Restoration Plan

native plant forage forest

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for the
Galiano Conservancy Association

University of Victoria

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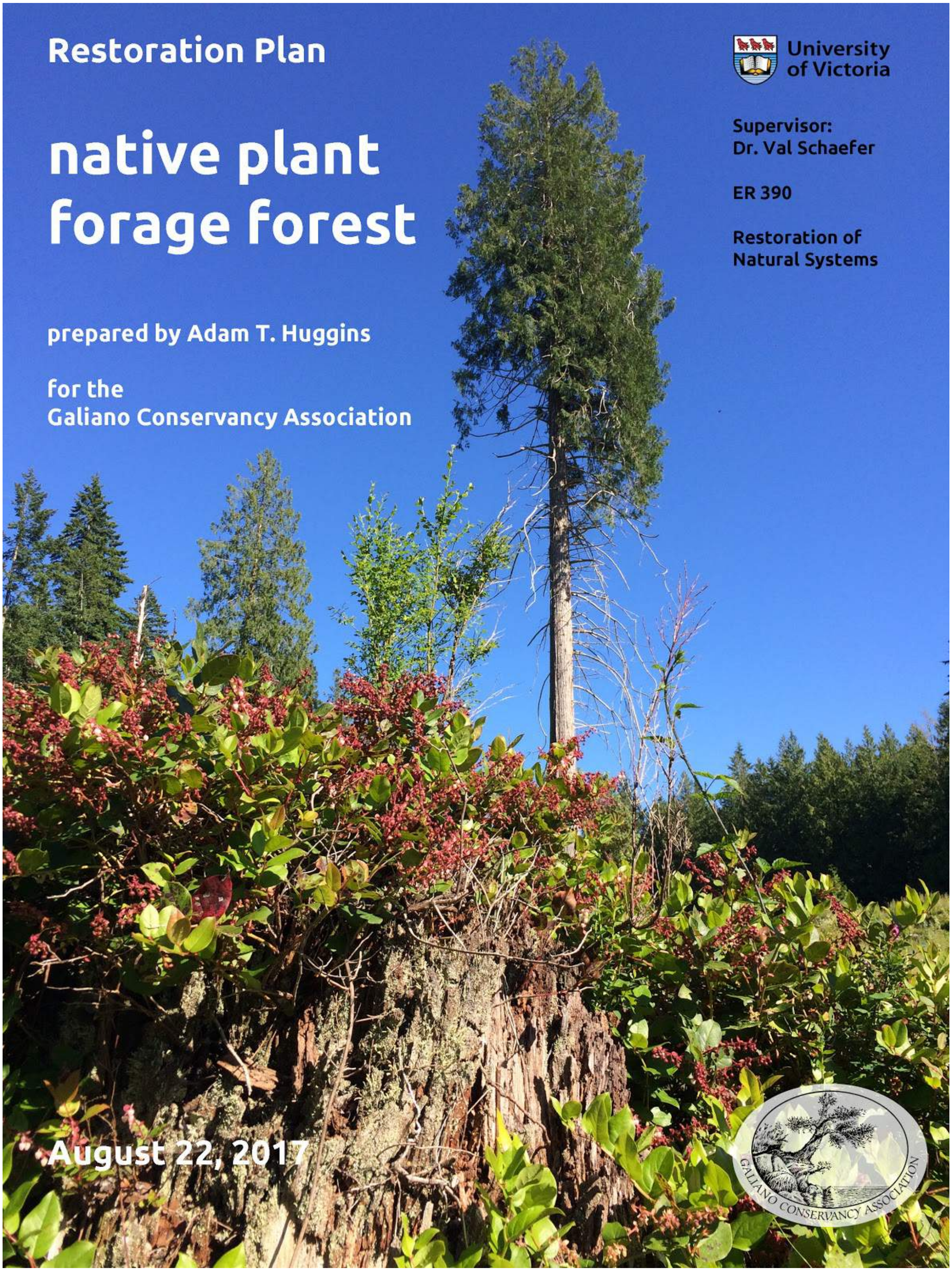
ER 390

Restoration of
Natural Systems



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Executive Summary

The Galiano Conservancy Association has initiated a variety of ambitious ecological restoration and permaculture projects to support its aim of modeling sustainable living with the natural world. Up to this point, however, their various restoration and food production projects have been spatially and conceptually distinct. A recently clear-cut piece of land across from the Learning Centre building provides the opportunity to synthesize these two approaches to landscape intervention with the creation of a “Native Plant Forage Forest” - quite possibly the first of its kind in North America.

Galiano Island, one of the Southern Gulf Islands in the Strait of Georgia of southwestern British Columbia, Canada, is a small community on unceded Hul’qumi’num territory. It falls within the globally unique and endangered Coastal Douglas-fir biogeoclimatic zone, characterized by mild maritime climate, and is largely dependent on tourism and resources from the mainland. The Penelakut Tribe, which has been in treaty negotiations with the Province of British Columbia for 24 years, is working to assert its rights and access its traditional foods in a colonized, fragmented territory.

This proposal brings together five central goals: (1) to restore ecological function and structure to a logged and degraded site; (2) to engage the Penelakut and Galiano communities in the planning, treatment, and ongoing management of the restoration site; (3) to document the creation and evolution of the project through various media; (4) to produce harvestable native plant foods, medicines, and materials; and (5) to monitor site, report results, and adapt management accordingly. To these ends, a thorough site assessment was undertaken, and a detailed restoration plan and forage forest design were drafted based on the results. Important edible species occupy central roles in the planting scheme. Site and regional history were summarized to inform efforts to engage both Hul’qumi’num and settler communities. Ongoing management and monitoring considerations are discussed, based largely on the masters thesis of University of Victoria graduate Hyeone Park.

It is my sincere hope that the implementation of this plan and the evolution of the project will benefit both the human and non-human communities of Galiano Island. In addition, I believe it will serve as a pioneering experiment in the harmonization of ecological restoration and permaculture with one another and with the traditional ecological knowledge that underpins them, providing valuable lessons and data for future projects. Finally, I hope that this project might provide a venue for the most important challenge of our times: the pursuit of truth and reconciliation[1] - between First Nations and settlers, and between human and natural communities - at local, regional, and global levels.

[1] See Coulthard (2014) for a critical analysis of this term and its recent politicization in the Canadian context

A Note on the Marriage of Ecological Restoration and Permaculture

Although distinct in a number of critical ways, the disciplines of restoration ecology and permaculture both arose in the 1980s as a response to the growing awareness around widespread anthropogenic ecological destabilization. As independent bodies of work, they both consist largely of practical articulations of centuries of indigenous knowledge, scientific study, and good old-fashioned common sense. Typically, permaculture projects prioritize boosting site productivity for human uses, whereas restoration projects prioritize reestablishing site ecological integrity and ecosystem services. In recent years, however, the changing role of history in guiding ecological restoration (Higgs *et al.*, 2014) and debates surrounding novel ecosystems (Miller & Bestelmeyer, 2016) have served to move restoration ecology closer to permaculture in theory and practice. While much can be (and has been) said regarding the relative merits of these disciplines - both of which are relatively young and inconsistently applied in the field - I (and others; see Park, 2016) regard them as complementary and informative frameworks to aid in the necessarily experimental art of landscape intervention, which is a broader term that reflects the uncertainties inherent in ecological praxis (Hobbes *et al.,* 2011).

Given the interdisciplinary nature of this project, I make reference to relevant concepts from both restoration ecology and permaculture, as well as to historical, anthropological, and geological texts. Handily, the core concepts of permaculture have been curated by David Holmgren (2002) into 12 principles, summarized below, which I will reference throughout the report by way of his icons.

Introduction

Galiano Island

Galiano Island is among the Southern Gulf Islands (SGI) of British Columbia, located off the eastern edge of Vancouver Island in the centre of the Salish Sea. The island comprises 5787 hectares and is defined by the Trincomali Channel to the west, Porlier Pass to the north, Active Pass to the south, and the Strait of Georgia - including the delta of the Fraser River - to the east (Green *et al.*, 1989). Galiano shares the hot, dry summers and mild, wet winters characteristic of the transitional Mediterranean climate that defines the Coastal Douglas Fir moist maritime biogeoclimatic zone (CDFmm) of the SGIs, a result of rain-shadow effects of the Olympic and Insular Mountains (CPAWS, 2004). The island has a seasonally fluctuating human population of about 1100 and is easily accessible to the nearby urban areas of Vancouver and Victoria.

Galiano Conservancy Association

The Galiano Conservancy Association (hereafter the GCA) is a "community based nonprofit society and registered charity dedicated to preserving and enhancing the human and natural environment" (GCA, 2016). Founded in 1989 as one of BC's first community-based land trusts, the GCA has maintained a pioneering attitude and has since evolved to incorporate ecological restoration, hands-on environmental education, and, most recently, permaculture-style food production. In total, the GCA has acquired 185.6 hectares of land for conservation purposes and holds conservation covenants on an additional 217.32 hectares (GCA, 2016), which add up to roughly a third of the total protected areas on the island - numbering over 1200 hectares and encompassing over 20% of the island surface (Islands Trust Fund, 2016). As a microcosm, this puts Galiano Island well beyond the global and national target of 17% protection for terrestrial ecosystems by 2020 and has prompted the GCA to continue to expand the scope of its activities.

The Ken & Linda Millard Learning Centre

In 2012, the GCA purchased DL 57, a 76 hectare lot located mid-island along the Trincomali Channel (Figure 1) and abuting the Trincomali Nature Reserve to the south. In addition to completing the Mid-Galiano Island Protected Areas Network, this acquisition preserves one of the longest stretches of undeveloped coastline in the SGIs. Here, the GCA protects over 35 hectares of mature forest (including rare coastal old growth), holds regular education retreats for school children and university students, demonstrates restoration strategies for ecosystems degraded by logging, and grows food for local restaurants such as Pilgrimme.

