Entangled Legacies: The Historical Ecology of a Sts'ailes First Nation Forest Garden, SW British Columbia

by
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Ethics Statement

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Abstract

Globally, researchers are increasingly using the archaeological, paleoecological, and ecological records to demonstrate the longstanding connection of Indigenous peoples to culturally valued landscapes. On the Northwest Coast of North America, forest gardens are a legacy ecosystem that allows for the study of past human-plant interactions and traditional resource and environmental management strategies of descendant communities through time. For the Sts'ailes in southern British Columbia, such ecosystem legacies are evident around ancient settlements nestled between sloughs along the Harrison River. In collaboration with a Sts'ailes eco-cultural restoration project, we explore the historical ecology of one such area by using a variety of methods including vegetation surveys, soil charcoal, GPS mapping, historical air photos, tree coring, and interviews with Sts'ailes knowledge-holders. Our results demonstrate continued connection of people to the waterways and plants surrounding the ancient villages of Seklwâtsel (Phillips site) and Yāçketel (John Mac site) over nearly 3,000 years.

Keywords: Historical Ecology; Forest Garden; Sts'ailes (Chehalis); Traditional Resource and Environmental Management; Archaeology; British Columbia

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Due to the collaborative nature of this project, I have opted to use the pronouns "I" instead of "we" and "my" instead of "ours" to credit and acknowledge the many people who shaped this research. Community-based projects such as this are often shaped through a recursive process of learning and experience, making the research process more like a leisurely walk through a forest with no trail rather than down a linear road. This project was no different as the objectives, methods, and results were constantly evolving and transforming as I was taught new things from both the Sts'ailes community and the landscape. For example, newly collected data from the vegetation mapping led me to redesign my sampling strategy for vegetation surveys, while talking with Elders and knowledge-holders about their needs helped to inform the location of new trails meant to increase access to key areas and resources for community use. As such, completing this project required an open and creative mind, valuing patience, listening and learning from others, and appreciating the generosity of those who shared their knowledge.

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Table of Contents

List of Figures

List of Acronyms

FCR	Fire-Cracked Rock
TREM	Traditional Resource and Environmental Management

Chapter 1.

Introduction

Increasingly, archaeologists are recognizing the importance of moving away from broad scale syntheses of Indigenous cultures to focusing instead on the individual connection to specific, culturally valuable places (Cuerrier et al. 2015; Lepofsky et al. 2017). As a part of this, there has been widespread recognition of how the archaeological, paleoecological, and ecological records demonstrate the longstanding interactions among Indigenous occupation and land use across the globe and through time (e.g., Dambrine et al. 2007; Ellis et al. 2021; Fisher et al. 2019; Ross and Rangel 2011; Trant et al. 2016). Approaching the study of these places through a lens of connectivity allows for more meaningful collaboration with Indigenous groups whose worldviews typically emphasize relationality and place-based knowledge (Artelle et al. 2019; Ban et al. 2018; Turner and Berkes 2006).

Historical ecology provides a pathway to explore complex interactions between Indigenous peoples and their biophysical world over diverse temporal and spatial scales (Balée 2006; Beller et al. 2017; Crumley 2017; Egan and Howell 2005). Often encompassed within this approach is a goal to document traditional resource and environmental management (TREM) practices (Fowler and Lepofsky 2011; Lepofsky and Armstrong 2018). TREM discourse focuses on how land-use legacies and connection to place are manifested and enacted in peoples' connection to the plant and animal world, as well as the overall landscape (e.g., Lepofsky et al. 2017). As these traditional systems are comprised of complex, and often cyclical interactions between anthropogenic and environmental variables, an interdisciplinary set of methods and approaches, integrated with traditional knowledge and ideologies of Indigenous peoples, is necessary to gain a more holistic understanding (Fowler and Lepofsky 2011; Lepofsky 2009). Ultimately, TREM practices are often inseparably linked to the cultural identity, well-being, and cultural survival of Indigenous peoples (Lepofsky 2009:161).

On the Northwest Coast of North America, TREM practices of Indigenous peoples are conceptualized as a continuum of management strategies across diverse ecosystems. This continuum includes Indigenous peoples' relationship to, and management of, species and ecosystems spanning the marine, intertidal, and terrestrial spheres, including forests (Armstrong et al. 2018; Atlas et al. 2021; Deur et al. 2019; Lepofsky and Caldwell 2013; Mathews and Turner 2017; Smith et al. 2019; Turner et al. 2013). Forest gardens are one plant management strategy employed by Northwest Coast Indigenous peoples (Armstrong et al. 2021; Turner and Peacock 2005; Turner et al. 2013) that also include strategies like root gardens and berry gardens (Mathews and Turner 2017; Lepofsky et al. 2017). As these types of human-plant interactions often leave subtle traces in the archaeological record, a wide range of methods are needed to document them (Armstrong et al. 2021; Lepofsky and Armstrong 2018; Lepofsky and Lertzman 2008). Characterizing forest garden ecosystems and the complex web of human-plant interactions that maintain them can help to represent how Indigenous peoples lived and connected with the larger landscape (Lepofsky et al. 2020).

Our particular focus in this thesis is to understand the unique history of a remnant forest garden associated with the ancient village sites of Seklwâtsel (Phillips site) and Yāçketel (John Mack site) along the Harrison River. We take an historical-ecological approach that brings together diverse lines of evidence to document this history. Our analysis includes examining the structure and composition of the extant forest via surveying and mapping; exploring the longevity of key species through charcoal analysis; combining historical air photo and tree ring analysis to reconstruct historic land use; investigating natural and environmental factors through GIS; and highlighting the continuity of use and traditional management practices of Sts'ailes people in this place via interviews with Elders and knowledge-holders. Finally, we pair the above with archaeological and paleoethnobotanical data gathered from parallel studies of this cultural landscape (Ritchie and Lyons 2017, Ritchie and Lyons n.d.).

Our data show that people have been living and connecting with this place for nearly three millennia. Over this time span, human activity was concentrated along the river and slough channels while various forms of active and passive management of the surrounding forest occurred. Culturally important species such as Pacific crabapple (*Malus fusca*) and hazelnut (*Corylus cornuta*) have a long history of human use in the study area that date back as far as the first settlement of this landscape. Today, as a place imbued with a deep history of connection to place, Sts'ailes has committed to conserving and revitalizing this cultural landscape.

Chapter 2. Methods

2.1. Cultural Setting

2.1.1. The Sts'ailes and Their Cultural Landscape

Sts'ailes is a Halq'eméylem-speaking Coast Salish Nation, whose *Xa'xa Temexw* (sacred earth, traditional territory) encompasses the Harrison River watershed as well as parts of the lower Lillooet River and Fraser Valley (Figure 1). Sts'ailes occupy a unique gateway position between two culturally and ecologically distinct regions (Ritchie and Lepofsky 2020). Culturally, they are situated between their Coast Salish neighbours to the west and the Interior Salish to the north. Ecologically, the Harrison River, which is the focal area of this study, is transitional between coastal and interior zones (Meidinger and Pojar et al. 1991).

Today, as a result of settler-colonialism, Sts'ailes people mainly reside in a single, on-reserve settlement along the Harrison River. However, archaeological evidence of their ancestral occupation spans their traditional territory, with many areas continuing to be used today by contemporary community members (Ritchie 2010). There is considerable cultural knowledge in the community garnered from current knowledge holders, earlier ethnographic accounts (Boas 1890, 1894; Duff 1949, 1952; Hill-Tout 1978; Ritchie and Hatoum 2020), and the archaeological record (Ritchie 2010; Ritchie and Lepofsky 2020; Springer and Lepofsky 2011). The present-day Sts'ailes community view their cultural and archaeological heritage as an inheritance from their ancestors, connecting them to their deep relationship with the Harrison River watershed and the rest of their *Xa'xa Temexw* (Ritchie 2010). Currently, the Nation is working to preserve traditional practices and sustain healthy, productive landscapes through the implementation of environmental restoration programs for culturally significant areas, such as the restoration of the forest garden described in this study.

Archaeological and oral historical evidence reflect the deep and intimate connection between the ancestral Sts'ailes and their core territory along the Harrison River (Ritchie and Hatoum 2020; Ritchie and Lepofsky 2020; Ritchie and Springer 2017). Large settlements, camps, resource harvesting areas, named places, transformer sites, pictographs, and other culturally salient places reflect this temporal and spatial breadth and depth. The earliest archaeological evidence dates to ~7,500 years ago (Ritchie et al. in prep). By the late pre-Contact and earlier historic periods, significant pithouse and plank house settlements were associated with family-owned and named slough channels and tended ecosystems. Today, these sloughs are still referred to by the name of individuals and families that lived alongside them (e.g., Phillips, Leon, and John Mac Sloughs). The sloughs served as social and physical divisions between settlements, gentle berths for canoes, and places to collect salmon and other riverine resources (Ritchie 2010), and there is evidence that some were modified and reformed by the past inhabitants (Ritchie and Lepofsky 2020). Additional landscape modifications include the creation of fire-cracked rock terraces on which settlements were built (Ritchie and Lepofsky 2020:7), resource processing areas (Lyons and Ritchie 2017), burial mounds (Ritchie 2010), and forest gardens (Armstrong et. al 2021).

2.1.2. Forest Gardens of Sts'ailes

Forest gardens in Sts'ailes territory are associated with several of the ancestral settlements located on the Harrison River sloughs (Armstrong 2017), but they are no longer actively managed. Consequently, these areas are being encroached by coniferous and deciduous trees and the culturally important food plants are only moderately productive. Recognizing this decline, and as the ancestral stewards of their traditional territory, Sts'ailes initiated a forest garden revitalization project in 2019. This broad initiative involves identifying, inventorying, and restoring ancient forest gardens in their territory, documenting traditional ecological knowledge through interviews and digital media, and facilitating intergenerational knowledge transfer between Sts'ailes Elders and youth while reconnecting their members to the place. Among the forest gardens identified in the territory (Armstrong 2017:7), the area associated with Phillips and John Mack Sloughs is the focal area of this study. Restoration work to date in the study area has focused on clearing an orchard-like area of Pacific crabapple and creating trails through the thick underbrush to allow easy access to the adjacent archaeological sites.

We focus on two forest garden indicator species (Armstrong et al. 2021) with high cultural salience locally and regionally. The first, Pacific crabapple is a shade-intolerant, deciduous shrub native to the Northwest Coast. It prefers moist to wet open environments that collect water such as stream banks, swamps, and bogs (Klinkenberg, 2020; Pojar and Mackinnon 2014). For Sts'ailes, restoring the productivity of the crabapple trees found along the Harrison River is a priority. Beaked hazelnut (*Corylus cornuta* var. californica) is a small, multi-stemmed deciduous shrub, that prefers moist but well-drained sites with open forest canopies (Klinkenberg, 2020; Pojar and Mackinnon 2014). The charred shells have been recovered from archaeological sites on the Harrison River including in a feature in the study area (Lyons and Ritchie 2017; Lyons and Ritchie n.d.). Both species were used for food, medicine, and technology in the past (Armstrong et al. 2018; Turner 2007; Wylie de Echeveria 2013).

2.1.3. Study Area

The study area is roughly 9.0 hectares and is bounded by water on three sides: Phillips Slough to the southwest, *Meth'á:lméxwem (*John Mack Slough) on the northeast, and the Harrison River on the southern edge (Figure 1). The northern boundary of the study area follows a private property line and a secondary channel of the John Mack Slough. The study area is culturally significant to many Sts'ailes families, in particular the Phillips and Mack families. There is no single Halq'eméylem name for the area because it encompasses two adjacent ancestral settlement areas

Evidence for Sts'ailes occupation and use of the study area spans from ancient times to the present. There are two archaeological settlement sites separated by approximately 100m of marshy, lightly forested area known as the Phillips site (DhRl-77) or *Seklwâtsel*, and the John Mack site (DhRl-83) or *Yāçketel* (Figure 1, Ritchie 2010). A total of 21 pithouse features (9 at Phillips site, 12 at John Mack site) and multiple plank houses have been recorded at the two sites. Radiocarbon dates suggest that these two settlements were used and occupied contemporaneously at times, with evidence of habitation and land-use activities beginning at least 2500 years ago until approximately 170 BP at the Phillips site and from 1800 BP to 200 BP at the John Mack site. In addition to the pithouses and plank houses, various burial mounds and cultural depressions have also been identified, usually being located on the forested side of the settlements (Ritchie 2010).

