal event (Figure 8). The 'bark shadow' should be associated with kinked lobes and a straight line where the bark was cut.

Figure 6. Large 'bark board', rectangular scar, near high elevation yellow cedar site, Chinukundl drainage, Haida Gwaii. At left, base of scar indicated by slight kinks above yellow flagging. At right, kinks at top and bark sloughing above.

Figure 7. Rectangular bark harvest scar near Nimpkish Lake, with cut bark (at top of scar) persisting and visible as scar heals over.

Careful examination of old gnarly cedars is needed to identify old scars that have been uniquely preserved and revealed on the tree. Many old cedar trees have sections that have 'died back' at some point in the past, which may be bark-less, usually on one side of the tree and associated with scarring. These areas of the cedar tree may reveal old bark harvest scars, either the original tapering scar edges and/or the scar crust.

Cedar scar morphology changes greatly over time, especially for those trees in poor growing conditions, have been fire scarred or which have been harvested multiple times, the latter lowering the integrity of the lower stem. In many cases at Ellen Cove, the trees have twisted remarkably with both portions of the healthy tree (i.e., those areas with bark) and the dead inner wood being disfigured (Figure 9). This is considered the result of weight and differential loading on the remaining elements of the lower 10 m of tree stem. In some cases, the top solid stem has twisted 180 degrees (Figure 10). Whether or not the twisting is natural (e.g., wind), a result of the modification, or both, is not clear. Single cultural scars can be found on trees with twisting bark and may be slightly twisted due to efforts to pull the top portion of bark to the side in order to remove it (as noted by Davidson in Stewart 1984:114) or twisted to the side by an individual moving along slope or uphill, avoiding an obstacle or deadly fall (etc.).

Figure 8. Rectangular bark harvested cedars, Nimpkish Lake. At left, note differential preservation at top of scar indicating where bark and top of scar was. Several obvious rectangular scars, with cut bark remaining (e.g., photo at right), were found nearby.

Fire Scarring

As found through survey of the Nimpkish Valley by the 'Namgis Nation and author (Stafford 2011, Stafford and Christensen 2009, Stafford et al. 2010), fire has played a major role in both destroying and preserving CMT features in the valley due to the high summer temperatures and strong winds associated with Nimpkish Lake. In areas near Nimpkish Lake where every cedar tree would have been bark harvested in the past, the cultural forests are sculpted by the fire history (Stafford and

Christensen 2009:24).

> *The fire either killed the living CMTs and left them in various states of decay or did not kill the CMTs but did impede the ability to grow and heal over the cultural scar. Some of the cedar were not greatly injured (i.e., are large and have generally scar-free stems) and cultural scars should be present inside standing large diameter cedar. The CMTs that have been recorded are only a portion of the trees that were bark harvested in the area as many have been lost due to the fire. The dry open face found on old bark harvesting scars would be susceptible to being burnt during a fire and many burnt cultural scar faces were noted. In some cases the lobes were burnt.*

Figure 9. Multiple harvested yellow cedar trees, Kingcome Inlet. Note healthy living lobes have grown away from old stem and are irregular.

The preservation of old CMTs due to fire is not known from any other areas of coastal BC and identification of these features is difficult for many observers. Bark harvested features will have ‘healing lobes’ which develop at the edges of the bark removal area and eventually cover the scar face (where the bark was removed). The fire scarring can result in an additional set of healing lobes being present as the area near the older cultural scar face is susceptible to being burnt and thus fire scarring occurs. The cedar tree then starts a new healing process which can include one or two new healing lobes. This results in what has been termed the “scar in scar” phenomenon. Measurements are taken of all lobes and when fire history is known for the area, this data can be used to obtain a relative age for the cultural feature.

Figure 10. Multiple scarred and twisted yellow cedar CMTs, Kingcome Inlet. At top, note lobe twisting around mid-stem of living tree, at top of scars.

The extent to which these features have been fire damaged and their distribution are directly associated with the intensity of the fire or fires that have burned through the area. For example, dense clusters of bark harvested CMTs were found near wetlands and in small draws or gullies that appeared to have escaped complete destruction by fire. Occasionally, large cedar trees in previously burnt areas have been found and are considered to have

Figure 11. CMT B20 ('Core poker'), Nimpkish Lake. Old stem with tapering scar and dual scar crust protruding from healthy red cedar (Right inset is from another angle).

high potential to have internal cultural scars, as found in one area near Nimpkish Lake (Stafford and Christensen 2009:21, Figure 11):