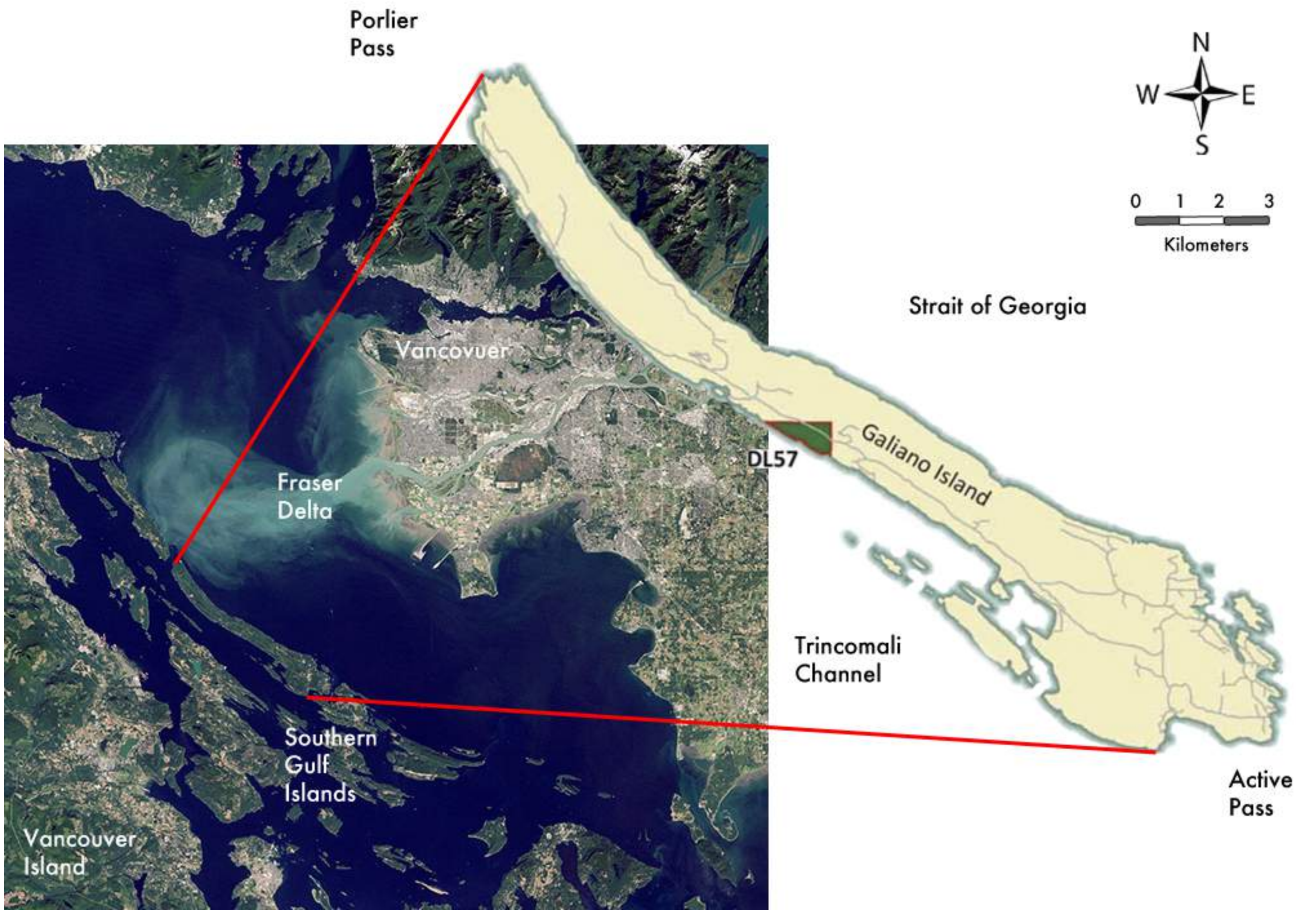

Figure 1: Regional context of Galiano Island and location of DL 57 on Galiano Island. Map adapted from GLCMC, 2013.

DL 57 has since been renamed the Ken & Linda Millard Learning Centre and now includes a modest structure (usually referred to as “the Learning Centre”) on the southeast corner of the property, complete with a commercial kitchen, a versatile classroom space, satellite panels, outdoor showers, and a harvest storage area. Campsites, an outdoor event space, and parking have been developed in the clearing around the structure, which is bordered by mature Douglas-fir (*Pseudotsuga menziesii*) and western redcedar (*Thuja plicata*) forest on three sides. The fourth side overlooks a recently clear-cut drainage area between several parallel sandstone ridges that slopes downhill to the northwest and eventually collects into a seasonal stream that flows to the ocean at crystal cove, roughly in the centre of the property coastline. The upper portion of this drainage, adjacent to the Learning Centre structure, is the proposed site for the GCA’s latest experiment in merging restoration and sustainable development: a ½ hectare Native Plant Forage Forest. This project is the subject of the remainder of this report.

Proposed Site

The proposed site for the Native Plant Forage Forest (hereafter the NPFF) is located within the BC Agricultural Land Reserve (ALR) at 48.92842° N and 123.46834° E and is about ½ of a hectare in size. It is bordered by the lower Learning Centre parking circle to the southeast, an old logging road (currently a footpath) to the southwest, a steep sandstone ridge to the northeast, and the end of the clearing to the northwest. Former tree cover was primarily western redcedar with some Douglas-fir, and large stumps remain distributed throughout the site. Logging took place between 2005 and 2012 and was carried out personally by the former landowner, Bill Campbell (Renwick-Shields & Weller, 2015). Parts of the site are significantly compacted as a result of the repeated use of heavy machinery. Site vegetation currently consists of a mix of early-to-mid succession native herbaceous and shrubby species, introduced agronomic grasses, and invasive herbaceous and shrubby species.

The defining feature of the site is a single western redcedar left standing in the centre of the clearing. The previous owner was in the process of felling it when the ownership was transferred, and the sawmarks are still visible. It is approximately 46 m tall (see Table 2) and has been affectionately dubbed the “Grandmother Cedar.”

Geologic Context

The SGIs are the result of a complex history of terrane accretion, erosion and deposition, tectonic thrusting, glacial advance and retreat, changes in sea level, and glacial rebound extending back over 400 million years. The basement rocks of this region consist of ancient metamorphosed sedimentary and volcanic rock and igneous intrusions, the accreted remains of several volcanic island arcs thrust by crustal motion against the North American Plate - the largest and oldest of which is known as Wrangellia (CPAWS, 2013). The colossal mountains formed by these collisions eroded into what is now the Strait of Georgia during the late Cretaceous, depositing over three kilometers of alternating beds of sandstone, shale, and conglomerate now known as the Nanaimo coal-bearing group (Green *et al.*, 1989; CPAWS 2013). Continued thrusting from subduction of the oceanic crust of the Juan de Fuca Plate beneath the North American Plate during the Cenozoic folded and faulted these sedimentary rocks perpendicular to the thrusting, resulting in the characteristic north-south oriented ridges of the SGIs. Repeated advance and retreat of glaciers during the ice ages further carved the SGIs in a north-south direction, eroding valleys in the weak shale and leaving more resistant sandstone ridges behind while depositing till throughout the region (Green *et al.*, 1989).

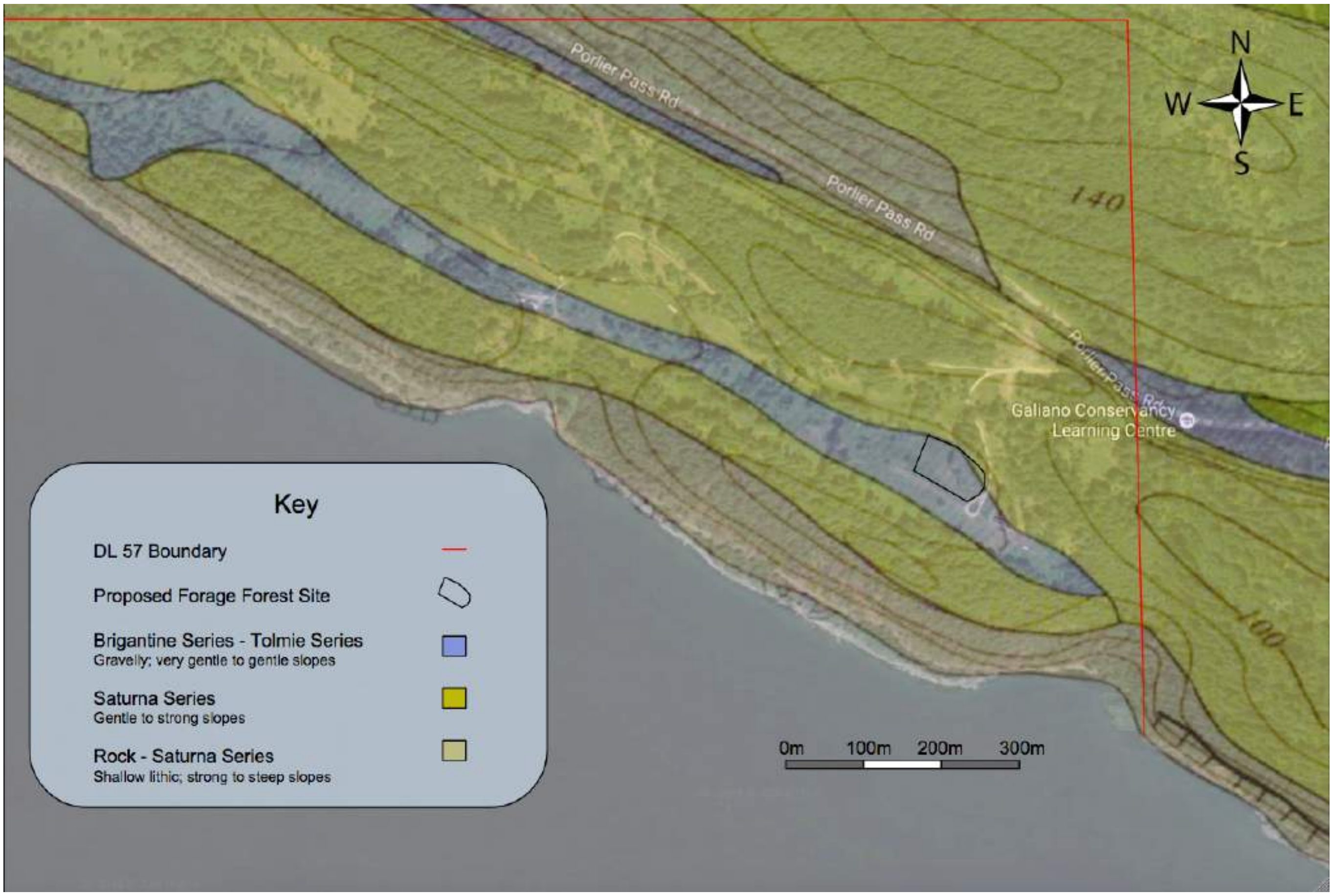

Figure 2: Soil series of DL 57 on current aerial imagery, with proposed NPFF site indicated; adapted from Green *et al.*, 1989.

The defining feature of Galiano Island is the Trincomali anticline. The original fold has long since been eroded along the faulted hinge line, which runs along the centre of the Trincomali Channel (Green *et al.*, 1989). As the eastern limb of the anticline, most of Galiano's sedimentary bedrock is the youngest in the region (~65 mya) and is known as the Gabriola Formation; its strata slope distinctly towards the Strait of Georgia (Green *et al.*, 1989; CPAWS, 2013). Changes in sea level, along with glacial isostatic depression and post-glacial rebound, have exposed the SGIs to renewed deposition of fine marine sediments in more recent times. Thus, Galiano soils are a heterogenous mixture of coarse eroded sedimentary bedrock, glaciofluvial drift, and loamy or clayey marine deposits.