Post-colonial occupation of the study site is evidenced by a homestead and two smokehouses (Figure 5). One smokehouse belonged to the Mack family while the other belonged to the Phillips family. The homestead was the primary permanent residence of the Phillips family for several generations. The Phillips family, like many Sts'ailes families, tended a fruit orchard, vegetable gardens, and kept livestock like cows and horses around their home up until approximately the 1970s. As we suggest below, the keeping of orchards and gardens near the home in recent years is a continuation of the much older practice reflected in forest gardens. Additionally, the Phillips family built, used, and maintained a smokehouse near the mouth of the Phillips Slough. This was used seasonally as a base camp for resource harvesting, processing, and hosting family members. Today, there are four homes within the footprint of the Phillips homestead and both smokehouses are no longer visible on the landscape.

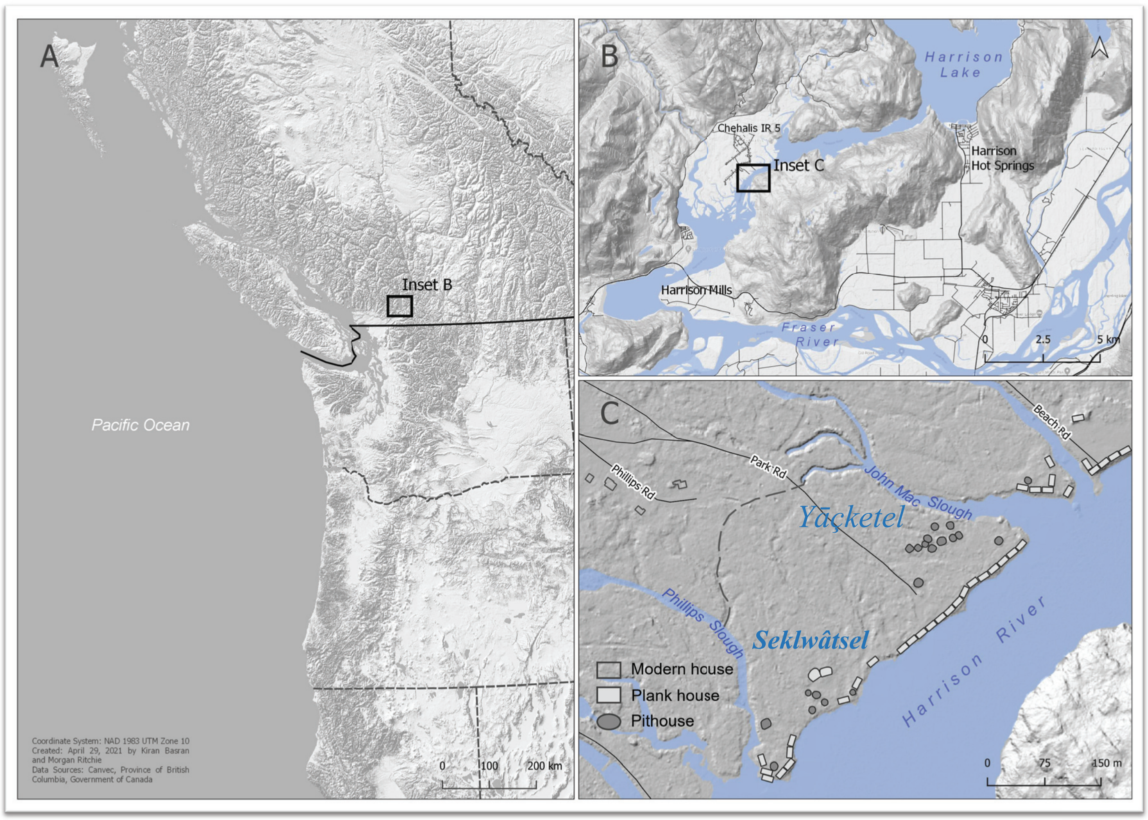


Figure 1: (A) Location of study area in SW British Columbia; (B) Chehalis IR 5 and surrounding area; (C) the study area showing the location of pit houses and plankhouses from the two archaeological village sites *Seklwâtsel* and *Yāçketel*.

Being part of a dynamic riparian floodplain, the study area is interspersed with an array of relic sloughs with low-lying, wetlands subject to seasonal flooding events (Lyons and Ritchie 2017). The slough network is part of a series of swales and berms that create heterogenous growing conditions for vegetation. Along the river, there is a sparse canopy of deciduous trees (e.g., red alder [*Alnus rubra],* paper birch [*Betula papyrifera],* black cottonwood [*Populus trichocarpa*], and willow species [S*alix* spp.*]*) with a few coniferous trees (Sitka spruce [*Picea sitchensis*], western redcedar [*Thuja plicata*], western hemlock [*Tsuga heterophylla*]). The subcanopy in the study area is comprised of culturally important trees such as Pacific crabapple, beaked hazelnut, and red elderberry (*Sambucus racemosa),* while the understory is made up of an assortment of other species such as Nootka rose (*Rosa nutkana*), salmonberry (*Rubus spectabilis*), black twinberry (*Lonicera involucrata*), and spiraea (*Spiraea douglasii)*. North of the river, nearer to the modern reserve, the vegetation shifts to a more conifer-dominant forest type with large western redcedars, western hemlock*,* and Sitka spruce. The understory in this portion of the site is comprised of species such as vine maple (*Acer circinatum*), bracken fern (*Pteridium aquilinum)*, and beaked hazelnut.

In general, the study site has experienced minimal recent disturbance and thus is an ideal location with which to trace long-term cultural-ecological histories. Places which have been recently disturbed are easily identifiable by encroaching invasive and other early colonizing species. In particular, there is a ~10m wide swathe of reed canary grass (*Phalaris arundinacea*) growing along the banks of the Harrison River; in the center of the study area, there are isolated thickets of Nootka rose (*Rosa nutkana)*, Himalayan blackberry (*Rubus armeniacus*), and reed canary grass. Areas around paths are characterized by dense thickets of Himalayan and evergreen blackberry (*Rubus lacinatus)*. We avoided these areas in our plant surveys but took them into consideration when interpreting the current distribution of crabapple and hazelnut trees. Below, we explore in more detail the recent disturbance history of this study area.

2.2. Methods

Following the research program of historical ecology (Balée 2006), we sought to identify the intertwined set of natural and cultural factors that influenced the history of the study area. We used a diverse set of methods to address four research questions: (1) What are the culturally important species in the study area today? (2) What is the spatial distribution of culturally important species in the study area today? (3) How has the forest changed over time? and (4) What cultural and ecological processes influenced changes in the forest through time? Our goal is to collect data from varying time scales in order to track the history of land use legacies in the study area and tell the story of this cultural landscape through the millennia and decades. Each method contributes a different piece to the larger history of human-plant interactions at the site, and although every method provides stand-alone data, some connect and contribute to more than one research question.

2.2.1. What Are the Culturally Important Plant Species in the Study Area?

We employed two survey techniques to determine the presence and relative abundance of species growing within the study area. First, after an initial reconnaissance and preliminary mapping, we judgementally placed ten 20 m x 20 m quadrats in areas with either high or low concentrations of crabapple and hazelnut. This placement was to help understand the association of these culturally salient species to other species. Field methods followed BC Ministry of Forests and Range and BC Ministry of Environment (2010) with slight modifications. Richness was categorized within vegetation layers: Layer A. trees >10m tall; Layer B. woody shrubs 5m-15cm tall; Layer C. herbs and woody plants <15cm tall. Relative abundance was assessed using percent cover of species in each of the vegetation layers.

Second, we walked the study site to record additional species not captured in the vegetation survey plots and that might indicate translocation events or the tending of otherwise rare species (cf. Turner et al. 2021). We avoided surveying edge areas, which we define as an approximately 20m buffer around modern disturbances such as trails and roads, as well as natural features such as the edge of the Harrison River. Similarly, we avoided places with dense clusters of invasive and disturbance loving species, such as Himalayan blackberry and Nootka rose. These thickets are virtually impassable and contain only sparse occurrences of a small number of species within them (e.g., black twinberry [*Lonicera involucrata]* and spiraea [*Spiraea douglasii*]). We assessed the cultural importance of the recorded species by consulting the regional and local ethnobotanical literature and the interviews conducted for this project.

2.2.2. What is the Spatial Distribution of Culturally Important Species in the Study Area?

To document potential spatial patterning amongst culturally important species and anthropogenic features in the study area, we used high-precision GPS to map and enumerate all mature living and dead crabapple and hazelnut trees in the study area. We focused our mapping efforts on these two species as they are easily identifiable, abundant in the study area, are indicator species of forest gardens (Armstrong et al. 2021) and have high cultural salience among Sts'ailes people. Since they are trees, these species also endure longer on the landscape than shrubs and herbs, providing greater opportunities to detect persistent ecological legacies. We excluded saplings and suckers in our enumeration, as they reflect recent, rather than past growth. In addition to documenting in detail the distribution of crabapple and hazelnut, we also qualitatively examined the spatial data for positive or negative associations among these two species as well as other species.

2.2.3. How Has the Forest Changed Through Time?

To assess how the forest has changed over time, we examined forest cover, structure, and composition. We used a series of historical air photos (1936 to 2003) to infer how cultural and ecological processes altered forest cover in the last century. We gathered stratigraphic data from soil pits to better understand the history of the landform and how that could have affected human settlement and plant growth and collected and analyzed soil charcoal from these pits to better understand past forest composition. Interviews with Sts'ailes Elders and knowledge holders provided additional historical context that encapsulates the lived experiences of Sts'ailes community members as well as the intergenerational transmission of traditional ecological knowledge.

In total, five interviews that included six Sts'ailes Elders and knowledge-holders were conducted. All are members of, or related to, the Phillips family (Appendix A). Interviews followed both SFU's and Sts'ailes' ethical protocols (REB# 20200218). Additionally, each participant was provided with two consent forms: an SFU Research Ethics Board approved form and an internally used form from Sts'ailes. Each interview lasted around an hour and the participants were compensated with an honorarium provided by the Sts'ailes Rights and Title Department. All interviews were recorded with permission and the audio files were kept on an encrypted external hard drive. Audio files and transcribed interviews will be permanently housed with the Sts'ailes Rights and Title Department. Each interviewee was sent a copy of their transcript and audio file if requested.

Forest stand-age structure and species composition was assessed via tree ring dating and the identification and quantification of soil charcoal. To understand changes in the more recent past, we assessed the age and density of the tallest trees in the canopy to determine if they were recent encroachments into the forest garden. In the southern portion of the study area, where there are few conifers, all the conifers were mapped and we attempted to core all of them; however, some cores were unsuccessful because of internal rot. Additionally, we selectively sampled large, tall, and "old-looking" deciduous species such as alder, birch, cottonwood, and aspen (*Populus tremuloides).* In the northern part of the study area, where the canopy is dominated by conifer trees, we judgementally selected and cored a small number of trees to compare their ages with those found closer to the river. However, tree ring analyses are not equally reliable for determining the establishment history across species. In particular, since hazelnut is a clonal species, it is difficult to obtain establishment dates via tree ring analysis. Additionally, we calculated the percent cover of each tree in our vegetation survey plots to understand the relative abundance of coniferous and deciduous trees across the study area.

Tree ring analysis was conducted by independent consultant Jenny Berg. Cores were mounted and sanded using increasing grit (Stokes and Smiley 1968). Cookies were also sanded with 120 to 600 grit paper. Ring boundaries were assessed using two methods. The Epson Expression 10000XL scanner scanned cores at 2400 dpi. Images were then imported to Coorecorder to identify ring boundaries. Measurements were taken from bark to pith, with the last year of growth identified as 2020. Samples were collected in 2020 near the end of the growing season so latewood formation was present in both hardwoods and softwoods. Since the objective of the project was to establish the age of samples, gap sediments were omitted from the measuring path. In addition, we used the pith estimation feature for cores that did not include pith but still displayed concentric rings at the end of the core. A Velmex table with J2X software was used for multiple paths on cookies and cores that required higher resolution.

We analyzed soil charcoal to assess forest structure, composition, and fire history in the deeper past. The soil charcoal was extracted from judgementally placed soil pits (~30 x 30cm) located in areas with and without crabapple and hazelnut as well as close to and distant from the ancient settlements. These were dug down to the sterile glacial till deposits. To maximize the amount of charcoal for identification, we collected all visible charcoal from the walls of each stratigraphic layer and then took an additional bulk sediment sample (~0.5 L) from each layer.

We also noted stratigraphic data from these soil pits to better understand the geomorphological history of the Chehalis River alluvial fan. We analyzed the stratigraphic profiles to understand the source of the present sediments, the transport agent (i.e., flood deposits), the environment of deposition (i.e., fast- or slow-moving water), and any post-depositional adaptations (i.e., paleosols, soil formation).