> *CMT B20 is an unique and educational CMT. The original cedar tree was harvested at about 20 cm diameter, then likely a fire killed most of the original stem when the tree was about 30 cm dia. The cedar then did rebound and grew to over 1m in diameter but along the way expelled the scarred core, which includes the original bark harvest scar and lobes. The core poker was then burnt, likely in the fire of 1895. The cultural scar revealed on the core poker is several hundred years old based upon the size of the healthy stem. The surrounding cedar trees which are also 1m+ in diameter and show little or no evidence of being harvested, very likely have old bark harvest scars in them as well.*

Fire may also have played a role in the management and reproduction of cedar. It has been suggested that cedar was a finite resource on the northwest coast (Earnshaw 2016; Eldridge 2017. this volume). Given the extensive use of cedar bark in areas where cedar were sought out and harvested regularly, the need for cedar trees of suitable size for bark harvesting may have become dire. Certainly, areas that naturally produce young cedar (e.g., landslides, burnt areas) would have been identified and possibly reproduced. As fire has been used by Indigenous peoples to promote berry growth and to clear the understory, it may as well been used to regenerate cedar stands that had been harvested to the available limit.

General Notes on Survey Techniques and Archaeological Potential

Repeated surveys of the same 'site area' will regularly result in the recording of a larger number of CMT features, in particular taper bark strip features. In two studies conducted by the author (Stafford 2000, Stafford et. al 2003) in areas previously surveyed for CMTs, the number of features doubled in both instances with the majority of the new features being taper bark strips. This is considered due to surveyor experience and confidence coupled with amount of time available for survey. At Ellen Cove, repeated surveys within areas previously surveyed by the same crews resulted in the location of more features each visit. This included the eventual identification of many broken culturally scarred snags and CMTs which had fallen to the ground or were standing and otherwise in an advanced state of decay and generally older (Figure 12). Similar to other observations of yellow cedar (Daniels et al. 1997) these moribund modified trees have managed to persist as standing features, apparently due to the strength and quality of the pungent wood and the lack of branches and leaves, which can catch the wind and cause the tree to fall.

Figure 12. Gnarly old multiple harvested yellow cedar, Kingcome Inlet.

Figure 13. Bark harvested cedar with 'V-tab' at top of scar indicating two side by side bark removals, Nimpkish Lake.

In addition to scar crust and long tapering scars, another clear cultural indicator is the presence of multiple tapering 'tops' on one scar face. Bark harvesting can begin by removing a test strip about a hand width wide, to make a 'roadway', then adjacent strips of bark are removed. When the tops of the adjacent strips diverge, this can results in long or short tapering sections of remaining bark, referred to by the author as "V-tabs" (Figure 13). Further, these may fall or rot off with time and preserve a slight imprint of the original scar(s).

Dense clusters of CMTs may be found within a few kilometres of any major waterway. In areas where yellow cedar is found near the mountain tops, dense clusters of yellow cedar CMTs may be expected several kilometres inland, with a gap in distribution between these two areas where no or few CMTs occur, depending on the distance to the mountain top. The areas where dense CMT clusters occur may be best characterized as cultural forests as these have been repeatedly harvested and managed for a variety of resources through the millennia. In these dense CMT areas, site boundaries are generally defined by forest type, similar to subsurface deposits that are defined by landform. As noted repeatedly here, site visibility is mainly determined by the age of the CMT features, with most old features being buried within healthy living trees.

Survey in the few old growth sections remaining in the Nimpkish Valley has shown that CMT sites are bounded by forest type and that the adjoining 'CMT-free' areas are also of cultural importance, usually streams, wetlands or lakes. Also, CMT clusters are often found amongst or between patches of dense berries, such as salal or Vaccinium. In the Nimpkish valley, it is not uncommon for sunny exposed areas with dense berries to be associated with fir trees only, and adjacent dark creek valleys to be full of bark harvested cedar. This hints at the complex system of Indigenous use and landscape management, with creeks being used to access the inland berry grounds which were periodically managed by fire (Turner 1999). In Kingcome Inlet, traditional use information gathered for one forestry cut block showed a large polygon associated with berry harvesting. The archaeological survey found dense numbers of bark harvested cedar associated with the berry harvesting polygon, suggesting that the primary activity or resource was in fact the berries, with the bark harvesting being a secondary activity (Stafford et al. 2008b). Thus, dense CMT clusters may be viewed as being found within traditionally owned and managed berry harvesting areas.

In contrast to the traditional cultural forests of Indigenous peoples, modern cultural forests are often 'clear-cuts' where nearly every standing tree is removed. Survey by the 'Namgis and author have found that, in the forests that regenerate in the Nimpkish Valley, there is still high potential for CMTs to be found in areas where they once existed. Similar to forest ravaged by fire, CMT features may be found on isolated standing and fallen dead stems that managed to survive the logging. Further, high stumps may reveal enough attributes to be confident of a cultural origin. Lower stumps also have potential to reveal cultural scars if investigated before extensive rot sets in (Earnshaw 2016). In previously logged areas, it is common to find standing remnant CMT stems near creeks and wetlands and in areas where the logging equipment could not reach. Further, stands of cedar with many bark harvest scars may have been viewed as non-merchantable timber and may be left standing, or felled and left on the ground. In second growth blocks that have old growth at the margins, best practice is to survey the old growth to determine if CMTs exist and may be present on old stumps.