The soils of the proposed NPFF site are a composite of Brigantine-Tolmie Series and Saturna Series (Figure 2). Brigantine soils are imperfectly-drained marine deposits of loam overlying clay on gentle slopes just above depressional basins, occasionally exhibiting high coarse fragment content (till and/or colluvium) in the upper horizons (Green *et al.*, 1989). Tolmie soils occupy the lower reaches of these drainages and consist of poorly-drained silty-clay marine deposits; distinct mottles and gleying indicate a high water table (Green *et al.*, 1989). Both soils usually extend over a meter. Saturna soils, on the other hand, are well-drained and form from channery, loamy marine deposits, colluvium, and drift; there is often less than 50 cm to bedrock (Green *et al.*, 1989). None of these soils have great agricultural utility for common crops, although Tolmie and Brigantine series have been "improved" through drainage (Bertrand *et al.*, n.d.). Note that Figure 2 is a broad-scale rendering and only imperfectly reflects the actual distribution of soils at the level of the proposed site.

Ecological Context

As mentioned previously, former site vegetation was dominated by mature western redcedar, with Douglas-fir occupying areas with superior drainage and red alder (*Alnus rubra*) occupying poorly drained areas. Isolated individuals of Pacific madrone (*Arbutus menziesii*), Pacific yew (*Taxus brevifolia*), bigleaf maple (*Acer macrophyllum*), and grand fir (*Abies grandis*) are present on or near the site and were probably part of the former canopy. Salal (*Gaultheria shallon*), sword fern (*Polystichum munitum*), bracken fern (*Pteridium aquilinum*), and introduced agronomic grasses comprise the majority of the current cover, with common rush (*Juncus effusus*) dominant in poorly-drained areas. Vegetation structure is primarily shrubby and herbaceous (Figure 3). A complete list of species currently on site is included in the baseline vegetation survey in Appendix A.

Several other factors have bearing on site ecology. First and foremost, reduced hunting and lack of predation have allowed mule deer (*Odocoileus hemionus*) populations on the SGIs to far exceed historical densities, resulting in simplified vegetation communities (Arcese *et al.*, 2014) and delayed sapling recruitment post-disturbance. Second, accelerating anthropogenic climate change is expected to alter forest composition throughout BC, negatively impacting important species such as western redcedar (Hamann & Wang, 2006), which may decline rapidly within the CDFmm (Hebda 1994). Finally, compaction due to past use of heavy machinery on site has resulted poor sapling recruitment and high cover of introduced species.

On a larger scale, the CDFmm is the smallest biogeoclimatic zone in BC and hosts the highest density of rare species of provincial and global concern; at the same time, it is also the most altered by human activities and is considered imperiled - of high conservation concern (Austin *et al.*, 2008). Ongoing development in this region, coupled with relative lack of protection, will continue to put globally significant species and ecosystems at risk (CDFCP, 2016).

Figure 3: L - Photo of proposed NPFF site looking northwest. R - CAD model of site looking north; human indicates scale and position from which photo on L was taken.

Social Context

The Salish Sea has a history of human habitation extending back at least 14,000 years (Fiedel,1999) - according to oral history, “since the beginning of time” (Turner, 2014). While the anomalous megafaunal extinctions of the Pleistocene Era have been correlated and attributed in part to the rise of indigenous civilization in North America (Alroy, 2001), the archaeological and anthropological records indicate that coastal First Nations had developed a sophisticated and sustainable culture and economy in the region prior to European contact (Turner 2014). It is estimated that up to 90% of the Coast Salish diet consisted of salmon (*Oncorhynchus spp.*), shellfish, and other marine life (Feduik & Thom, 2003). Nevertheless, the Salish made extensive use of native plants for food: plants served as primary sources of starch, important ceremonial foods, valued trade items, and stopgaps during lean periods (Turner, 1995). In addition, native plants provided medicines and materials that, skillfully processed, were essential to the survival of First Nations (Turner, 2007).

The First Nations of the Salish Sea comprise numerous tribal groups and extended families and are collectively known as the Coast Salish (Suttles, 1963). Coast Salish peoples speak Salishan languages, employ reef nets to catch salmon, and cultivate camas (*Camassia spp.*) and wapato (*Sagittaria latifolia*), among other practices (Turner, 2014). The SGIs were utilized by ancestors of members of the modern-day Hul’qumi’num Treaty Group (HTG) for at least 3000 years, with Galiano Island hosting a seasonal village site of the Penelakut Tribe, who now occupy Penelakut Island and several smaller reserves, including one on the northwest corner of Galiano Island (Arnett, 1999).

European colonization, beginning with the arrival of Spanish and English explorers in 1792, was devastating for Coast Salish peoples. A deadly combination of warfare, disease, destruction and appropriation of food harvesting sites, residential schools, resource extraction, development, large industrial projects, and administrative neglect has negatively impacted Coast Salish peoples in terms of population, ecological influence, cultural continuity, political power, economic status, and land and resource base (Arnett, 1999). Strikingly, the lands of the Salish Sea remain *unceded* to this day, a wicked problem which is widely acknowledged and remains unresolved.

People of non-indigenous ancestry now make up the vast majority of the local, regional, Provincial, and broader Canadian population. On rugged Galiano Island, small-scale agriculture, logging, fishing, and hunting were primary occupations prior to the 1960's, when reliable ferry service opened the SGIs to tourism, urban refugees, artists, vacation home-owners, and seniors (Galiano Museum & Archives). Today, BC produces less than 50% of its food requirements, with less than 10% of food consumed on Vancouver Island produced there (Kazmierowski, 2010). While subsistence culture remains strong on Galiano, the majority of food is now imported.

Despite all this, indigenous communities - locally and globally - are undergoing a tremendous resurgence (Corntassel, 2012; Waziyatawin, 2012), alongside burgeoning social justice, local food, and conservation movements. With the looming threats posed by climate change and the ascendancy of powerful multinational corporations, it is essential to halt further destruction and re-establish just and sustainable local native food systems (Waziyatawin, 2012).

Statement of Problem

Ongoing colonization of the SGIs has disrupted the long-standing and dynamic relationship between Coast Salish peoples and coastal ecosystems, resulting in:

- disenfranchisement of the Coast Salish
- widespread ecological degradation
- declining ecosystem productivity
- declining ecosystem biodiversity
- loss of food security and sovereignty
- interruption and dilution of TEK
- endangerment of vulnerable species, ecosystems, and Coast Salish culture

Statement of Opportunity

The impacted ecosystems of the Ken & Linda Millard Learning Centre afford the GCA the opportunity to simultaneously address severe cultural and ecological perturbations while exploring innovative restoration and land management strategies on a small scale.

Goals and Objectives

The International Union for the Conservation of Nature (IUCN) identifies three underlying principles of restoration: that it should be *effective, engaging,* and *efficient* (Keenleyside *et al.*, 2012). These principles can be seen as analogous respectively to the three core ethics of Permaculture, which can be expressed as *Earth Care, People Care,* and *Fair Share* (Akhtar *et al.*, 2016). Accordingly, five overarching project goals are proposed to guide the NPFF restoration project, each with three primary objectives to be addressed in this report. Action items will follow from the objectives.

1. Restore ecological function and structure to logged and degraded site

   A. Conduct thorough site assessment and TEM to identify potential ecological trajectories
   B. Develop and implement restoration prescriptions to remove barriers to recovery
   C. Design and implement detailed successional forage forest planting scheme

2. Engage the Penelakut and Galiano communities in the planning, treatment, and ongoing management of the restoration site

   D. Acknowledge and address historical and contemporary colonial legacy
   E. Solicit input and insight from community leaders through formal consultation
   F. Provide accessible avenues for ongoing hands-on intergenerational involvement

3. Document the creation and evolution of the project through various media

   G. Collaborate with local organizations and websites to host interactive content
   H. Train and equip local elementary school students to be video documentarians
   I. Fund the creation of interpretive signage and indigenous art for the site

4. Produce harvestable native plant foods, medicines, and materials

   J. Manage succession, wildlife, and fertility to promote productivity of select species
   K. Incorporate select edible species into restoration design based on consultation and TEM
   L. Develop harvest calendar and coordinate with appropriate stakeholders

5. Monitor site, report results, and adapt management accordingly

   M. Develop monitoring plan based on recommendations from H.P. Master's thesis
   N. Adjust management and design based on feedback from monitoring results
   O. Engage university and college students to continue research on site and report results

Site Assessment

Objective A: Conduct thorough site assessment and TEM to identify potential ecological trajectories

Methods

Site assessment was conducted on the 18th of October, 2016; weather was overcast, 14°C, with intermittent showers. Vegetation and topography were employed as guides to determine distinct sample quadrats across the site, and eight soil pits were excavated to 1 m or bedrock within eight 100 m^2 quadrats (see Appendix A). A portable Garmin GPS unit was used to determine position and altitude and cross reference against Google Earth imagery. Slope and aspect were manually determined using a handheld compass and a clinometer, and vegetation was noted within each quadrat; a second survey was completed on June 23, 2017 to note previously cryptic species. Soils were classified and unusual features were noted.

Observations were made in accordance with *Standards for Terrestrial Ecosystem Mapping in British Columbia* (1998), and site series were identified using *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* (Green & Klinka, 1994). Soils were classified using the *Terrain Classification System for British Columbia* (Howes & Kenk, 1988). Wildlife trees were also manually measured and assessed according to the *Wildlife/Danger Tree Assessor's Course Workbook* (2001).

TEM polygons were generated around sample quadrats based on visible vegetational and topographical shifts. After the Terrestrial Ecosystem Map (TEM) was generated, a "zone and sector" analysis was performed according to the Author's experience and perspective, with reference to section 3.9 of *Permaculture: A Designers' Manual* (Mollison, 1988).

Results

Several intergrading site series occur across the survey area (Figure 4). Site series determinations were consistent with existing and previous forest cover and species assemblages. Soil pits reflected overall topography, which is of a gently sloping northwest-oriented drainage bordered to the northeast and southwest by parallel sandstone ridges. Where bedrock is not exposed in outcrops or cliffs on the ridges, the thin, well-drained glacial drift and sandstone bedrock-derived soil gives rise to the FdBg - Oregon Grape series and, in particularly steep areas, could support the Fd - Onion Grass series. This is consistent with current vegetation on both ridges, which includes drought-hardy species such as Douglas-fir, pearly everlasting (*Anaphalis margaritacea*), and California brome (*Bromus carinatus*).