To understand the fire history of the study area, we extracted charcoal from *in situ* cultural layers and diffuse charcoal from surrounding silt matrices that would have been influenced by low-action water movement and mixing from tree roots. The former context reflects cultural preference and availability of fuel woods. The charcoal in the latter context could have been generated by either forest burning (deliberate or accidental) or other cultural activities. In all instances, we reason that the charcoal collected from each test pit represents a relatively local picture of forest composition since charcoal moved via water or other forces would be limited. Thus, charcoal identifications overall are a good proxy measure of general forest composition in the past. In addition, in all contexts, some species such as shrubs, are more likely to burn to ash and thus will be under-represented in our samples. Finally, we infer that the depth of the charcoal corresponds to age, allowing us to analyze changes to forest composition through time. The validity of this proxy measure is supported by radiocarbon dates taken from contexts across the study area (see Appendix B).

To understand changes in forest structure through time, we looked at the differences in the abundance of coniferous versus deciduous charcoal across the study area as well as temporally via stratigraphy. Following standard procedures for wood identification, we sought to identify all specimens $\geq$2mm from each stratigraphic layer. We chose this cut off because charcoal fragments smaller than this are difficult to sort and near impossible to identify to species. For each, we attempted to snap the charcoal to expose clean surfaces of at least two of the three identifiable sections (i.e., transverse, tangential, radial). We used a metallurgical microscope (max magnification 80x) to find identifying characteristics. Charcoal identification proceeded in several steps. We first determined if the charcoal was deciduous or coniferous. If coniferous, we limited our identifications to taxa with distinct and relatively easier to identify characteristics (i.e., *Taxus*, *Pseudotsuga*, *Picea, Pinus*). All others were lumped into an "unidentified coniferous charcoal" category. If deciduous, identification was attempted to the most specific taxonomic order. This basic set of identifications allowed determination of the relative percent abundance of deciduous versus coniferous woods in each sample and to plot this across soil pits. Finally, we selectively radiocarbon dated older (deeper) charcoal that we either identified as crabapple, came from layers whose charcoal suggested a transition from coniferous to deciduous trees, or was recovered away from the ancestral village sites where we had little prior knowledge of cultural use.

2.2.4. What Cultural and Ecological Processes Influenced Changes in the Forest Through Time?

We draw together several methods to understand how cultural and environmental factors influenced the distribution and abundance of culturally important plants in the study area. To explore the influence of people on the distribution of crabapple and hazelnut, we examined whether these forest garden indicator species tend to be found in association with the ancient settlements. Our expectation is that areas closer to settlements would be relatively more tended, which would in turn be reflected in a relatively greater abundance of cultural species. The association of culturally important plants with settlement sites is well documented in many places (e.g., Dambrine et al. 2007; Lepofsky et al. 2017:458; Ross 2011; Ross and Rangel 2011).

Interviews with Sts'ailes knowledge holders and historical air photos provided information on more recent anthropogenic factors that may have influenced vegetation patterns in the study area. In the interviews, we asked questions about the history of land use (e.g., clearing, burning, harvesting, cultivating, etc.), as well as the location of remnant features such as homesteads, smokehouses, roads, and trails. Similarly, the air photo time series provided insight into changing land use patterns and forest structure through time. Finally, flood and elevation models allowed us to assess the role of seasonal flooding on the current distribution of vegetation in the study area.

Chapter 3. Results

3.1.1. What Are the Culturally Important Plant Species in the Study Area?

We recorded 39 plant species in the vegetation plots and informal inventory, the majority of which are shrubs (Table 1). Of this total, nine are forest garden indicator species (Armstrong et al. 2021). In fact, only one of the ten forest garden indicator species identified in a coast-wide study of forest gardens is not represented in the study area. A large percent of these 39 species (97%) have known uses for food, medicine, technology, and other applications among Northwest Coast First Nations (Table 1) and several of them are species that are known to have been regionally transplanted in the past (Turner et al. 2021). Seven of the 39 species are rare within the study area (Figure 2), being represented by only one or two plants (lodgepole pine [*Pinus contorta]*, Sitka willow [*Salix sitchensis*], blue elderberry [*Sambucus cerulea*], black swamp gooseberry [*Ribes lacustre*], oceanspray [*Holodiscus discolor*], and stinging nettle [*Urtica dioica*]), or in the case of domestic cherry (*Prunus avium)*, a single stand of trees. We also recorded two species in the informal survey that are abundant in the study area but were not captured in the vegetation plots (black hawthorn [*Crataegus douglasii*] and western hemlock).

Table 1: Species growing in the study area today or in the recent past.

Scientific Name (Common Name)	FG Indicator[1]	How Identified[2]	Cultural Uses[3]
TREES			
Alnus rubra (red alder)		VP, IN, AR	F, T
Betula papyrifera (paper birch)		VP, AR	T
Picea sitchensis (Sitka spruce)		IS	F, M, T, S, RT
Pinus contorta (lodgepole pine)		IS	F, T
Populus tremuloides (trembling aspen)		VP, AR	T
Populus trichocarpa (black cottonwood)		VP, IN, AR	F, M, T, RT
Prunus avium (domestic cherry)*		IS	F

Rhamnus purshiana (cascara)		VP, IN	M
Thuja plicata (western redcedar)		VP, IN, AR	M, T, S, RT
Tsuga heterophylla (western hemlock)		IS, AR	F, T
SHRUBS			
Acer circinatum (vine maple)		IS, IN	T, RT
Amelanchier alnifolia (Saskatoon berry, or June berry)		IN	F, M, T, RT
Cornus sericea (red osier dogwood)	X	VP	F, M, T, RT
Corylus cornuta var. californica (beaked hazelnut)	X	VP, IN, AR	F, T, S, RT
Crataegus douglasii (black hawthorn)	X	IS	F, T, S, RT
Holodiscus discolor (oceanspray)		IS	T
Lonicera involucrata (black twinberry)	X	VP	M, T, RT
Malus fusca (Pacific crabapple)	X	VP, IN, AR	F, M, T, RT
Ribes lacustre (black swamp gooseberry)		IS	F, T
Rosa nutkana (Nootka rose)	X	VP	F
Rubus armeniacus (Himalayan blackberry)*		VP, IN	F
Rubus lacinatus (evergreen blackberry)*		VP	F
Rubus parviflorus (thimbleberry)		VP, IN	F, T
Rubus spectabilis (salmonberry)	X	VP, IN	F, T
Rubus ursinus (trailing blackberry)		VP	F
Salix hookeriana (hooker's willow)		VP	T
Salix sitchensis (Sitka willow)		IS	T

Sambucus cerulea (blue elderberry)		VP	F, T, RT
Sambucus racemosa (red elderberry)	X	VP	F, M, T, RT
Spiraea douglasii (spiraea)		VP	T
Symphoricarpos albus (common snowberry)		VP, IN	M, T
Viburnum edule (highbush cranberry)	X	IS, IN	F, RT
HERBS			
Carex obnupta (slough sedge)		VP, AR	T
Dicentra formosa (Pacific bleeding heart)		IS	
Maianthemum dilatatum (false-lily-of-the-valley)		IS	F, M, RT
Phalaris arundinacea (reed canary grass)*		VP	T
Polypodium glycyrrhiza (licorice fern)		VP	F
Polystitchum munitum (sword fern)		VP	F, T
Pteridium aquilinum (bracken fern)		VP	F, T
Urtica dioica (stinging nettle)		IS, IN, AR	F, M, T, RT

* Introduced/invasive species.

[1] Forest garden indicator speieces as per Armstrong et al. 2021.

[2] VP = Vegetation plots; IS = Informal survey; IN = Interviews; AR = Archaeobotanical remains, which includes charcoal remains identified as part of this project and reported in Lyons and Ritchie n.d.

[3] Per Turner 1995, 2007, Turner et al. 2021, interviews from this study; F = food; M = Medicine; T = Technology; S = Spiritual/ceremonial; RT = known regional transplant.

Interviews with Sts'ailes Elders and knowledge-holders provided additional insights into other species that were present in the study area in the more recent past, including species that no longer grow in the study area today. A total of 14 native species were mentioned in the interviews as being harvested from the study area (Table

1). All of the native species mentioned are still present in the study area today (n=13), apart from Saskatoon berry (*Amelanchier alnifolia),* which grows elsewhere along the Harrison River, suggesting a reduction in diversity in the study area today. One person mentioned that "sweetgrass" could also be gathered in the study area, but we have been unable to confirm its identification.

3.1.2. What is the Spatial Distribution of Culturally Important Species in the Study Area?

Both crabapple and hazelnut are abundant in the study area and tend to be found in non-overlapping clusters, associated with ancient and modern settlements. Crabapple (n=320) are most densely distributed in the southwestern and southeastern corners of the study site alongside the Phillips and John Mac pithouse settlements. Hazelnuts (n=74) are most common along the northern end of the study area near the former Phillips family homestead (Figure 2). Conversely, away from the ancient and historic settlements there are few crabapple or hazelnut trees. This strong positive association between crabapple, hazelnut, and ancient and modern settlements is typical of Northwest Coast forest gardens (Armstrong et al. 2021). Similarly, we note that the rare culturally important species in the study area (those represented by only one or two individuals) are also strongly associated with the pithouses and modern homes rather than the middle of the study area (Figure 2). This suggests that people may have taken advantage of and/or had a role in the distribution of these plants. Due to our small sample size, we could not discern if crabapple and hazelnut are associated with other culturally important species.

Our mapping of blackberry thickets and buffer areas around select anthropogenic and natural features amounted to 2.457 ha (26.7% of area) of area that we avoided surveying. This included 0.123 ha (1.3% of study area) of blackberry thickets, 1.01 ha (10.9% of study area) of buffer zones around modern roads and trails, and 1.328 ha (14.4% of study area) of buffer zones along the riverbank and slough edges. In-field observations characterized the vegetation in these areas as bearing signals of modern disturbance rather than legacies of the past forest.