Summary and Conclusions

The old growth forests of the northwest coast preserve an archive of events imprinted into the biological landscape and demonstrate the interconnectedness between all things living and dead on a traditional pre-industrial landscape. Proper identification of taper bark strips, particularly old taper bark strips, can be difficult and surveys have tended to under-represent actual numbers due to low observer confidence and experience and visibility of the feature (Stafford and Maxwell 2006). Fire scarring, death and decay aid greatly in the preservation of visible cultural modifications.

Due to the quality of yellow cedar, cultural modifications on these trees may persist visibly for a very long time and be present a great distance from the shore and major streams. The slower growing yellow cedar have preserved visible scars that are of an age which will or may not be typically visible on red cedar due to variable growth rates, and can be very old, potentially up to 1000 years BP. Internal scars will exist in the large (100+ cm DBH), healthy red and yellow cedar within and near the clusters of CMTs.

Mainly it is the presence of old growth cedar that identifies high potential for culturally modified cedar trees, specifically cedar bark harvest scars, to be present in great numbers. In commercially logged areas there is still high potential to find bark harvested CMTs, although in fewer numbers as isolated standing and fallen features and on commercially logged stumps (Stafford and Jacobson 2010, Earnshaw 2016).

These features are mainly identified in the field by their relation to the landscape. They are often associated with each other or creeks (as paths from the ocean) and ridges, benches exposed to sun, natural corridors, look outs and good ‘lunch’ or short term stay localities. Most importantly, many bark harvesting areas appear to be closely associated with highly productive berry patches and it is very likely the cedar and berries were harvested by the same individuals and families.

We may conclude that culturally scarred trees are an important overlooked aspect of forest ecology and in areas of repeated use; a ‘culturally modified forest’ - as opposed to culturally modified tree - more aptly describes the primary unit of study. The interconnectedness of the features and larger landscape needs to be acknowledged in order for the proper protection and study of these sites. Further, in areas of the coast where much of the forest has been logged (e.g., Vancouver Island), the remaining old growth forests preserve the vestiges of these culturally modified forests and should be protected as significant heritage sites for future generations.

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The Midden

THEMED ISSUES

This has been the second part of a double issue featuring a specific theme in BC archaeology. We are hoping that in the future other 'guest editors' could take on other themed issues in their respective interest areas and gather similar collections of articles for *The Midden* in the future.

Other topics that *The Midden* editorial board considered of interest would be (though not limited to)....

Rock Shelters
Island Archaeology
Early Sites/First Peopling
Paleobotany/Ethnobotany
At Risk/Threatened Sites
Archaeology in the North
Archaeology in the Rockies
Historic Archaeology
First Nation Partnerships/First Nations Led Projects
Sea Level Change
Repositories Issues
Feminist Archaeology
Activitist Archaeology
Archaeology Stories
Cultural Resource Managment!

Please see submission guidelines on next page for contact information

Submission Guidelines

General
The Midden publishes articles relevant to British Columbia archaeology. All contributions are welcome, provided that they have not been accepted for publication elsewhere.

The Midden publishes two times a year, so articles will normally appear within six months of submission.

A complimentary PDF of the final article is supplied to authors.

Submit all contributions by email to the Editor at asbcvictoria@gmail.com

***Deadlines** (2018)*
Issue 1 Feb 1, 2018
Issue 2 May 1 2018
Issue 3 Aug 1, 2018
Issue 4 Nov 2, 2018

Format

- *submit all work in either OpenOffice or Microsoft Word*
- *single-spaced*
- *no page numbering*
- *bold and italics may be used where appropriate*
- *If you use special characters (e.g. phonetic symbols), please bring these to our attention so we can ensure they appear correctly in the final version.*

Suggested Length of Submissions
Article 2000-3000 words plus illustrations. Shorter pieces are also accepted; please contact the Editor before submitting a longer piece.
Book Review 1000-1500 words
Letter 500-750 words
Image Of interest to BC archaeologists, aesthetically or scientifically interesting, or mystery object with included caption

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***Tables and Charts** Include any tables and charts at the end of the document, with captions.*
***Citations** Please use in-text parenthetical citations - e.g., La Salle (2010:3) or (La Salle 2010). Do not use footnotes. Follow the American Antiquity format for references, which can be found at http://www.saa.org/StyleGuideText/tabid/985/Default.aspx.*
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