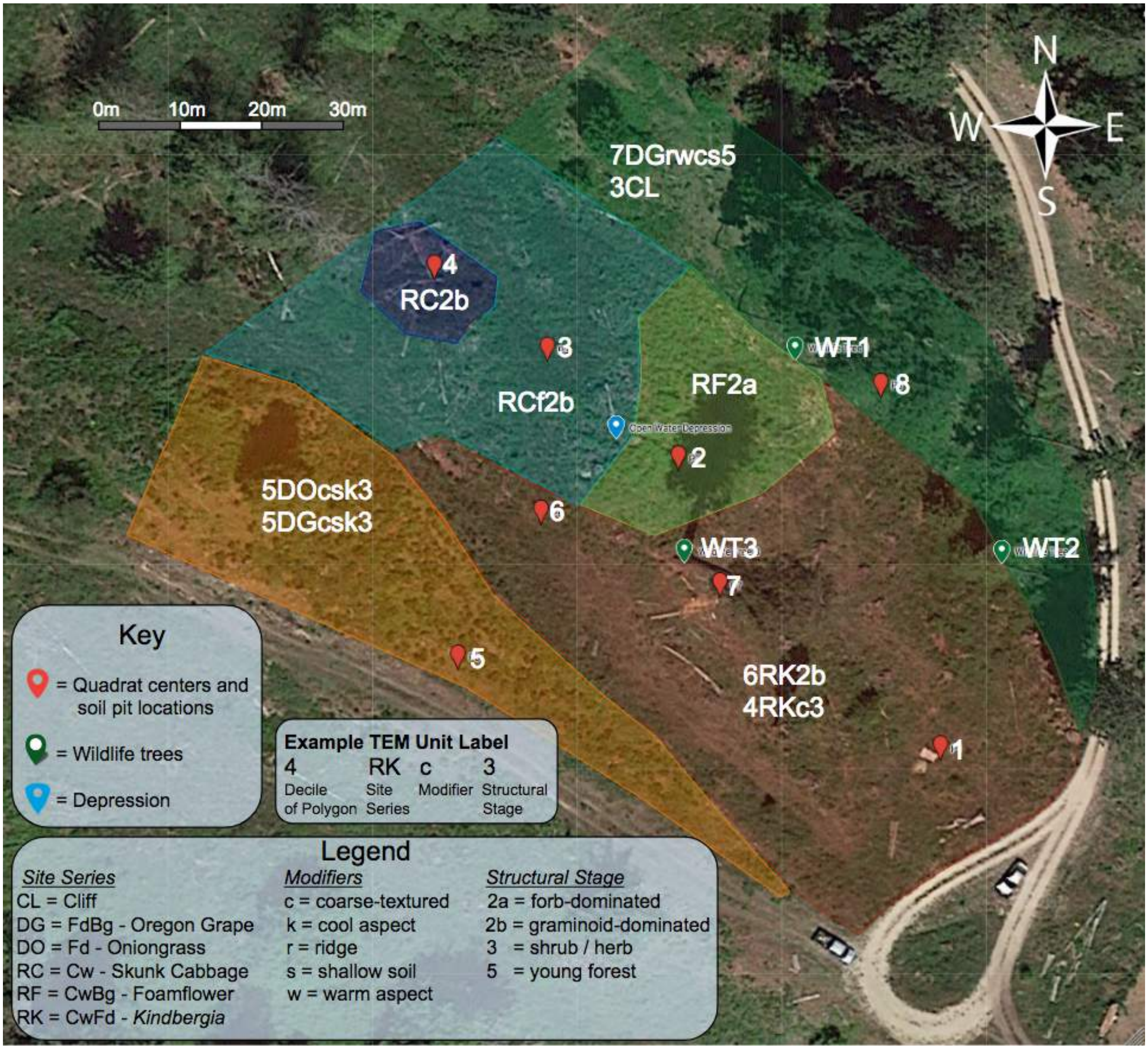

Figure 4: TEM for proposed NPFF site, including site series polygons, quadrat centers, and wildlife trees.

Slope aspect and degree of disturbance have also affected vegetation patterns on these ridges, with the northward facing ridge on the south end of the site sheltering a density of shrubby vegetation unequalled elsewhere on the site, and the southeast facing slope at the north end of the site featuring remnant Douglas-fir forest on rugged terrain that probably inhibited cutting. The main body of the site, however, clearly supported western redcedar forest, ranging from CwFg - Kindbergia in the more upland (southeast) area to Cw - skunk cabbage in the lowland (northwest).

Bracken fern dominance in the center of the site is a good representation of the extent of CwBg - Foamflower, which is transitional between the other two series. The dark blue polygon in Figure 4 represents a depressed area with a nearly exposed water table, and is easily distinguished by the density of Small-fruited Bulrush (*Scirpus microcarpus*) and extensive gleying; a much smaller depression where the water table is exposed is indicated with a blue marker. Site series and other relevant details are summarized in Table 1. See Appendix A for site and quadrat-specific plant species lists.

Soils, while clearly reflecting the observations made by Kenney et al. (1989), showed remarkable variation within such a small area. Coarse material included both rounded and angular fragments, ranging in size from pebbles to boulders, and was distributed unevenly throughout the site, in pockets making up over half the soil and completely absent in other areas nearby. Soils in the drainage appear to be of marine and glaciofluvial origin; soils near or on the ridges are a mix of weathered bedrock, colluvium, and also show glacial influence. In addition, microtopography and the soil pit in quadrat 7 suggest a third, minor bedrock ridge extends out underground roughly from the parking area to the Grandmother Cedar (wildlife tree 3), further dividing the site. The increasing prominence of fine silt and clay in soils towards the northwest of the site is consistent with the receiving position of this area. The drainage area as a whole is well-described by the Brigantine series designation, which describes loamy sand of glacial and/or fluvial origin (with or without mixed fragments) overlying marine deposits of poorly-drained silt and clay: the latter is exposed in the

Table 1: Summary of ground inspection forms for sample quadrats of proposed NPFF site.

Quadrat	Site Series	Structural Stage	Modifiers	Slope	Aspect	Altitude	Soil
1	CwBg - Kindbergia	3 - Shrub/Herb	c	5°	300°	57.5 m	sṩdWGbj-FI
2	CwBg - Foamflower	2a - Forb		4°	290°	52.6 m	sṩWGbj-FI
3	Cw - skunk cabbage	2b - Graminoid	f	3°	290°	50.5 m	smWGbp-U
4	Cw - skunk cabbage	2b - Graminoid		1°	270°	49.4 m	mWGbp-U
5	5Fd - Oregon Grape 5Fd - Oniongrass	3 - Shrub/Herb	c, k, s	20-30°	0°	53.7 m	sṩdDGarv-FA
6	CwBg - Kindbergia	2b - Graminoid		4°	295°	51.6 m	smWGbj-FI
7	CwBg - Kindbergia	2b - Graminoid		5°	285°	54.3 m	sṩdWGbj-FI
8	3CL - Cliff 7Fd - Oregon Grape	5 - Young Forest	c, r, s, w	25°	210°	56.6 m	sadDGarv-FA

lowland northwest of the site, while the former is prominent in the upland southeast of the site. Nevertheless, it was possible (in October) to strike clay and the water table within 1 m of the surface even in the southeast of the site. Soils on the ridges were consistent with the Saturna series designation, which indicates thin, well-drained soils composed of weathered sandstone bedrock, glacial drift, and colluvium on sandstone bedrock.

Figure 5: Charcoal layer, ~2 cm thick, at 20-30 cm across site.

Throughout the site, thin LFH horizons (5-10 cm) and Ah horizons (5-20 cm) were indicative of moder and mull humus forms (*Standard…*, 1998). Of interest is the presence of a 2 cm layer of charcoal (Figure 5), about 30 - 40 cm down, visible throughout much of the drainage area. This indicates the presence of fire in the history of the site, despite the relatively moist nature of the site. Due to the recent history of logging, the site is mostly treeless, with only a perimeter of intact Douglas-fir forest on the northeastern boundary, isolated stands of red alder trees across the northwestern boundary, and the Grandmother Cedar standing sentinel over the center of the site. Given the likelihood of mortality for this lonely holdout due to exposure and a warming climate, it was assessed as a wildlife tree, along with two dead red alder trees from the northeastern perimeter forest (Figure 6). These trees provide perching and cavity nesting to birds on site, with potential for other functions in the future. Details are summarized in Table 2.

Figure 6: Wildlife trees, numbered, viewed from quadrat 5.

Table 2: Summary of attributes of existing wildlife trees for proposed NPFF site re: *Wildlife/Danger Tree Assessor's Workbook.*

Tree	Species	Diameter (cm)	Height (m)	Appearance	Crown	Bark	Wood	Lichen	Wildlife Use
1	*Alnus rubra*	140	~8.5	6	6	6	3	0	Cavity
2	*Alnus rubra*	150	~20	4	5	4	3	0	Perch
3	*Thuja plicata*	594.4	~46	1	1	1	1	1	Cavity, Perch