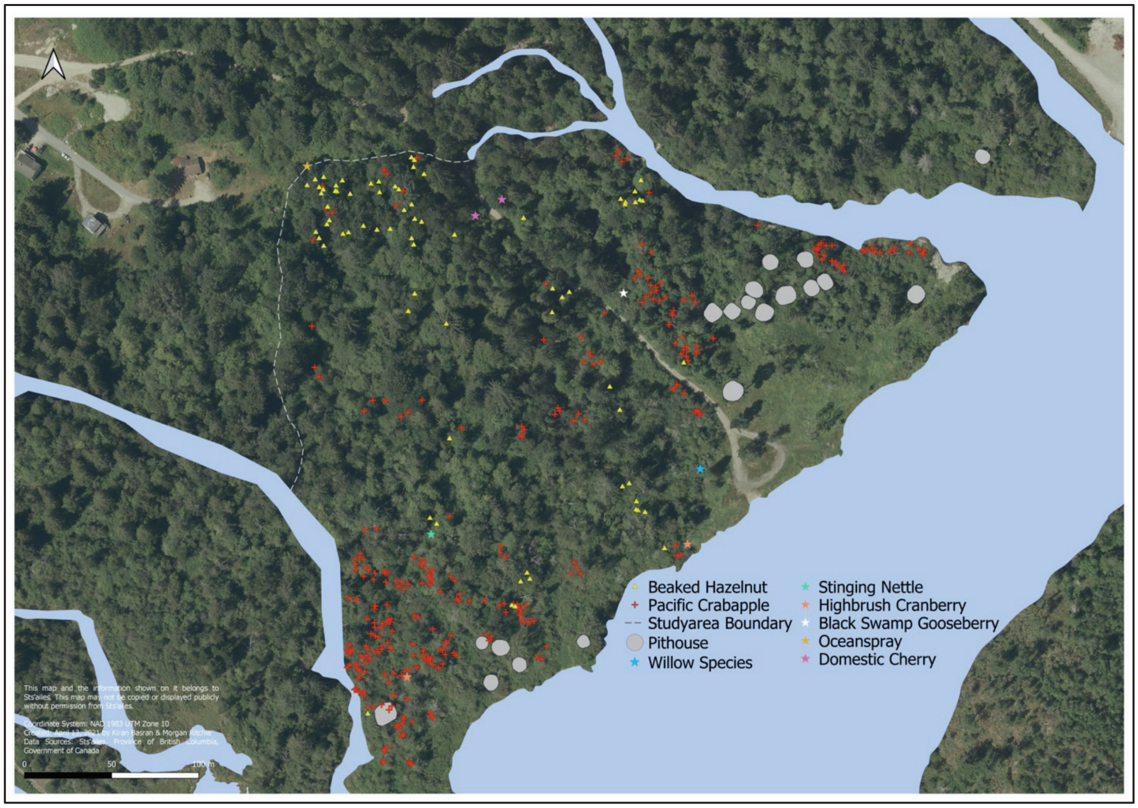
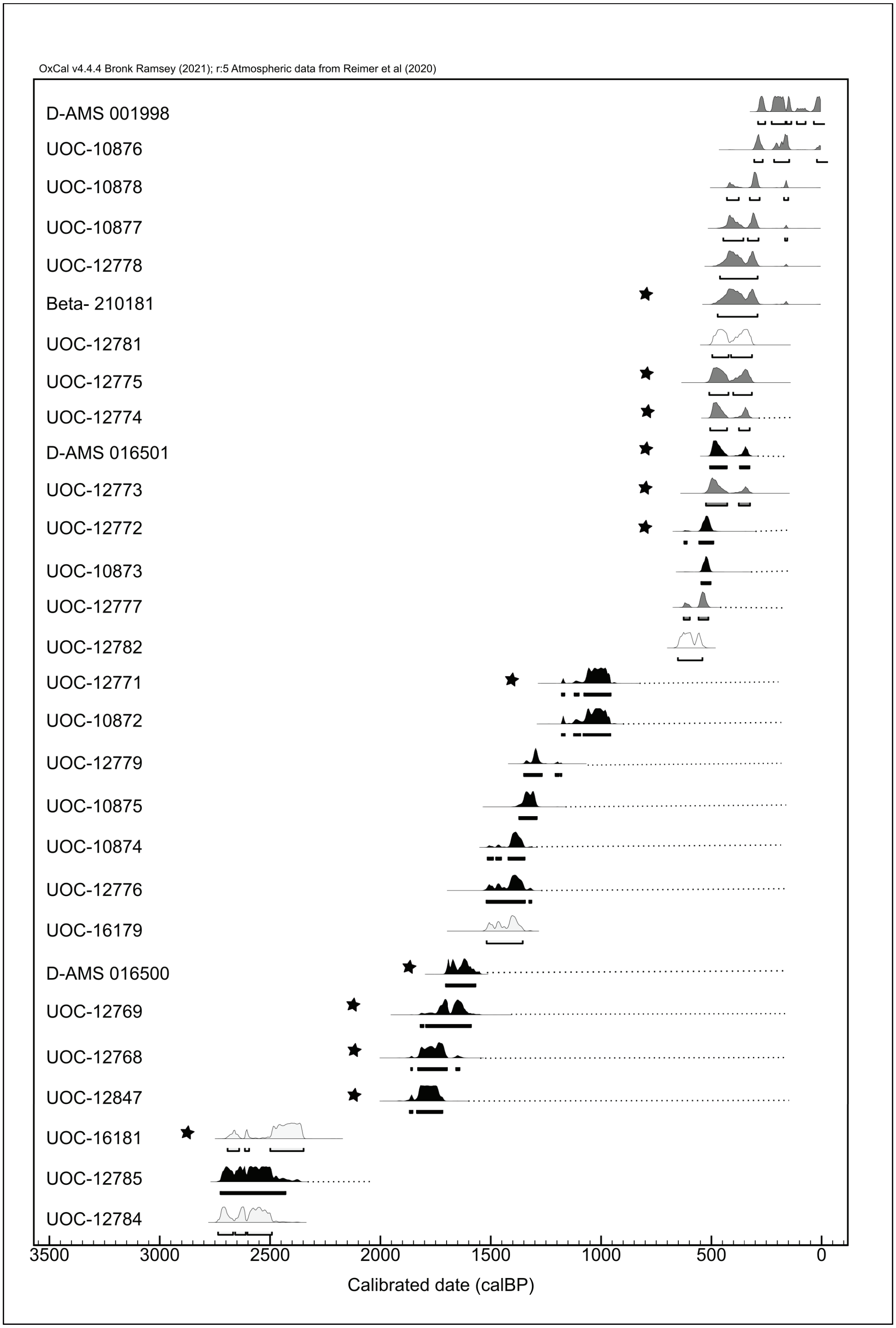


Figure 2: Study area showing distribution of crabapple, hazelnut, rare species, species represented by a single stand of trees (i.e., domestic cherry), and pit houses.

3.1.3. How Has the Forest Changed Through Time?

Evidence from sediment profiles and radiocarbon dates demonstrate that the alluvial fan within the study area stabilized around 2700 cal BP (Figure 3). Underlying coarse sands, pebbles, and cobbles indicate that prior to this time the distal end of the alluvial fan was too unstable to support vegetation or settlement. Even with over 100 radiocarbon dates spread out across the fan, there is no archaeological evidence for human occupation prior to ~3000 years ago (Ritchie et al., in prep). All earlier known sites in the area are on terraces above the Harrison and its tributaries (Ritchie et al. 2016). After this time, the alluvial fan became more stable, creating more favourable conditions for vegetation growth and human settlement. This shift is apparent in sediment profiles, of fine sands and silts relating to periodic overbank flooding of the Harrison River.


OxCal v4.4.4 Bronk Ramsey (2021); r:5 Atmospheric data from Reimer et al (2020)
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D-AMS 016501
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UOC-12847
UOC-16181
UOC-12785
UOC-12784
3500
3000
2500
2000
1500
1000
500
0
Calibrated date (calBP)

Figure 3: Radiocarbon dates from the study area. Dates from plank houses = black; pithouses = dark grey; charcoal layer = light grey; cooking pit = white; dates from John Mac Slough depicted with a star. Dotted line indicates continued occupation based on inferences from stratigraphic evidence and Colonial era artifacts. Some features are represented by multiple dates. Prepared by Morgan Ritchie.

The distribution and identification of the charcoal from the soil pits indicates that the study area is characterized by heterogenous fire and forest histories (Figure 4, Appendix E). In general, charcoal was rare in our soil pits with some pits having no charcoal at all or only in the most recent layers, and some with only sparse flecks. However, concentrations of charcoal were found in the lower layers (40-80cm) of three of our soil pits (ST 9, ST 10, and ST 20). This stands to reason based on their proximity to the settlements and areas of cultural use along the river.

Using charcoal as a proxy for fire, the distribution of charcoal indicates that fire was unevenly distributed through time and across space. There is no evidence of fire in the central portion of the study area until recently (i.e., the upper 20cm of the profile). Evidence of older fires are limited to *in situ* cultural features near the Phillips Slough (2736-2492 cal BP) and John Mac Slough (2499-2348 cal BP), and diffuse soil charcoal from near the Harrison River plank houses (1517-1354 cal BP). Our identification of charcoal from these contexts indicates a mixed conifer and deciduous forest in the areas associated with archaeological features, as would be expected of high disturbance areas (i.e., both from the floodplain and cultural activities). In contrast, the area away from the ancient settlement is dominated by coniferous charcoal, as would be expected of areas that are less prone to flooding (Figure 7) and anthropogenic disturbances.

In addition, the uneven distribution of soil charcoal highlights the concentration of human activity and of the areas along the sloughs and riverbank, rather than the inland sections of the study area. This pattern continues until recent times. The focus on the sloughs and rivers is reflected in the abundance of soil charcoal and FCR that was recovered in shovel tests (ST 9 and ST 10; Figure 4) located in the area between Phillips Slough and the pithouses. Based on this evidence, we infer that this area was likely sparsely treed and was able to support cultural activities involving fires and other daily activities. Charred grass and sedge seeds recovered from a cooking feature near the riverbank, dating to ~651-540 cal BP (Lyons and Ritchie n.d.), supports the notion that this area was an open, grassy ecosystem. In comparison, shovel tests from a comparable distance inland revealed no or few small flecks of charcoal and no fire-cracked rock, indicating the absence of *in situ* fires. The pattern of soil charcoal suggests nearly 3000 years of intensive use of the river and sloughs and comparatively less use of the areas away from the waterways.

Charcoal recovered from other contexts potentially reveals other signatures of human activity and management of the forest. For example, we collected diffuse soil charcoal taken from soil pits near the plank houses along the riverbank areas that was not associated with fire-cracked rock or artifacts (ST 2 and ST 3; Appendix E). We infer that this charcoal likely represents either intentional or unintentional forest burning events associated with the daily life of the settlement and management of the forest. This could include activities such as clearing the area around the village to create space to build new structures as the population increased. Interestingly, although a larger sample size would help to test this supposition, our data shows that crabapple charcoal is not found in these diffuse charcoal layers, only in *in situ* cultural features, suggesting the possibility that these forest burns were not directed at crabapple.

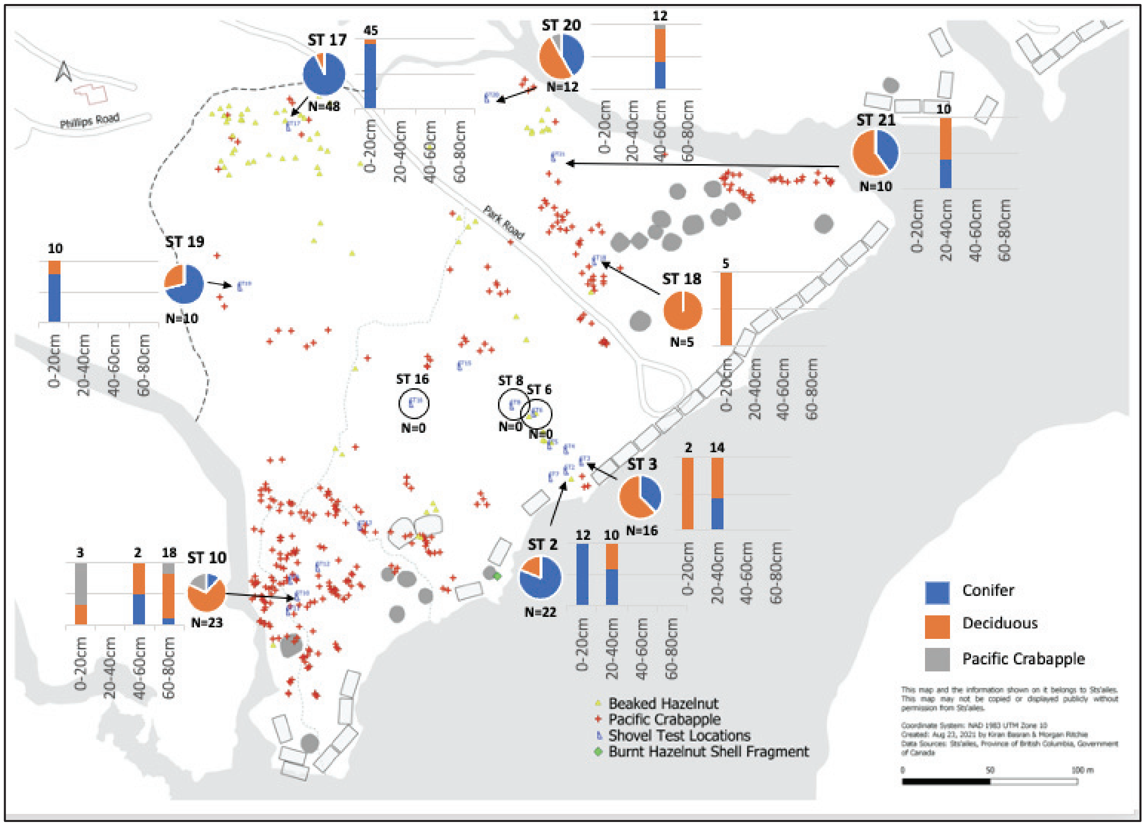

Figure 4: The distribution and abundance of conifer, deciduous, and crabapple charcoal through time in relation to the modern distribution of crabapple and hazelnut. Note the location of the charred hazelnut shell fragment found by Lyons and Ritchie (n.d.) along the riverbank. Note also contamination of surface charcoal (n=3) in ST 17, 60-80cm. Field notes, the sediment profile, and radiocarbon dates demonstrate that charcoal was introduced from top layer into lower layers. this date is therefore excluded from this figure.

Historical air photos illustrate that the forest became increasingly dense throughout the 20th century (Figure 5). In 1936, tree cover along the riverbank and in the northwest corner of the study area was sparse. Through time, the forest became denser, especially along the edge of the river. Three major areas of anthropogenic disturbance are also visible in 1936: (1) a large clearing associated with the Phillips homestead in the northern section; (2) an open area associated with a smokehouse near the Harrison River and John Mac Slough; and (3) an open area surrounding the Phillips family smokehouse near the Harrison River and Phillips Slough (Figure 5). Additionally, in 1968, there is a major disturbance visible in the center of the study area that only left a few trees standing. Increasing encroachment can be seen in all four of these locations and presently only the areas along the river remain clear of trees. We discuss further below the anthropogenic and ecological drivers of these shifts in forest cover.

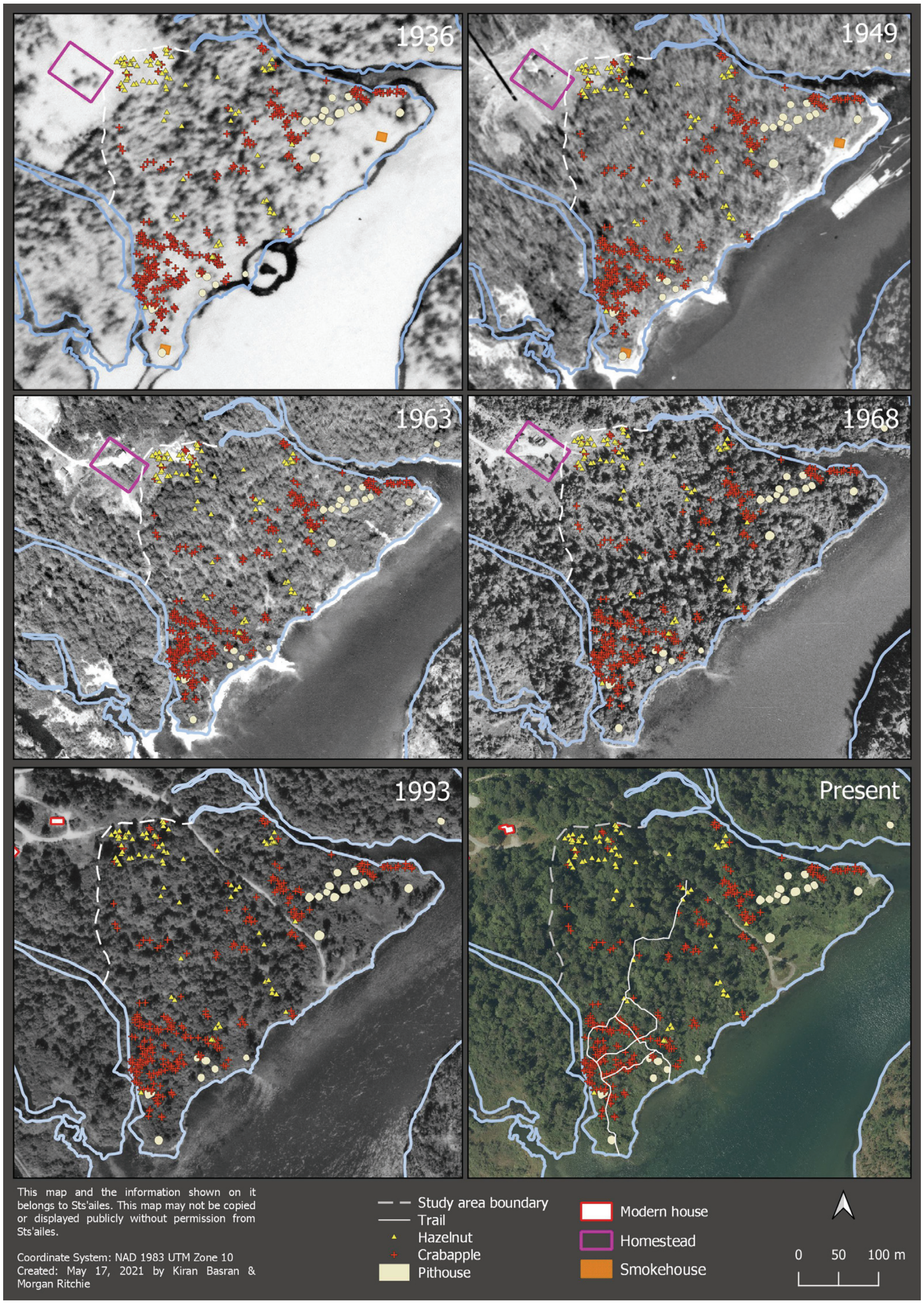

Figure 5: Collage of historical air photos showing the Phillips homestead, historic smokehouses and modern homes, changes in forest cover, and the distribution of crabapple and hazelnut today.

Our analysis of tree ages reflects a natural progression of tree encroachment over the last century from deciduous trees to shade tolerant conifers and then to other conifer trees (Figure 6; Appendix C). Crabapple, cottonwood, and alder represent the oldest species with ages over 100 years old, followed by birch and aspen within the last 80 years. These species continue to establish throughout the last century and in the present, as evidenced by saplings found during vegetation surveys. Less than a century ago, conifer trees (Sitka spruce, western redcedar, lodgepole pine) began establishing in the study area, creating the mixed canopy forest that exists today. Since conifer trees generally have a natural life span of several hundred years and no conifer stumps were found during our surveys, we surmise that there were no conifers growing in the southern portion of the study area within the past few centuries.

Taken together, these data indicate that at least by 130 years ago, the forest was a mixed deciduous forest with at least some crabapple. Beginning around 120 years ago, deciduous trees other than crabapple appear in our sample of cored trees. While the fact that there are no older deciduous trees in our sample may simply reflect the maximum life span of most deciduous trees, we note that cottonwoods can live for considerably more than 100 years. Thus, based on the extant sample, we suggest that sometime ~120 years ago (~AD 1900), there was a shift in forest conditions such that other deciduous trees started growing in the study area. As we discuss further below, we suggest this shift is associated with the dramatic decline in the population of Sts'ailes people associated with myriad colonial processes in the late 19th century. The establishment of coniferous trees in the mid-20th century time reflects the unchecked successional encroachment of trees into the study area.

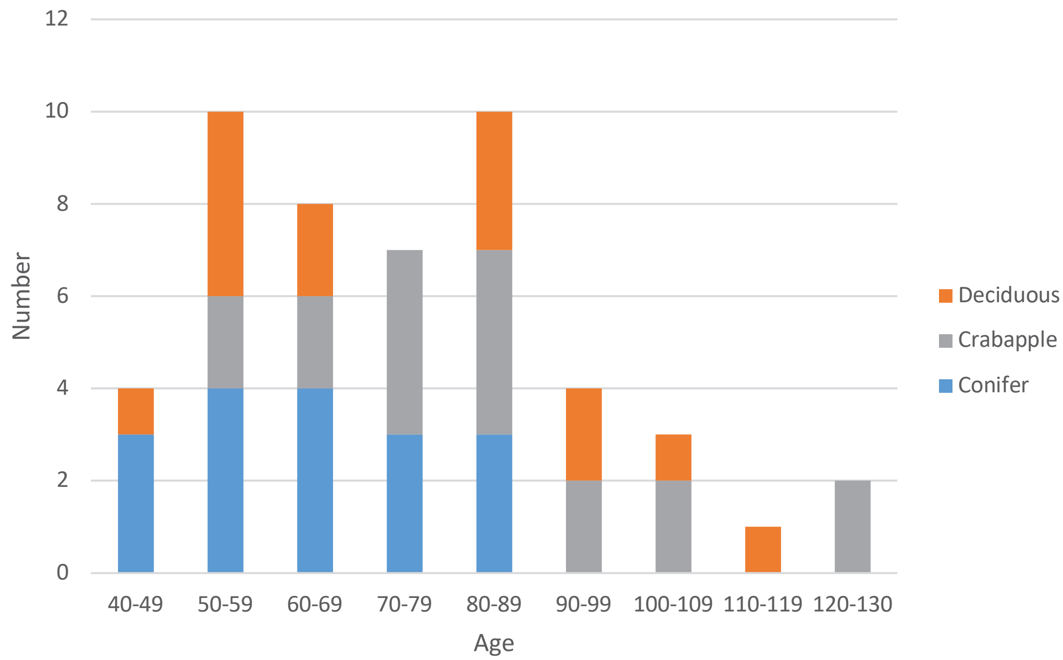

Figure 6: Shifting forest structure showing initial encroachment of deciduous trees followed by conifers, with crabapple growing throughout the sequence. See Appendix C for more detailed information of species and tree ages.

Our identification of the soil charcoal indicates that crabapple have been growing in the study area for at least 2600 years (Figure 4; Appendix D). Notably, the two oldest pieces of crabapple charcoal were recovered from areas in proximity to the ancient pithouse settlements and the sloughs, where crabapple still grows today. In addition, both pieces come from layers where fire-cracked rock is also present (ST10, ST 20). This indicates that this culturally important shrub, and forest garden indicator species, is associated with human made fires, rather than forest burns. Aside from the crabapple charcoal, we did not recover any other forest garden species in the charcoal analysis. This is in part due to the fact that shrub charcoal burns to ash and thus is less likely to be recovered.

However, crabapple, hazelnut, and the charred remains of other forest garden species were recovered in a parallel paleoethnobotanical analysis of remains from in and near the study area, demonstrating the continuity of these species through time. The charred remains of red elderberry seeds, and possible crabapple charcoal, were identified from a buried charcoal and fire-cracked rock (FCR) layer located on the bank of the Phillips Slough adjacent to the study area and dating to ~885-796 cal BP, along with a charred hazelnut shell dating to ~651-540cal BP found in a cooking feature near the riverbank (Lyons and Ritchie n.d.; see Figure 4 for location of hazelnut shell). The presence of these culturally important species suggests that crabapple and hazelnut co-occurred in the forest at least 650 years ago along with other culturally important species. The continuation of this pattern into contemporary times suggests that these culturally valued species have persisted in the study area for centuries.

The combination of tree ring dates and soil charcoal reflects the long term and possibly continuous presence of crabapple in the study area from ~2600 BP when the pithouses were first occupied, through the last century, and continuing in the study area today. The 130-year-old tree currently growing near the John Mac Slough pithouse settlement is likely from the same cohort of crabapple as those represented by crabapple charcoal in the upper portion of ST10 near Philips Slough (see Figure 6), thus connecting the tree ring data set to that of the soil charcoal.

While tree ring analyses of hazelnut can only provide limited interpretations on their history in the study area, other lines of evidence suggest that hazelnuts were more abundant in some parts of the study area in the pre-colonial past. In particular, in our interviews, Elders shared that hazelnut used to be plentiful near the river and in the centre of the study area where few grow today. These lines of evidence suggest hazelnut would have been growing along the river in the recent and more distant past and their absence from our soil pits may be due to the fact that the shrub's pithy stems will not survive as charcoal in a fire. In the northern end of the study area, hazelnut trees today are mainly growing in in a large cluster within the bounds of the clearing surrounding the old Phillips homestead. Based on our tree ring analysis, hazelnuts growing there established around 30 years ago (Appendix C). This recent establishment is supported by the historical air photos which show that this area was completely clear of trees until at least 1968.

Finally, interview data demonstrate that over the last century, forest composition would be very similar to modern conditions. Even after the establishment of the homestead and its associated fruit orchards and vegetable gardens, the Phillips family continued to harvest native species from the study area for food, medicine, and technology. This includes important forest garden indicator species, crabapple and hazelnut, which were used for food and ceremonial purposes. Rose hips were used frequently for creating medicinal and non-medicinal teas. Trees such as redcedar and alder were used for smoking fish, while the bark of another tree, cascara, was gathered in large quantities and sold to Chinese buyers in Vancouver for its medicinal properties. The shoots and berries of salmonberry, thimbleberry, and blackberry were gathered as snacks or for further preservation at home, while stinging nettle was collected and eaten like spinach. As Boyd Peters remembered, his grandparents referred to Phillips Slough as their grocery store (interview, 2020).

3.1.4. What Cultural and Ecological Processes Influenced Changes in the Forest Through Time?

Multiple lines of evidence point to the many processes that have influenced the forest in the study area over time. Our earliest insights into the forest's history comes from the soil charcoal, which indicates that earlier fires were concentrated along the waterways in the study area. Given that this is a wet, floodplain where fires wouldn't naturally flourish, we infer that these fires are mainly associated with human activity. In the southern part of the study area, this would most likely be associated with the on-going daily activities in the ancient settlements. Away from the river, towards the north, the charcoal comes exclusively from surficial layers and is likely associated with recent burning for forest clearing within the last 150 years as discussed below (see Figures 4 and 5).

While the charcoal record is relatively silent with respect to the kinds of activities that took place in and around the ancient settlements, our discussions with Sts'ailes knowledge holders provides considerable insights into the activities that shaped the forest in the 20th century. These activities included clearing for orchards and gardens via tree-cutting and controlled fires. Vange Point noted that her grandfather used to keep the area around his house "clear so that there was just grass growing all over" and that "it was such a big area" (interview, 2020). Controlled fires were also used to maintain her grandfather's orchards and clearings. He would usually "burn on the other side of their yard and he would burn it towards the river" (Vange Point interview, 2020). Interview responses from Phillips family members emphasize the large amount of work that went into maintaining these clearings and tending these food plants, from pruning fruit trees to using scythes to keep the ground clear.