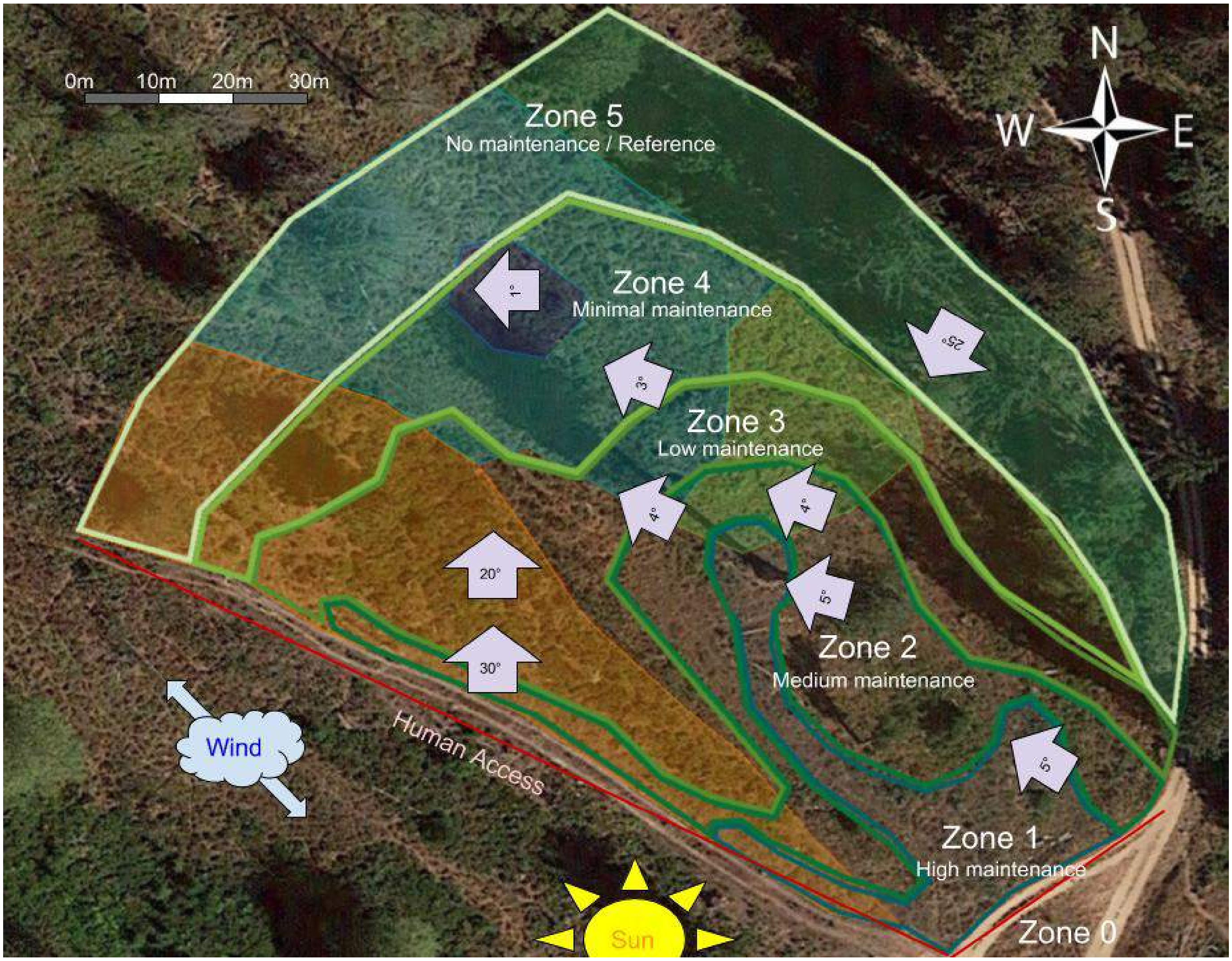

Figure 7: Zone and sector analysis for proposed NPFF site over TEM polygons; purple arrows show slope and aspect.

Zone and sector analysis (Figure 7) is a tool employed in Permaculture in order to conserve, capture, and optimize the energy of both *on site* resources and resources which pass *through the site* (Mollison, 1988). Ascending zones represent descending levels of accessibility, proximity to on site energy sources (people or animals), and maintenance frequency/intensity. Sectors are meant to identify directional flows of solar, wind, hydrological, and aesthetic energy through the site. Together, zones and sectors inform placement of site elements to efficiently capture (or deflect) energy flows.

For the NPFF site, Zone 0 is defined as the parking circle, which is proximal to the Learning Centre building and is the primary human access point to the site. Zone 1 - indicating the area of highest visibility, visitation, and maintenance - occurs nearest this access and extends down to the

Grandmother Cedar, which will likely be visited frequently. Zone 2 includes the areas immediately surrounding Zone 1 and also extends down the primary pathway between the Learning Centre building and Crystal Cove, which is often used. Zone 3 surrounds Zone 2 and encompasses most of the rest of the cleared area that is not very wet, as well as most of the north-facing slope. Zone 4 includes most of the very wet areas and the base of the forested southwest-facing slope. Finally, Zone 5 represents unmanaged land and extends outward from the other zones. Zone details are summarized in Table 3.

Primary sectors for the NPFF site include solar radiation, predominant wind patterns, slope and aspect, and access (includes view). Solar altitude for the site latitude varies from 64.5° at the summer solstice to 17.6° at the winter solstice (NRCC, n.d.). The sun at solar noon is pictured at the south of the site; east-to-west motion is across the bottom of the figure. Local winds tend to blow through the Trincomali channel from the southeast or northwest, although cool northeasterlies occur regionally on occasion (Environment Canada, 2015). Site topography is as previously described - two parallel ridges running southeast to northwest (between 20° and 30° slope on sides) bordering a gently-sloping (from 5° down to 1°) northwest oriented drainage. As slope declines across the site, the water table approaches the surface until it nearly reaches surface level in the RC2b polygon (dark blue).

Table 3: Area and interpretation for Zones of Figure 7.

Zone	Area (ha)	Notes
0	-	"Home": area from which human energy radiates
1	0.077	High-maintenance: geophytes, herbs, shrubs
2	0.15	Medium-maintenance: herbs, shrubs, trees
3	0.192	Low-maintenance: shrubs, trees
4	0.183	Minimal-maintenance: shrubs, trees, wetland species
5	.295+	No maintenance: reference ecosystems

Soil compaction is evidenced across the site, and most pronounced beneath the old vehicle tracks. On the wetter parts of the site, common rush is a good indicator of “exposed and compacted mineral soil with a fluctuating groundwater table” (Klinka *et al.*, 1989). In drier areas, the agronomic grasses are concentrated on compacted soil.

Wildlife make regular use of this site, and a variety of birds are commonly seen singing and foraging throughout the day. Mule deer are a consistent presence, as indicated by the frequency of heavily browsed plants. It is possible that other small mammals and even amphibians make use of the site, although none have yet been seen. A non-comprehensive inventory of vertebrate species sighted is included in Appendix A.

Restoration Prescription

Objective B: Develop and implement restoration prescriptions to remove barriers to recovery

Barriers to Recovery

A plurality of conceptual models have been developed to guide restoration planning: many visualize a punctuated equilibrium of alternative stable states separated by identifiable barriers, or filters, to recovery - an example is the Recovery Cascade Model (Robson *et al.*, 2011). With the successive removal of barriers, the ecosystem moves haltingly towards the desired state. Primary barriers to recovery identified thus far for the NPFF site are:

- Excessive mule deer browsing
- Compaction across site
- Unequal distribution of woody debris
- Significant cover of invasive species

These barriers are addressed individually below.

Recommended Treatments

High mule deer pressure has been shown to simplify forest structure, reduce songbird diversity, and eliminate populations of culturally important species in the Gulf Islands (Arcese *et al.*, 2014). Deer must be effectively excluded from young plants on site in order to encourage recruitment on site, protect additional plantings, and maximize productivity of useful species. While results from the exclosure vs. protection of individual plants at the nearby GCA Mill Site (described in Hamann-benoit, 2014) have yet to be published, the exclosure method has clearly proved to be superior in terms of vegetative performance. Therefore, it is recommended that the NPFF be completely fenced: approximately 300 m worth of fencing will be required (Figure 8). Details are included in the budget in Appendix 3. Approximately 30 m of fencing can be saved if the cliff along the northeast edge of the site is incorporated into the fence; in addition, this will preserve access to this habitat.

Compaction reduces soil permeability, impedes rooting and seedling establishment, and creates anaerobic conditions that alter soil microbial communities (Brady & Weil, 2008). Compaction was the primary issue at the GCA Mill Site (Hamann-benoit, 2014), and was successfully addressed by applying the “rough and loose” method (see Polster, 2013). Given the similarity in soil classifications and agents of compaction, it is recommended that the same method be applied to the NPFF site, but restricted to areas dominated by introduced agronomic grasses, invasives, and common rush. Use of heavy machinery on the remainder of the site would likely cause compaction in previously unaffected areas; these are identified in Figure 8. This treatment should be applied in the dry season. Stumps should be preserved when possible.

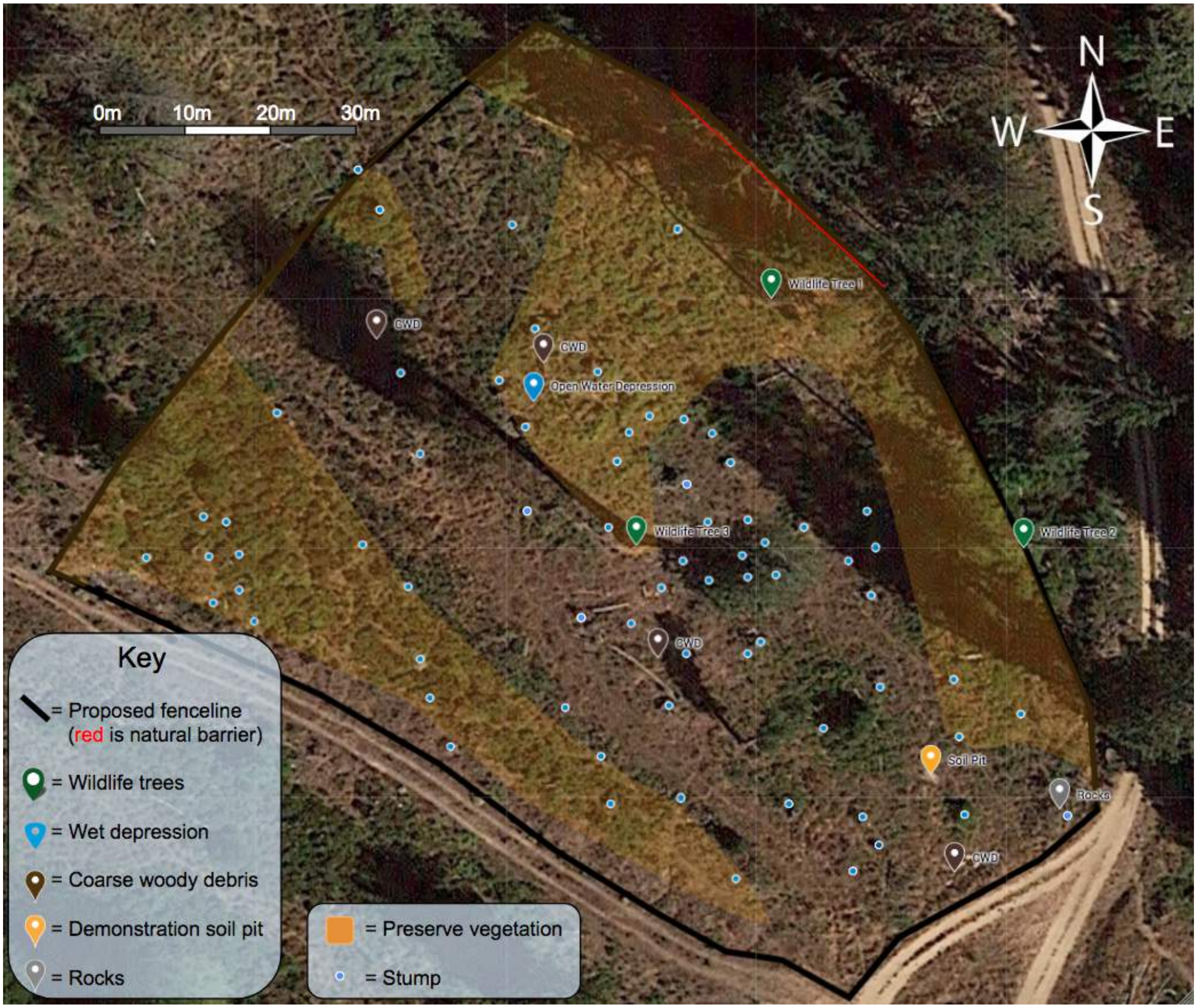

Figure 8: Guide for restoration prescription, showing proposed fenceline, areas of vegetation and stumps to preserve during machine work, coarse woody debris piles to redistribute, and significant features to retain.