Other memories shared by members of the Phillips family recount frequent travel on a well-maintained trail that took them from the homestead to access the Harrison River and family smokehouse. This area was of great importance to the family for many reasons, including transportation. Virginia Peters remembered that “our road was the river” back then, as no road yet connected Sts’ailes to the outside world (interview 2020). The smokehouse was also used seasonally for hosting family, processing salmon and other resources, as well as a place of refuge to give birth or recover from illness. The frequent visitation and use of the riverbank areas near the confluence of the Harrison River and Phillips Slough during this period likely affected the pattern of conifer growth in this area as the family intentionally kept this area clear of underbrush (personal comm, Darius Lawrence 2020). Today, the area around the Phillips family smokehouse, and the area around the smokehouse near John Mack Slough are devoid of coniferous trees. Instead, conifers grow more inland in the middle of the study area where there has been less human activity over the past century.

The sequence of historical air photos provides additional information about the processes that shaped the study area forest through time. Forest clearing activities throughout the 20th century are associated with the Phillips homestead, the Phillips smokehouse, and the other smokehouse near John Mack Slough. At the homestead, the family worked to keep the area around their house clear to support their fruit orchards and vegetable gardens until the 1960’s when Sts’ailes knowledge holders say that there was a decline in their maintenance due to forced enrolment in residential schools and the subsequent traumas they faced. Likewise, the historical air photos show that maintenance and use of the smokehouses also ceased around the 1940s. Meanwhile, with regard to the distinct, oval-shaped clearing visible in the 1968 air photo, Willie Charlie and Gerald Phillips are confident that it was the result of logging for timber. Willie Charlie remembered that “it was all cottonwood all over, but the people cut it all down and sold it” (interview, 2021). One of these people was Gerald Phillips, who would clear the brush out from around the cottonwoods, so that the loggers could have easy access to the base of the selected trees (interview, 2021).

In addition to recent forest clearing influencing the distribution of crabapple and hazelnut, we note that the patterning of these trees appears to be strongly affected by ground water. For example, crabapple and hazelnut do not tend to co-occur in this specific study area with crabapple typically growing nearer to the river and sloughs at relatively lower elevations, while hazelnut prefers higher, drier ground (Figure 7). This preference likely explains the sparse distribution of these two species along the central riverbank area, where two large relic slough channels that extend to the north create extra low-elevation areas that may be too wet for even crabapple to establish.

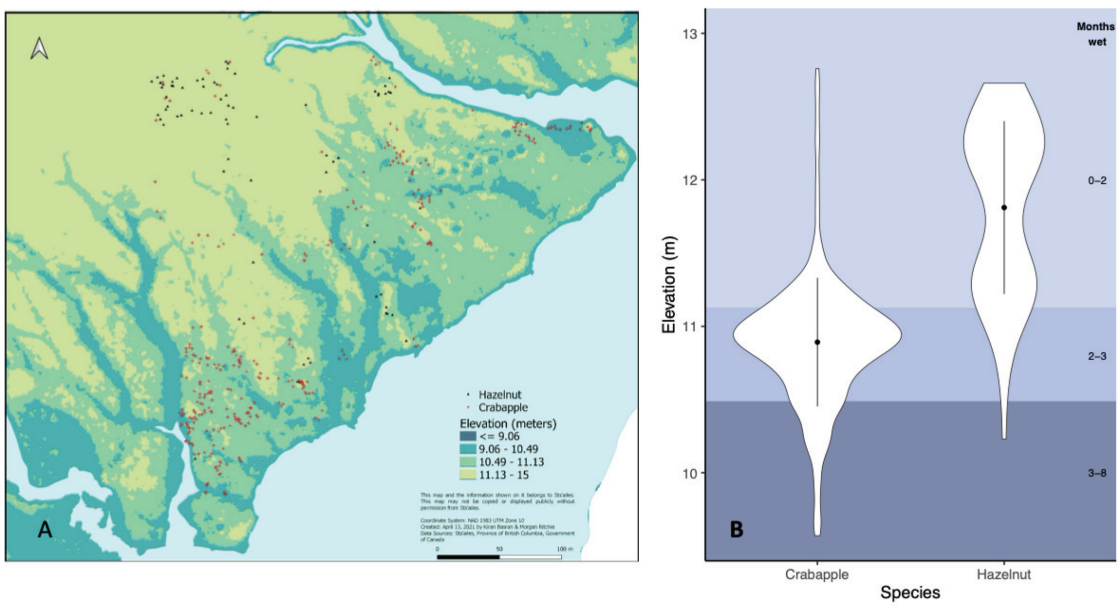

Figure 7: Distribution of crabapple and hazelnut relative to elevation and exposure to flooding. (A) Flood and elevation model showing that crabapples tend to grow around low elevation slough channels, wheras hazelnuts prefer higher, drier ground. Note the low-lying, relic slough channels near the central riverbank extending northward where few crabapple and hazelnut grow (B) Violin chart showing crabapple and hazelnut have unique elevational distributions (*p<0.001*). Elevation map produced by Sts'ailes, violin graph produced by Gavia Lertzman-Lepofsky.

Several sets of anthropogenic activities influence the distribution of crabapple and hazelnut today. As mentioned, cottonwood logging in the late 1960s created the oval-shaped clearing in the middle of the study area where modern crabapple and hazelnut do not grow (see Figure 5). We are uncertain if crabapple or hazelnut were once growing in this area, however the existing distribution suggests that crabapples were sparsely distributed throughout the study area but nowhere nearly as dense as around the two ancient village sites. In other areas, where the forest was managed and cleared, such as around the Phillips residence, hazelnut has now established in a large stand. These trees likely grew up within the last 40 years by taking advantage of the open forest canopy left behind when the fruit trees around the Phillips homestead were cut down or not being actively maintained. However, closer to the river, where a decrease in use of the area began around the 1960s, encroaching trees increasingly closed the forest canopy. Both crabapple and hazelnut are shade intolerant species and they likely established in the study area in more open forest conditions. The already established crabapple has been able to survive this encroachment. However, Sts'ailes Elders noted that hazelnut used to be more abundant in the study area and near the river, yet today only a handful are left, likely due to the encroaching trees creating too much shade for them to survive. Thus, the recent encroachment of deciduous and coniferous trees can likely be linked to the decline of this culturally important species.

Chapter 4. Discussion

By bringing together diverse sources of data and knowledge to document the history of one of the many forest gardens in Sts'ailes territory, we can begin to understand some of the ways in which the Sts'ailes lived on and interacted with the landscape around *Yāçketel* and *Seklwâtsel* settlements over three millennia (Figure 8). Not surprisingly, our understanding of these interactions is more detailed for the time since European contact (18th century onwards) when we can augment our narrative with family stories, historical air photos, tree ring ages, and vegetation survey data. Prior to this time, our summary is more general as it relies on fewer kinds, and less direct inferences. We explore this deeper time scale via archaeology and charcoal analysis, combined with data from parallel studies of Sts'ailes settlement patterns and paleoethnobotany (Ritchie et al. in prep; Richie and Lyons n.d.). The younger set of data allows us to compile a narrative at the decadal time scale, whereas for the earlier time period, our summary is at centennial and millennial intervals. Taken together, these multiple lines of inquiry converge to illuminate several key legacies of the entanglements of Sts'ailes ancestors with their environment through time.

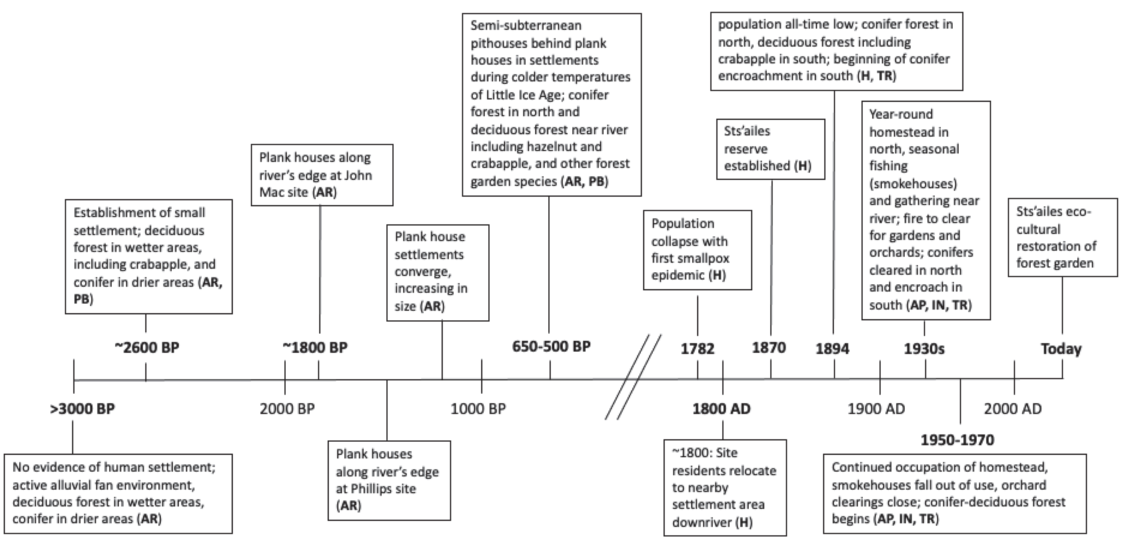

Figure 8*:* Timeline of events in the study area and our evidence for them. The break in the timeline reflects the shift in our understanding of the historical ecology from the millennial to decadal time scales. AP = air photos; AR = archaeology; H = historical; IN = interviews; TR = tree ring analysis.

4.1.1. 3000 BP - AD 1782

Our understanding of lives lived on the Jack Mack and Philips slough systems, and in the settlements of *Yāçketel* and *Seklwâtsel* begins about 3000 years ago. While people may have harvested resources from the study area prior to this time, we have no tangible evidence of these social and ecological interactions. From sediment profiles, we infer that the alluvial fan environment was too active for vegetation to establish and settlement to be viable. The absence of charcoal in the sediments precludes determining forest composition. This absence could be the result of water transport of fine particles and/or the absence of fires in these wet forests. We assume that the active flood plain supported a mostly young forest of deciduous and coniferous trees, that may or may not have included crabapple, hazelnut, and other culturally salient taxa.

The stabilization of the alluvial fan ~ 2600BP would have allowed both human settlement and preservation of the paleoecological record associated with the settlement. At this time, people started living near the Phillips Slough in a small settlement consisting of two or more plank houses (Ritchie et al., in prep, Figure 3). The presence of charcoal found in two *in situ* features with FCR dating to this period near the Phillips and John Mack sloughs suggest that the forest in these places was open enough to support cultural activity and fires. Notably, the focus of human activity directed at the sloughs reflects the initiation of a pattern that is reinforced in the following millennia: an orientation towards the waterways. This same culturally embedded orientation toward waterways is also reflected in the language used to describe Salish house parts (Schaepe et al. 2001:40).

Charcoal recovered from these two cultural features provides some insights into forest structure and perhaps selective burning practices. Both features contain ancient crabapple charcoal as well as a mix of predominantly deciduous and some coniferous species, as expected of a floodplain forest. That the crabapple charcoal was recovered from a cultural feature, rather than diffuse forest deposits, suggests that the charcoal originated from people collecting downed branches for fuel, rather than from forest clearing. As we did not collect paleoethnobotanical samples apart from charcoal, we cannot determine whether these features were being used to process other plants.

Settlements began to expand in size some 800 years after the first plank houses were established in the study area. Around 1,800 cal BP, plank houses were constructed near the mouth of *Meth’á:lméxwem* (John Mack Slough), and soon after, at ~1600 cal BP, people built plank houses along the mouth of the Phillips Slough. Over the next several hundred years, plank houses continued to be built, expanding along the river’s edge. The process of building plank houses involved recontouring the lower margin of the alluvial fan and creating raised level construction surfaces (Ritchie et al., in prep). Diffuse charcoal collected from sediment layers near the plank houses from this time show that people were burning the existing mixed conifer-deciduous forest likely to make way for the expansion of the plank house settlement.

Over time, the settlements in the study area continued to grow larger, and by ~850 years ago, the presence of red elderberry and possibly crabapple from a cooking feature just outside of the study area (across the Phillips Slough; Lyons and Ritchie n.d.) reflects the on-going use of culturally important plants. The slightly more recent cooking feature dating to ~650 cal BP with a charred hazelnut shell provides firm evidence that hazelnut was growing in the study area and that people were likely harvesting them (Lyons and Ritchie n.d.). Notably, there is no hazelnut growing along this section of the riverbank today likely because of changing environmental conditions associated with the decline in human management of the area in the last century.

During the Little Ice Age (ca. 800–250 cal BP) we see considerable changes to the settlements in the study area, in part influenced by cooler temperatures (Pitman and Smith 2012). Starting around 550 cal BP, inhabitants constructed and lived in semi-subterranean pithouses located behind the plank houses. Seed and charcoal samples collected from pithouse floors in the study area dating to ~400 cal BP demonstrate that people processed and presumably ate red elderberry and salal (*Gaultheria shallon*), and that they used spruce, hemlock, red cedar, alder, birch, and willow for fuel (Lyons and Ritchie n.d.). All of the species recovered, with the exception of salal, grow in abundance in the study area today. That the salal and elderberry were bearing harvestable fruits suggests that they were growing in relatively open forest, such as how we imagine the forest to be around the two settlements.

Taken together, the accumulated data while sparse, indicate continuity in land use over several millennia beginning around 2600 years ago. This is especially reflected in both the long-term archaeological record of settlements and the linguistic terms for house parts focused on the river and slough channels. The connection to these waterways comes into further focus when compared to the absence of evidence (charcoal, artifacts) of use in the center and northern portions of the study area, away from the slough and river. The long-term use of culturally salient plants for food and fuel–plants that are still valued today–similarly speaks to the complex and age-old connections between the ancestral and modern-day Sts'ailes and this place. Management of the forest is indicated by the fire history of the area and the longevity of culturally important species on the landscape.

4.1.2. AD 1782-2021

From the late 18th century onwards, as the resolution of our data increases, we witness dramatic shifts in the use of the landscape around *Yāçketel* and *Seklwâtsel*. In 1782, the first smallpox epidemic rocked the Coast Salish world. The population of Sts'ailes plummeted (Boyd 1999:135;137-138; Carlson 2001:76; Harris 1994), having dramatic social and ecological effects. By 1800, among the Coast Salish more broadly, entire families and more than three quarters of the population at Sts'ailes were lost to disease (Boyd 1999:135; 137-138; Harris 1994). At this time, Sts'ailes people left their villages in the Harrison watershed to congregate at a single settlement downriver of the study area (Ritchie 2010; Ritchie and Lepofsky 2008).

Over the next hundred years, the Sts'ailes world continued to change under various colonial processes that in turn influenced their connections to *Yāçketel* and *Seklwâtsel*. Sts'ailes families began living permanently in and around *Yāçketel* and *Seklwâtsel* after the official boundaries for the reservation were established in 1870 (Sproat 1879:38). By 1894, with as few as 124 Sts'ailes people surviving (Sessional Papers 1890:268, 1894:300), use of the areas around *Yāçketel* and *Seklwâtsel* would have been greatly diminished, especially when compared to the once thriving, densely settled villages of the previous two millennia.

Ironically, this time corresponds to some of our strongest evidence of prior human management of the forest. Our tree ring data suggests that conifers began to encroach into the southern portion of the study area around 90 years ago. We surmise that this encroachment is due to the decline in human presence and thus the decline in both active (burning and clearing) and passive (weeding and trampling) of the forest. Declining diversity of culturally important species in the study area within the last century likely also reflects the decline in human presence. For example, Elders recalled that saskatoon berries used to be harvested from within the study area. While present at other sites along the Harrison River today, they can no longer be found in this location. Similarly, stinging nettle, which was also commonly harvested from the study area within the last 50 years, survives only in a single patch today. Elders also remembered that hazelnut used to be more abundant, especially near the river, however today they are predominantly found in the northern, drier portions of the study area. These species, especially hazelnut, likely benefitted from the previously more open conditions along the river and sloughs associated with past human use and settlement. Our data suggest that once humans were removed from the landscape, the forest changed rapidly. Crabapple growing today in and around the ancient settlements are likely legacies of the pre-encroachment forest, however we note that many of the crabapples are in poor condition and are not fruiting. However, the persistence of culturally important plants on the landscape despite over a century of human activity is a trait indicative of other forest gardens in British Columbia (Armstrong et al. 2021; Fisher et al. 2019; Trant et al. 2016).

The longevity of human-crabapple relationships is further indicated by the presence of crabapple wood charcoal in the soil samples extracted from the modern crabapple groves. For instance, near the Phillips site, where there are young crabapple trees among those established over a century ago, we extracted ancient crabapple charcoal from multiple stratigraphic layers. The presence of crabapple throughout our sequence, and its association with settlements, suggests that people were using and harvesting this culturally important species for nearly three millennia.

Despite the dramatic social and ecological changes of the 18th and 19th centuries, Sts'ailes people continued to manage and connect to the forest, river, and sloughs until the 1950's. Importantly, the very naming of the slough systems themselves -- with John Mack and Phillips family names – reflects the on-going connection of the Sts'ailes people to this landscape. The waterways were still a central focus of their daily life and were accessed via well-maintained trails. At the mouth of the slough carrying their name, the family smokehouse was a nexus for travel, hosting family, processing resources, and taking refuge. Myriad native plants were gathered for food, medicine, technology, and ceremony, including hazelnut and crabapple. Away from the river and sloughs, as a part of their homestead, the Phillips family cleared large swathes of the forest via controlled burns and other tools to create orchards and gardens composed of European plant species.

Increasing colonial disruptions led to a sharp decrease in human activity in the study area from the 1950s onward that broke many peoples' connection to this place. This disconnect began with the cessation of the Phillips and John Mack smokehouses, both of which disappear from the landscape by the 1950s. In the late 1960s the area was commercially logged, illustrating both a significant shift in how Sts'ailes people interacted with the forest. By the 1970s, the Phillips homestead was replaced by modern homes and the associated orchards and clearings were left to grow over. Thickets of rose, blackberry, and spiraea colonized previously disturbed and open space near the river and sloughs making access to the area difficult, especially as Elders aged. In turn, this decreased access to the waterways and meant that people spent less time harvesting traditional plants from the study area.

Our narrative of connection to the landscape around *Yāçketel* and *Seklwâtsel* continues strongly to present day through the efforts of current generations of Sts'ailes people. Today, the Sts'ailes eco-cultural restoration plan is working towards reconnecting Sts'ailes people with this important cultural landscape. The Nation is doing this by identifying both the historical and ecological legacies that persist on the landscape to protect, conserve, and revitalize this place. This involves increasing access to key areas such as the archaeological sites through the creation and maintenance of trails as well as clearing brush and weeds out of areas with high densities of culturally important species, beginning with the crabapple orchard near the Phillips Slough. To promote increased productivity in these trees, the Nation is experimenting with traditional management techniques such as pruning and topping. To facilitate harvesting by community members, some trees have had their branches weighed for easier access to the fruits. Most importantly, Sts'ailes is encouraging their members to visit this place by arranging community harvesting events that involve all ages of Sts'ailes people.

Reconnecting community members with this cultural landscape has significant implications for the inter-generational transfer of cultural and ecological knowledge as well as strengthening Sts'ailes identity. The Nation aims to reconnect Elders to places that they frequented in their childhoods so they can pass on cultural teachings to younger generations through hands on experiences that reinvoke integrated systems of knowledge and practice. Sts'ailes Elders believe that getting youth onto the land is essential for sharing these teachings because youth can gain a greater appreciation of their heritage when they experience it first-hand (Boyd Peters, interview 2021). Ensuring the survival and transmission of this place-based knowledge requires the cooperation of all generations of Sts'ailes because, not just the youth. As Pat Charlie put it, "that's our role as Elders: that we have to share these statements that we've gotten, it's not learned from [a] book" (interview, 2021). This transfer of knowledge is also crucial to maintaining the Nation's cultural identity because "these things should not be forgotten. [They are] a part of who we are and what we belong to" (Pat Charlie, interview 2021).

Chapter 5. Conclusion

Our story is one of continuity and change over nearly three thousand years. For example, we see continuity in the strong emotional connection Sts'ailes people hold to *Yāçketel* and *Seklwâtsel*, as they chose to live and settle along these waterways for many generations. There is also the continued presence of crabapple in certain locations that spans from the first occupation to today and the continued use and harvest of many other culturally important species. We also detect change in the declining use of this area over the last century and the subsequent shifts in biodiversity that sustained people in this place for thousands of years.

Our data also allows us to follow threads of human agency via the longstanding history of gardening and tending of culturally important plants near the home. For Sts'ailes people, we see the continuation and evolution of this practice from ancient times to the present. There is the persistent legacy of crabapple and other culturally important species growing around the villages of *Yāçketel* and *Seklwâtsel*. Post-Contact, with the introduction of new technologies and species, Sts'ailes people continued to keep important plants near at hand in orchards and gardens, while harvesting and tending "wild" foods from the forest. Today, the relationship between Sts'ailes people and their culturally preferred plants has evolved once again with the implementation of new stewardship and restoration goals, including in the study area. These kinds of reconnections, and the current renewed focus on European-style gardening (Virginia Peters, 2021), are especially important due to the heightened need for self-sufficiency brought on by the current pandemic.

While our compiled data and knowledge supports a narrative of Sts'ailes' ecological entanglements with Phillips and John Mack Slough, it is much weaker on the social context of these relationships. For instance, we do not know who did the initial clearing of the forest for the homes some 2600 year ago. Was it family groups working together? Did a family head coordinate the efforts? Similarly, who was responsible for and who enacted the now invisible actions that would have been required to maintain the culturally important plants in and around the settlements (e.g., pruning, weeding)? Did people share the crabapples and hazelnuts or was access controlled by specific families? Were these foods part of the daily fare or taken out only at special events? Our questions are far-ranging, but we have little data to answer them. Thus, the onus is on us to tell these stories not as an accumulation of data, but as the interwoven histories of generations of people tied to place.

This research allows us to take a deep dive into the history of the Sts'ailes people and one particular place, but it also connects the people of this place to other cultural landscapes of the ancestral Sts'ailes in the Harrison watershed and beyond. Archaeological and ethnoecological studies elsewhere in Sts'ailes territory demonstrate the intertwined histories of settlements and forest gardens which are both place-specific and share elements across the region. However, the Phillips and John Mack Slough forest garden appears to be unique compared to other regional forest gardens (e.g., Armstrong et al. 2021). Although most of forest garden indicator species are present in the study area, they are not as abundant in the understory as in other places. This may be due to a mix of edaphic factors and particular land-use histories in the study area. Beyond Phillips and John Mack Slough, the structure and composition of forested areas around other settlements in the territory are more similar to forest gardens elsewhere in the province (Armstrong et al. 2021). These larger landscape studies ultimately allow us to explore the identity, history, and connection of Indigenous peoples to their ancestral territories (Lepofsky et al. 2020).

While current heritage legislation laws in British Columbia and elsewhere place emphasis on protecting traditional archaeological remains such as artifacts/belongings and sites, incorporating a more holistic view of landscapes that includes the connection of Indigenous people to their biophysical world through time and space is key to recognizing and honoring the full breadth of people's long-term connections to place (Lepofsky et al. 2020). Gaining protection for these landscapes and places can be challenging, however. Within the legal context of British Columbia today, "Aboriginal rights and title exist on a spectrum based on the depth and breadth of connectivity to land" (Hogg and Welch 2020:216)". In this context, an integral facet of demonstrating the continuity and connection of people and the landscape is through documenting plant management systems, which encompass the knowledge, practice, and belief systems of Indigenous peoples (Turner and Spalding 2013). The narrative of this forest garden, growing along the Harrison River and nestled between the Phillips and John Mack sloughs, not only tells the story of the Sts'ailes people and their connection to this place but ultimately helps to protect and conserve the traditional knowledge, practices, and identity of generations of Sts'ailes people past, present, and future.

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Appendix A.

Interview Questions and Interviewees

Interviews were semi-structured and based around a group of sample questions, with additional questions being generated by dialoguing throughout the interview. Sample questions were designed to cover five main topics: (1) personal experiences and memories of the landscape; (2) knowledge of culturally important plants at the site, their use, and harvesting techniques; (3) knowledge of landscape management practices (e.g., clearing, burning, etc.); (4) the identification of remnant features on the landscape (e.g., trails, historic buildings, etc.); and (5) the value to future generations of Sts'ailes Nation's current efforts to revitalize and manage the forest garden and landscape.

Example Questions

1. Personal Experiences and Memories:
    a. How often did you visit the study area? Was it only in particular seasons?
    b. What did you do when you visited the study area?
    c. Do you remember what the study area looked like? Was it entirely forested? Was it open?
2. Harvest and Use of Culturally Important Plants
    a. What plants did you harvest from the study area? Did you do any of this with friends or family?
    b. Who taught you how to harvest these plants?
    c. What were these harvested plants used for?
3. Landscape Management Practices
    a. Were specific areas in the study area cleared for access or other activities?

b. Were trees and other plants tended to at all? For example: keeping areas free of weeds, pruning, topping, etc.

c. Was fire used to manage the forest and landscape?

4. Remnant Features on the Landscape

a. Were there features or structures on the landscape thar are not there today? For example: trails, roads, homes, smokehouses, clearings, etc.

b. Where were these features/structures located and what were they used for?