Logged sites retain less coarse woody debris (CWD) than would remain after a natural disturbance, such as a blow-down, landslide, or fire. CWD is critical to recharging soil organic matter, supporting diverse fungal and microbial communities, providing habitat for wildlife, and serving as nurse-logs for plant establishment (Freedman *et al.*, 1996; Stevens, 1997), although it can be a nutrient sink in the short term (Laiho & Prescott, 2004). Finer woody debris assists in many of these functions and and can also be used strategically to inhibit the germination of introduced species in the soil seedbank (Mollison, 1988). While scientists are only beginning to recognize and characterize the complex relationships between forest vegetation and the underground fungal and microbial networks that support it, it is clear that compaction, exposure of soil to the sun, and reduced plant diversity - all associated with logging disturbance - can negatively impact the diversity of local soil microbiology (Lazaruk *et al.*, 2005). Therefore, it is recommended that appropriate CWD, fine woody debris, and compost tea (inoculated with soil from intact nearby ecosystems) be applied throughout the site, in order to bolster soil microbial communities, increase the amount of organic material onsite, selectively discourage re-establishment of introduced species, and provide micro-habitat for native species. Slash from past logging activity is available elsewhere on the property, and several piles are present on site (figure 8); these should be redistributed.

5. Use & value renewable resources & services

Introduced agronomic grasses, along with English holly (*Ilex aquifolium*), cutleaf blackberry (*Rubus laciniatus*), Canada thistle (*Cirsium arvense*), foxglove (*Digitalis purpurea*), rose campion (*Silene coronaria*), and a suite of introduced forbs comprise the introduced contingent of the baseline site vegetation. While it remains unclear whether the majority of invasive species are the cause of native species decline, or merely the opportunistic symptom of the underlying causal anthropogenic factors (Gurevitch & Padilla, 2004), the historical, educational, and cultural goals of this project demand a reduction in invasive species cover. It is recommended that species be considered and treated on an individual basis - with the exception of graminoids and small forbs (defined as a group in Appendix A), which can be initially removed as a group via the "rough and loose" method and will require ongoing management. As long as enough pressure is applied to allow for the establishment of desired species, this suite of species can be tolerated as natural succession slowly suppresses them. Treatment recommendations (Table 4) are adapted from the SPES guide.

9. Use small & slow solutions

Table 4: Invasives management recommendations for NPFF.

Species	Treatment Recommendation
Arctium spp.	Manual removal of roots; consider preserving due to edibility
Cirsium spp.	"Rough and loose", followed by sheet mulching and ongoing manual removal
Digitalis purpurea	Manual removal; consider preserving for beauty and educational purposes
Graminoids and Forbs (see Appendix A)	"Rough and loose", followed by sheet mulching, ongoing manual removal and/or tolerance
Ilex aquifolium	Cut near base and treat stump with herbicide; or, remove root ball
Rubus laciniatus	Cut canes and dig out root crown
Silene coronaria	Ongoing manual removal

Once these preliminary actions are taken, the site will be sufficiently prepared for the establishment of pathways and the first wave of planting.

Planting Scheme

Objective C: Design and implement detailed successional forage forest planting scheme

Overview

While extensive research and numerous documented projects exist to guide the restoration of logged sites in the Pacific Northwest, there appears to be little modern precedent for the intentional creation of native plant food landscapes. What has become clear, thanks to the dedicated research of a handful of ethnobotanists, is that coastal First Nations carefully cultivated several native plant species as valued food items; in addition, they enriched ecosystems near village sites with desirable species and maintained and augmented sites with harvestable concentrations of food plants (Turner, 2014). Unfortunately, Eurasian agricultural systems and industrial agriculture have dominated rural landscapes of the West for the past century, nearly obliterating previous food systems.

It is only in the past couple decades, with the rise of local/slow food movements and the international spread of Permaculture, that small-scale, biodiverse, and semi-domesticated food systems are being reconsidered. Meanwhile, the discipline of Ecological Restoration has been growing in leaps and bounds, and the first stabs at restoring and reviving specific indigenous food species and traditions are being documented across the Pacific Northwest (Apostol & Sinclair, 2006). Some, including Friends of the Trees founder Michael Pilarski, have recognized the fertile ground opening up at the intersections of Ecological Restoration, Permaculture, and TEK: “these convergences allow us for the first time to begin designing systems which are based largely on native plants which give high productivity and ecological integrity” (2003). Nevertheless, while primarily non-native perennial systems - such as the Beacon Hill Food Forest in Seattle and the GCA’s very own food forest (GCFF) - are being experimented with on a broader scale, native plants are often included only for structural, educational, or medicinal purposes. Studies from Eastern North America suggest that for the commercial cultivation of even high-value wild species to be profitable, it must be accompanied by rigorous public education (Burkhart & Jacobsen, 2008). Nowhere on the west coast of North America, to this Author’s knowledge, has a project of the nature of the GCA’s NPFF been implemented. As such, the planting scheme proposed here has no immediate reference site, but is based instead on plant species and site series compatibility, permaculture principles, consultation, horticultural research, and this Author’s personal experience and aesthetics.

8. Integrate rather than segregate

Figure 9: Proposed site layout, with fenceline, gates, pathways, learning circle, and notable plant clusters.

Layout

The planting scheme is designed around several main arterial pathways, a series of capillary pathways, keyhole beds, and a learning circle (Figure 9). The main arterial pathways are set in a figure-eight shape, with the Grandmother Cedar at the center, in order to make use of the already-compacted vehicle tracks. These pathways connect the southeast and northwest gates and should be about 1.5 m across to allow for large groups to pass. Capillary pathways are densest in Zones 1 and 2 and are arranged to serve the labor-intensive plantings in Garry oak meadow area, the southwestern ridgeline, the demonstration soil pit, and select areas along the northeast of the site. They should be about 1 m across to discourage larger groups but still allow wheelbarrow access. Keyhole paths are placed to serve specific plantings, and should also be 1 am across.

Figure 10: Landscape view of proposed site layout and planting scheme in 10 - 20 years, viewed from the Learning Centre.

The southeast gate is the main entrance, and it is here that a map and threshold artwork should be mounted. The northwest gate allows for the eventual creation of a path leading to the nearby pond. The ridgeline gate is optional and placed for convenient access from the ridgeline pathway. All pathways should be mulched with cedar chips and to discourage weeds and periodically refreshed with new mulch.

The learning circle is located on a relatively flat piece of ground that is free of stumps and should remain dry year-round. It is near the Grandmother Cedar, but just beyond the range of occasionally dangerous falling limbs. It is also near enough to the entrance over level terrain to allow for wheelchair accessibility, but far enough from the parking area to feel like a secluded, separate space. Perched between Zones 2 and 3, it effectively extends Zone 1 awareness to a larger area, allowing for more detailed plantings. The vantage from this area offers a broad perspective on the site but should not distract from whatever is occurring in the circle. Logs can provide seating.

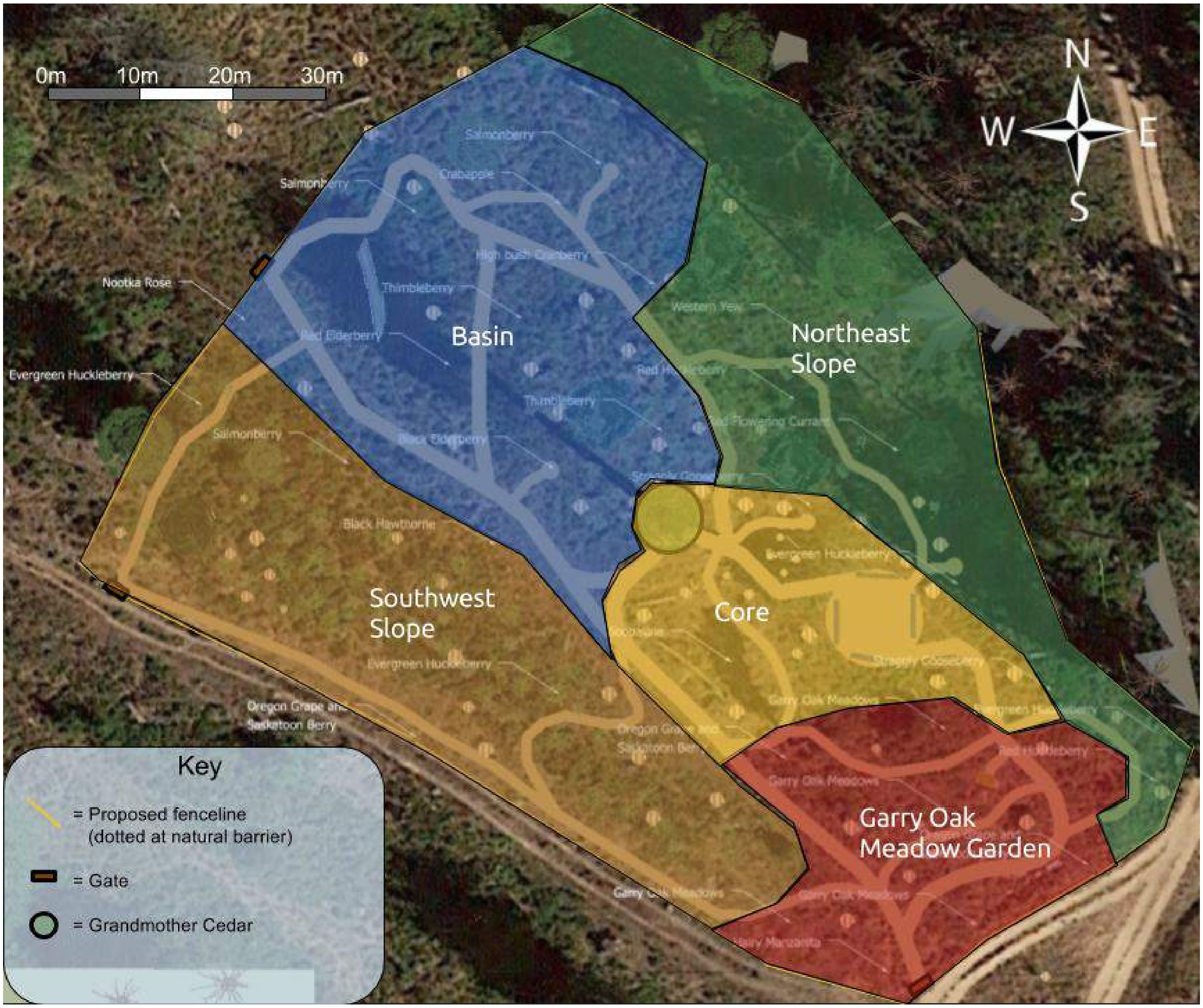

Figure 11: Proposed site layout with major planting and management areas identified.