5. Future Value of Sts'ailes Eco-Cultural Restoration

a. Do you think it is important for this area to be managed once again? Why?

b. Do you think managing this area is important for future generations? Why?

Interviewees		
Name	**Date**	**Comments**
Boyd Peters	2020-09-11	Brother of Vange Point
Vange Point	2020-10-21	Sister of Boyd Peters
Virginia Peters	2020-10-22, 2021-03-30	Mother of Boyd Peters and Vange Point, sister of Patricia Charlie and Gerald Phillips
Patricia Charlie	2021-03-22, 2021-03-30	Sister of Virginia Peters and Gerald Phillips

Gerald Phillips	2021-03-30	Brother of Patricia Charlie and Virginia Peters
Willie Charlie	2021-03-30	Husband of Patricia Charlie

Appendix B.

Radiocarbon Dates

Feature	Layer	Convent. B.P. RC Age	2 sig. Cal B.P.	Depth of sample	Lab #	Comments
ST 3	S4	1541 +/- 30	1520-1350	~30cm	UOC-16179	Conifer charcoal
ST 17	S3	118 +/- 30	270-9	~60cm	UOC-16180	Conifer charcoal; field notes indicate contamination of charcoal from upper layers falling into sample
ST 10	S4		2740-2490	65-70cm	UOC-12784	Charcoal collected from deeply buried FCR and charcoal feature.\
ST 20	S1	2411 +/- 30	2690-2350	45-55cm	UOC-16181	Pacific crabapple charcoal

Calibrated using Calib 8.20 (Stuiver and Reimer 1993), InCal 20 (Reimer et al. 2020).

Appendix C.

Tree Ring Dates

ID Number	Coordinates (UTM)	Species	Path A	Path B	Final Age (years)
001	-121.910727, 49.284249	Sitka Spruce (*Picea sitchensis*)	-	-	79
002	-121.910667, 49.284271	Red Alder (*Alnus rubra*)	-	-	83
003	-121.910650, 49.283826	Red Alder (*Alnus rubra*)	-	-	58
004	-121.910067, 49.284215	Paper Birch (*Betula papyrifera)*	-	-	52
005	-121.909722, 49.284276	Black Cottonwood (*Populus trichocarpa*)	-	-	No Age
006	-121.910024, 49.284509	Sitka Spruce (*Picea sitchensis*)	-	-	54
007	-121.910186, 49.284648	Red Alder (*Alnus rubra*)	-	-	No Age
008	-121.910291, 49.284853	Sitka Spruce (*Picea sitchensis*)	-	-	No Age
009	-121.910291. 49.284853	Sitka Spruce (*Picea sitchensis*)	-	-	No Age
010	-121.910372, 49.284818	Lodgepole Pine (*Pinus contorta*)	-	-	No Age
011	-121.910478, 49.284983	Sitka Spruce (*Picea sitchensis*)	-	-	69
012	-121.910567, 49.284851	Pacific Crabapple *(Malus fusca*)	-	-	No Age
013	-121.910928, 49.284716	Lodgepole Pine (*Pinus contorta*)	-	-	87

014	-121.910746, 49.284642	Sitka Spruce (*Picea sitchensis*)	-	-	69
015	-121.909136, 49.284620	Pacific Crabapple (*Malus fusca*)	-	-	83
016	-121.909110, 49.284627	Black Cottonwood (*Populus trichocarpa*)	-	-	99
017	-121.910214, 49.285085	Pacific Crabapple (*Malus fusca*)	-	-	No Age
018	-121.910081, 49.284900	Red Alder (*Alnus rubra*)	-	-	102
019	-121.909905, 49.284735	Red Alder (*Alnus rubra*)	-	-	82
020	-121.909872, 49.284753	Red Cedar (*Thuja plicata*)	-	-	87
021	-121.909822, 49.284783	Red Cedar (*Thuja plicata*)	-	-	67
022	-121.909866, 49.284636	Black Cottonwood (*Populus trichocarpa*)	-	-	94
023	-121.909634, 49.284822	Paper Birch (*Betula papyrifera)*	-	-	81
024	-121.909544, 49.284608	Sitka Spruce (*Picea sitchensis*)	-	-	52
025	-121.909358, 49.284682	Paper Birch (*Betula papyrifera)*	-	-	No Age
026	-121.909192, 49.284798	Paper Birch (*Betula papyrifera)*	-	-	49
027	-121.909274, 49.285801	Sitka Spruce (*Picea sitchensis*)	-	-	72
028	-121.909106, 49.285501	Black Cottonwood (*Populus trichocarpa*)	-	-	63
029	-121.908969, 49.285559	Sitka Spruce (*Picea sitchensis*)	-	-	74
030	-121.908878, 49.285634	Sitka Spruce (*Picea sitchensis*)	-	-	52

031	-121.908995, 49.285422	Paper Birch (*Betula papyrifera)*	-	-	53
032	-121.908861, 49.284990	Sitka Spruce (*Picea sitchensis*)	-	-	86
033	-121.908818, 49.284790	Sitka Spruce (*Picea sitchensis*)	-	-	67
034	-121.908559, 49.285057	Red Cedar (*Thuja plicata*)	-	-	52
035	-121.908183, 49.285963	Pacific Crabapple (*Malus fusca*)	-	-	No Age
036	-121.909530, 49.285367	Black Cottonwood (*Populus trichocarpa*)	-	-	No Age
037	-121.909565, 49.285365	Red Alder (*Alnus rubra*)	-	-	112
038	-121.909793, 49.285380	Black Cottonwood (*Populus trichocarpa*)	-	-	69
039	-121.911161, 49.285009	Sitka Spruce (*Picea sitchensis*)	-	-	42
040	-121.910825, 49.285322	Red Cedar (*Thuja plicata*)	-	-	46
041	-121.910716, 49.285665	Black Cottonwood (*Populus trichocarpa*)	-	-	52
042	-121.910121, 49.285958	Red Cedar (*Thuja plicata*)	-	-	No Age
043	-121.910132, 49.286154	Red Cedar (*Thuja plicata*)	-	-	47
044	-121.908151, 49.285822	Pacific Crabapple (*Malus fusca*)	121	115	121
045	-121.906455, 49.286169	Pacific Crabapple (*Malus fusca*)	130	-	130
046	-121.908833, 49.286656	Beaked Hazelnut (*Corylus cornuta*)	36	31	36
047	-121.908757, 49.286672	Beaked Hazelnut (*Corylus cornuta*)	26	23	26

048	-121.909943, 49.286503	Beaked Hazelnut (*Corylus cornuta*)	32	38	38
049	-121.910751, 49.286505	Beaked Hazelnut (*Corylus cornuta*)	28	30	30
050	-121.909549, 49.284717	Pacific Crabapple (*Malus fusca*)	61	60	61
051	-121.910529, 49.284030	Pacific Crabapple (*Malus fusca*)	50	-	50
052	-121.910352, 49.283777	Black Cottonwood (*Populus trichocarpa*)	-	-	No Age
053	-121.910687, 49.284191	Pacific Crabapple (*Malus fusca*)	71	-	71
054	-121.910687, 49.284191	Pacific Crabapple (*Malus fusca*)	103	99	103
055	-121.9104407, 49.28382877	Pacific Crabapple (*Malus fusca*)	-	-	96
056	-121.9105178, 49.28392084	Pacific Crabapple (*Malus fusca*)	-	-	74
057	-121.9101844, 49.28431578	Pacific Crabapple (*Malus fusca*)	-	-	80
058	-121.9102984, 49.28437938	Pacific Crabapple (*Malus fusca*)	-	-	93
059	-121.909608, 49.28439684	Pacific Crabapple (*Malus fusca*)	-	-	109
060	-121.9096598, 49.28443393	Pacific Crabapple (*Malus fusca*)	-	-	75
061	-121.9099707, 49.28449416	Pacific Crabapple (*Malus fusca*)	-	-	77
062	-121.9099761, 49.28445996	Pacific Crabapple (*Malus fusca*)	-	-	80
063	-121.9099364, 49.28535299	Pacific Crabapple (*Malus fusca*)	-	-	87
064	-121.9106336, 49.28550049	Pacific Crabapple (*Malus fusca*)	-	-	59

065	-121.910702, 49.28544532	Pacific Crabapple (*Malus fusca*)	-	-	60
066	-	Pacific Crabapple (*Malus fusca*)	-	-	No Core
067	-	Pacific Crabapple (*Malus fusca*)	-	-	No Core
068	-	Red Cedar (*Thuja plicata*)	-	-	No Core
069	-	Pacific Crabapple (*Malus fusca*)	-	-	No Core
070	-121.9110486, 49.28586018	Pacific Crabapple (*Malus fusca*)	-	-	55
2071	-121.91, 49.28502	Red Alder (*Alnus rubra*)	-	-	82
2101	-121.909, 49.2868	Pacific Crabapple (*Malus fusca*)	-	-	49

Appendix D.

Charcoal Identifications

	ST 2		ST 3				ST 10			ST 17			ST 18	ST 19	ST 20	ST 21
Species	CS 1	S 3	S 1	S2	S 3	S 4	S 2	S 4	S 5	S 1	S2	S 3	S1	S1	S1	S1
Acer sp. (maple)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Alnus rubra (alder)	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
Malus fusca (crabapple)	-	-	-	cf. 1	-	-	2	-	3	-	-	-	-	-	1	-
Populus/Salix sp. (cottonwood/aspen/ willow)	-	-	-	-	-	-	-	-	1	-	-	-	cf. 1	1	3	2
Unidentifiable Deciduous	-	4	-	-	6	1	1	1	12	-	2	-	4	1	2	-
Total Deciduous	-	**4**	**1**	**1**	**6**	**2**	**3**	**1**	**16**	-	**2**	-	**5**	-	**7**	**3**
Picea/Pinus sp. (spruce/pine)	2	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-
Pseudotsuga menziesii (Douglas fir)	-	-	-	-	-	-	-	-	-	-	cf. 1	-	-	-	-	3
Unidentifiable Conifer	10	6	-	-	-	6	-	1	2	12	1	1	-	7	5	4
Total Conifer	**12**	**6**	-	-	-	**6**		**1**	**2**	**12**	**2**	**3**	-	-	**5**	**7**

Appendix E.

Soil Charcoal Descriptions

Context	R.C. Date	Description	Comments
ST 2			
S1 20 cm, n=12		Brown sandy, silt with organics	Diffuse charcoal
S3 30cm, n=10	1517-1354 BP (95.4%)	Brown sandy silt with some charcoal flecking	Diffuse charcoal
ST 3			
S1 10cm, n=2		Dark brown silt with lots of roots	Diffuse charcoal
S3 25cm, n=6		Charcoal rich dark brown/black silts with lots of FCR and 2 artifacts	*in situ c*ultural feature
S4 30cm, n=8	1517-1354 BP (95.4%)	Orange coarse sands w/ some silt, pebbles	Diffuse charcoal
ST 10			
S2 20cm, n=3		Brown silty sand layer, FCR and charcoal	*in situ c*ultural feature
S4 50cm, n=2		Grey-brown sandy layer lots of FCR and charcoal	*in situ c*ultural feature
S5 60cm, n=18	2736-2492 BP	Burn feature, charcoal rich soil, FCR	*in situ c*ultural feature
ST 17			
S1 10cm, n=12		Dark brown organic with lots of roots and charcoal	Diffuse charcoal
S2 20cm, n=4	151-10 BP (67.5%)	Intermediate layer of orange-brown sandy silt	Diffuse charcoal
ST 18			
S1 12cm, n=5		Dark brown, organic layer with roots	Diffuse charcoal
ST 19			
S1 14cm, n=10		Dark brown, organic layer, wet	Diffuse charcoal
ST 20			
S1 45-50cm, n=12	2499-2348 BP (80.2%)	Grey-brown silt with 12 pieces FCR and scattered charcoal	*in situ c*ultural feature
ST 21			
S1 35-40cm, n=10		Dark grey sandy silt with 8 pieces FCR and charcoal	*in situ c*ultural feature

Appendix F.

Phillips Family History in the Study Area

Decade	Event(s)
<1930’s	• Phillips family is told to move to the area, by who = unclear.
1930’s	• Forest cleared around homestead for orchards and gardens of introduced species, keeping of some farm animals. Forest cleared with fire. • smokehouse and surrounding area used frequently, forest directly and indirectly kept clear by Phillips family.
1940’s	• Continued maintenance of forest clearing around homestead. • Smokehouse and surrounding area still in use.
1950’s	• Maintenance of forest clearings decreases as family struggles with effects of residential schools. • Smokehouse no longer used, surrounding area no longer maintained.
1960’s	• Forest begins to encroach into former orchards and gardens at homestead. • Smokehouse disappears from landscape.
1970’s	• Members of Phillips family move away from the area.