Plantings

Plantings are arranged according to site series compatibility, zone, and common associations. Plantings will be covered below as five major management areas (Figure 11). In areas that have been treated with the "rough and loose" method, nursery plants can be established in small holes in the loose soil; in areas where the vegetation has been left undisturbed, a swath of vegetation approximately a meter in diameter should be cleared around the planting hole to allow for nursery plant establishment. Plants should be mounded slightly to account for settling. Ideally, each plant should be mulched with a weed-suppressing layer of either burlap or cardboard around its periphery, atop of which a foot or so of fresh bark mulch should be placed. Bark mulch that is high in cedar chips should be reserved for pathways. Each woody plant should be marked using a stake with flagging. Certain species and groupings will require more specialized treatment, and this is noted.

A Note on Nurse Stumps

Of immediate interest, however, are the preponderance of stumps in various states of decay scattered across the site. Most are western redcedar, and many are rotted at the center (Figure 12). Several are already serving as nurse logs for healthy but heavily browsed specimens of salal and red huckleberry (*Vaccinium parvifolium*) (Figure 13). Red huckleberry, in particular, grows best "on top of tall wide stumps of coniferous trees...in the full sunlight, that are at least 30 inches across, and at least 4 feet high" (Padvorac, 2004). This specialized, water-retaining niche allows this moisture-loving plant to thrive in droughty, exposed conditions and maintain an aerated root crown (ibid). Padvorac (2004) recommends a planting mix of 1 part conifer sawdust, 1 part conifer bark chips, and 2 parts soil. This can be used to fill pre-existing cavities or holes cut into the tops of the stumps on site. Potted red huckleberry plants can then be established in this medium, with optional companion plantings of licorice fern (*Polypodium glycyrrhiza*), salal, twinflower (*Linnaea borealis*), trailing blackberry (*Rubus ursinus*), or others. As *Vaccinium* species are known to be dependent on mycorrhizal associations, incorporating some soil from beneath a healthy plant is recommended.

Management for these stump "islands" will differ from that of the management areas they occupy across the site. Until the red huckleberries' roots have time to tap into the moisture reservoirs of the decaying stumps, they may require some supplemental water; see Management section.

Figure 12: Cratered stump on site is a potential nurse stump.

Figure 13: Nurse stump with salal and red huckleberry.

Figure 14: Southeast gate and Garry oak Meadow Garden management area, with hairy manzanita at far left, tall Oregon grape and Saskatoon berry hedgerow across the bottom, interspersed Garry oak and arbutus trees, and meadow swales.

Garry oak Meadow Garden

This planting area falls entirely within Zone 1 and on the CwBg-*Kindbergia* site series, which is moderate both in terms of moisture and nutrients. This suits its position as a gentle, transitional slope. However, the removal of the canopy and resulting full-sun exposure has created early seral conditions that are drier and poorer than this designation, as is indicated by encroaching mats of salal, which is characteristic of nitrogen-poor soils and water-shedding sites (Klinka *et al.*, 1989).

It is unlikely that this site, or any nearby, supported a Garry oak ecosystem in the recent past.[2] Nevertheless, it has become clear in recent years that, due to long-term climatic changes that favoured coniferous climax ecosystems, Garry oak ecosystems have only persisted on rocky, inhospitable sites, or due to human intervention - usually in the form of clearing and burning (Weiser & Leposky, 2009). Given this, and the importance of these ecosystems to Hul'qumi'num and settler people alike, it is appropriate to engineer a Garry oak ecosystem for the site in Zone 1 (Figure 14).

Even following "rough and loose" treatment, the density of agronomic grass and forbs in this area will ensure ample regeneration of annual weeds. Meadow ecosystems are notoriously difficult to re-establish without great expense and large inputs of time, energy, and plant material. Soil compaction and weed pressure can drastically inhibit establishment of native meadow species. While fire can be a useful tool, its effects can be unpredictable depending on the season, intensity, soil, and seed bank. Extensive and meticulous solarization, wedding, and planting would be required to create a "natural" meadow.

[2] But see charcoal layer in Figure 5

Therefore, I recommend the use of the permaculture swale technique to establish desirable meadow species. Swales are on-contour berms and depressions designed to catch and

infiltrate surface water (Mollison, 1988). They assist in capturing moisture in dry areas and in so doing provide unique planting niches for species with varying moisture needs (Figure 15). The berms invite soil amendments and create a concentrated area of aerated soil for the cultivation and maintenance of desired species; the depressions can be used as pathways.

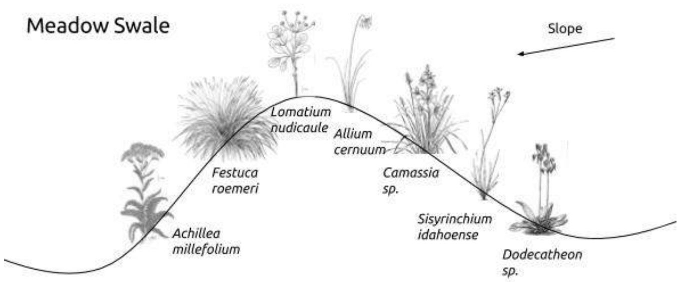

Figure 15: Cross-section of meadow swale species positions

During the “rough and loose” process, a series of three or four swales can be laid across the southern end of the site, with the depressions corresponding to the pathways on the layout. Care must be taken to ensure that they are more or less on-contour. Given the nutrient-poor nature of the soils and the goal of production, it is recommended that the berms be amended with a mixture, compost, manure, and seed-free soil, resting on top of a weed-suppressing layer of cardboard or burlap. Native wildflowers, camas, and bunchgrass can be planted at appropriate positions along the berms. These attractive species will welcome visitors in (Figure 16). See Figure 54 in Appendix B for swale positions.

The Gary Oak and arbutus trees should be planted on mounds evenly across the area, with arbutus restricted to the rockier, more marginal soils on the edges. Saskatoon berry (*Amelanchier alnifolia*) and tall Oregon grape (*Berberis aquifolium*) will form a drought-tolerant, attractive, and productive natural hedge to separate the meadow swales from the parking circle. Hairy manzanita (*Arctostaphylos columbiana*) can be planted on the driest, most exposed part of the site near the southeastern entrance. Dull Oregon grape (*Berberis nervosa*), wild gooseberry (*Ribes divaricatum*), soopolallie (*Shepherdia canadensis*), osoberry (*Oemleria cerasiformis*), and evergreen huckleberry (*Vaccinium ovatum*) can be interspersed in the remaining spaces As the name suggests, this zone must be managed more intensively, as a garden would, and some supplemental watering may be necessary to establish the meadow swales.

Figure 16: Eye-level view of Garry oak Meadow Garden area.

Figure 17: Learning circle and Core planting area, with soopolallie and wild gooseberry patches in the center, evergreen huckleberry patches on the periphery, and interspersed tall Oregon grape and Saskatoon berry on drier areas.

Core

The Core area is also primarily on CwFD - *Kindbergia*, encompassing most of Zone 2 and much of Zone 3. This suggests regular (but less frequent) maintenance, and a greater reliance on perennials for production. A slightly lower position on the slope means that these soils are slightly richer and fresher than those of the Garry oak Meadow Garden area, but a full-sun exposure means that this area is still fairly droughty. It also appears that a minor, submerged bedrock ridge runs down the center of it, dividing the site into two mini-drainages on either side of the lone Arbutus tree (and, lower, the Grandmother Cedar).

The focus species for this production area are those that prefer full-sun, good drainage, and some moisture, but are at least somewhat drought-hardy. All are found on the coastal bluffs at Montague Harbor, which is the only place on Galiano where soopolallie is found; both wild gooseberry and evergreen huckleberry are also found on coastal bluffs on DL 57. Given the intermediate preferences and notoriously capricious nature of these species, it is recommended that various locations across the Core area be planted with each, even as focused clusters of each species are planted for production purposes. In obviously drier areas, such as along the submerged ridge (marked by the Arbutus tree on site), Saskatoon berry and tall Oregon grape can be planted. Other potential shrubs for suitable microsites in this area include red-flowering currant (*Ribes sanguineum*) and osoberry. Care should be taken to preserve mature patches of blackcap raspberries (*Rubus leucodermis*) and trailing blackberries in this area, and to augment their population after machine work is complete (although the disturbance may be sufficient to do so). Plantings should either be dense enough to suppress weedy annuals or spaced out well enough to allow easy weeding.

In shady nooks near stumps surrounding the periphery of the learning circle, woodland strawberry (*Fragaria vesca*), yerba buena (*Clinopodium douglasii*), miner's lettuce (*Claytonia perfoliata*), and coastal mugwort (*Artemisia suksdorfii*) can be established to delight the senses of visitors. These can also be harvested for tea, greens, and fruit. In the future, a circular wildflower calendar can be established around the periphery of the circle to mirror site phenology.

Along the eastern edge of this area, natural red alder and western redcedar regeneration can be encouraged to create additional shade for the learning circle, which will be shaded in the mornings but exposed for much of the rest of the day. Until this shade is forthcoming, a light canopy can be erected when shade is desired. Bitter cherry (*Prunus emarginata*) can be scattered throughout to establish a quick, open canopy.

Southwest Slope

This area, mostly in Zones 3 and 4, consists of a steep (20° to 30°, depending) northeast-facing slope, with sandstone bedrock within ½ to 1 m from the surface. The very top of the slope is a dry, rocky ridge composed of material displaced by the road cut into the southwestern side of the rise; the remainder of the slope is relatively undisturbed, with dense cover of sword fern, salal, trailing blackberry, and blackcap raspberry (Figure 18). The slope series is FdBg - Oregon Grape, and the ridgeline keyed out as Fd - Oniongrass, although this is due to disturbance and unconsolidated material rather than this being a likely association for this rise.

With the exception of cutting three capillary pathways to access the ridgeline trail, minimal alteration should be made to the slope, which is already composed of edible and useful species.

Figure 18: Southwest Slope in 11/2016, showing exposed ridge at right and relatively undisturbed slope at left.

Figure 19: The Southwestern Slope planting area, with fully vegetated slope at center, ridgeline hedgerow of Saskatoon berry and tall Oregon grape, trailside evergreen huckleberry plantings, and red alder and western redcedar recruits.

Plantings should be confined to disturbed, weedy areas (Figure 19). On the south side of the ridgeline pathway, a hedgerow of interplanted Saskatoon berry and tall Oregon grape is perhaps the only sufficiently drought-tolerant choice, with the possible exception of hairy manzanita. The slope itself, however, is the only part of the site that receives some shade from the afternoon sun, and is thus an exceptional spot for evergreen huckleberry, which can be inserted into bare patches and established on the sides of the capillary trails. The base of the slope may also provide good habitat for this species, or species that prove unsuccessful elsewhere on site.

This area includes many red alder and western redcedar saplings, which are kept low due to heavy browsing. Some of these should be allowed to grow and provide shade, but in the long run this slope should be permitted only a patchy canopy in order to preserve sunlight across the remainder of the site. The slope is also an alternative site for the Yew , as a lone, mature individual inhabits the same slope farther down towards the pond.

Figure 20: The Northeast Slope planting area, with a Pacific yew grove, grand fir trees, and clusters of highbush cranberry, red-flowering currant, baldhip rose, thimbleberry, and osoberry.

Northeast Slope

This planting area is the most varied on the site, ranging from shrub-covered CwFd - *Kindbergia* on the south end to Cw - skunk cabbage at the north end, with CwBg - Foamflower in between and FdBg - Oregon Grape at the base of the cliffs (with a 25° southwest-facing slope). The factor that ties these all together is the predominance of native vegetation throughout and shading from the east supplied by mature, remnant Douglas-fir trees along the cliff. A number of species of interest included on the site inventory (see Appendix A) are found only along the cliff, which has created some refuge from hungry mouths and biting saws. Taking this into consideration, the slopes immediately beneath the cliff should not be disturbed at all and used only for observation, as Zone 5.

The areas spanning the base of these slopes are primarily in Zones 3 and 4, and offer a range of planting possibilities. Of greatest interest is the nitrogen-rich and relatively moist CwBg - Foamflower series, easily recognized on the site as the dense patch of bracken fern. This area should not be disturbed by machine work; instead, plants can be established individually in circular swaths cut into the fern cover. Groups of moisture- and nitrogen-loving species such as highbush cranberry (*Viburnum edule*), thimbleberry (*Rubus parviflorus*), and osoberry should be established here. Additionally, small groves of Yew and grand fir can be planted in this area to add diversity to the future site canopy and create the feeling of an open forest as a transition between the dense Douglas-fir cover on the cliff slopes and the shrubby Core area. Natural red alder and western redcedar recruitment should be encouraged in and around this area as well. On wetter parts of this planting area to the north, bigleaf maple is also an optional addition to the canopy. On drier parts of this planting area to the south, red-flowering currant, baldhip rose (*Rosa gymnocarpa*), evergreen huckleberry, and dull Oregon grape can be established between the base of the cliff slope and the Core and Garry oak Meadow Garden areas.

The pathways along the base of the Northeastern Slope are meant to meander along the edge between plantings and natural forest, blurring the distinction between the two. This area will eventually be the most forested part of the forage "forest", creating habitat for shade-loving edible species to be established later on in the successional scheme; for now, full exposure to hot afternoon sun will prevent the establishment of these species. Seating for shady, solitary contemplation and conversation can be established in appropriate places.

Basin

The Basin area, spanning Zones 3 to 5, is the largest planting area on the site. It consists primarily of site series Cw - skunk cabbage, and is largely defined by the extent of common rush across the northern half of the site (Figure 21). This area is consistently moist, characterized by a fluctuating water table, and has finer soils than the rest of the site. The most nutrient-rich part of this area occurs near the northern fenceline and is dominated by small-fruited bulrush; the rest of the Basin suffers from compaction and will benefit from "rough and loose" treatment at the driest time of year.

Most native edible species prefer consistent moisture, but not all can tolerate waterlogged soil or a fluctuating water table. Plantings in this area must be restricted to the species that will thrive in these conditions (Figure 22).

Figure 21: Basin area in 11/2016, seen from Southwest Slope.

Figure 22: Basin planting area, with Pacific crabapple and black hawthorn groves, clusters of blue and red elderberries, and extensive plantings of salmonberry, thimbleberry, and Nootka rose; cascara and hardhack may also be included.

The least waterlogged parts of the site just north of the Grandmother Cedar should be reserved for blue elderberry (*Sambucus nigra caerulea*), which requires consistent water but prefers drier, continental climates. Black hawthorn (*Crataegus douglasii*) and thimbleberry will also thrive on the southern half of this planting area. Proceeding northwards, the most moisture-loving species should be established. The northeast corner of the site can host a grove of Pacific crabapples (*Malus fusca*) along a capillary trail; this is also a good area to establish a bigleaf maple. The center of the northern part of the site already hosts a mature salmonberry (*Rubus spectabilis*) shrub, and should be the focus of an extensive planting of salmonberries. Red elderberry (*Sambucus racemosa*), cascara *(Rhamnus purshiana*), and hardhack (*Spiraea douglasii*) can also be established here; these are of marginal edibility and use, so only a few of each are needed. Near the northwest gate, a dense colony of Nootka rosa (*Rosa nutkana*) can be established (Figure 23); this species tends to form thickets and should only be established where this is desirable.

Several herbaceous species - such as skunk cabbage (*Lysichiton americanus*), fireweed (*Epilobium angustifolium*), Pacific silverweed (*Potentilla anserina pacifica*), and yellow monkeyflower (*Erythranthe guttatus*) -

Figure 23: Northwest gate and Basin planting area, viewed from the west; salmonberry groves and Nootka rose thickets in foreground, with red elderberry, black hawthorn, thimbleberry, and Pacific crabapple in background.

are also compatible with this site series, and may be established in favourable pockets. These plants, however, are more suitable for a Zone 1 or 2 maintenance regime, and therefore may be more appropriate later on in the successional scheme. Some natural red alder recruitment should be encouraged in this area, but the canopy space should largely be reserved for small trees such as Pacific crabapple and tall shrubs such as the two elderberries. Black cottonwood (*Populus trichocarpa*) is also an option for the periphery; tall trees in this area can serve as a windbreak for the prevailing northwesterly winds.

Pathways in this area may need to be reinforced with gravel or boards in places to ease access during the winter months; alternatively, they can be considered submersible infrastructure and allowed to remain inaccessible during the wet half of the year. If possible, access to the northwest gate should be preserved year-round.

A Note on Plantings

This section has focused on situating the most well-known and productive edible species from the CDFmm biogeoclimatic zone within a coherent planting scheme on a recently clear-cut site. Proportions and species may change pending consultation. A number of species have been left out; plant lists for each planting area, which include these "optional" species, are included in Appendix B, alongside a complete Phase 1 planting list for the whole site and a custom seed mix to be spread on those areas where no perennials are established. The project budget, including nursery stock, is included in Appendix C. A planting timeline is included in Appendix D. A virtual site walkthrough can be viewed at https://youtu.be/QOpmbnBngLM.

Management considerations vary across the site, and are considered in the Management section.

Community Collaboration

Overview

The Galiano Island community consists primarily of settlers of European descent and seasonal visitors from Canada and abroad. The GCA has been very successful over the years in engaging these groups through school programs, camps, annual events (such as the Walkalong for Learning), farmers markets, and restoration projects (such as the Mill Site: see Hamann-Benoit, 2014). It is the Penelakut, however, on whose unceded territory and proprietary knowledge this project is situated. The Penelakut community is both geographically and culturally alienated from the broader Galiano community; as such, most of this section will concern engaging the Penelakut in the NPFF. Many of the recommended actions will also promote non-indigenous involvement in the NPFF, and Penelakut involvement itself should motivate the involvement of other islanders.

Objective D: Acknowledge and address historical and contemporary colonial legacy

The Penelakut

The Penelakut are one of six communities banded together as the Hul'qumi'num Treaty Group (HTG) and sharing the Hul'qumi'num language. Up until the mid-19th century, their territory extended from Lake Cowichan east to the mouth of the Fraser, and from Goldstream north to just south of Colvilletown, encompassing the SGLs and the nearby "mainland" of Vancouver Island (Evans *et al.*, 2005). Currently, the Penelakut hold several small reservations at the mouth of the Chemainus River, on Tent Island, and on the northern tip of Galiano Island, as well as the whole of Penelakut Island (formerly Kuper Island) where the majority of the community resides. They currently number between 800 and 950 members, depending on the source consulted, with about half living on Penelakut Island (Statistics Canada, 2017).

The traditional territory of the Hul'qumi'num peoples was never ceded, not even as part of the Douglas Treaties, which were "negotiated" under false pretenses and have since repeatedly been violated (Arnett, 1999). Between 1860 and 1861, James Douglas (then Governor and Vice Admiral of the Colony of Vancouver Island) made explicit promises to Hul'qumi'num si'em (prominent heads of family groups) that they would be formally compensated for their land, which Douglas had recently made subject to preemption by settlers through an illegal policy (ibid). However, overlapping jurisdiction of different Hul'qumi'num groups, resistance from certain groups, and a series of ill-timed events discouraged Douglas from following through on his promises, despite the availability of funds with which to do so (ibid). As a result, the creeping imposition of British settlements into unceded territory brought the settlers and Hul'qumi'num into inevitable conflict over land, resources, and the application of law.

The Penelakut and Lamalchi, who are connected by way of relation to their winter villages on Penelakut (formerly Kuper) Island, played a pivotal role in indigenous resistance to British incursion. Following several grisly murders in 1863 that were arguably justifiable under Hul'qumi'num law, Douglas sought to maintain the extension of British law throughout the unceded territory by display of military force and coercion, as he had done on previous occasions (Arnett, 1999). Poor communication and heavy-handed tactics on the part of the Royal Navy set in motion a sequence of events that culminated in a standoff at the village of Lamalchi on the south end of Penelakut Island in which the British gunboat *HMG Forward* instigated a firefight and suffered the fatality of a young sailor (ibid). The only defeat in the history of the Royal Navy at the hands of an aboriginal foe was recast by the authorities and the officers responsible as murder and willful resistance to a legitimate police action (ibid). A protracted manhunt was undertaken with the coerced assistance of Hul'qumi'num factions, and at length four Lamalchi warriors were apprehended, tortured, tried on trumped-up charges without legal representation or proficient translators present, and publicly executed in what even the colonial newspaper *The Victoria Daily Chronicle* called "judicial murder" (ibid, p. 301).

With Lamalchi resistance removed, the illegal settlement of Hul'qumi'num territory accelerated, and Hul'qumi'num people were confined to small reservations corresponding to their immediate village sites and surrounding cultivated areas (Arnett, 1999). In 1884, the federal government granted 80% of the remaining Hul'qumi'num territory for the construction of the Esquimalt & Nanaimo railroad (Evans *et al.,* 2005). From 1890 to 1975, the Kuper Island Residential School (Figure 24), established on the site of the village Yuxwula'us, separated Hul'qumi'num youth from their families and exposed them to verbal, physical, sexual, and psychic abuse (TRCC, 2015). The traumas from this period have only recently been brought to national and international attention, and the process of reckoning has only just begun. According to the 2011 Community Well-Being Index (CWB), of the 407 communities in BC, reservation Kuper Island 7 ranks 401st, and Hul'qumi'num communities in general score near the lowest of all communities, even amongst First Nations reservations (INAC, 2011). The Penelakut, for clear historical reasons, are one of the most disadvantaged communities in British Columbia.

Figure 24: Kuper Island Residential School at Telegraph Harbor on Penelakut (Kuper) Island. BC Archives, pdp05505.

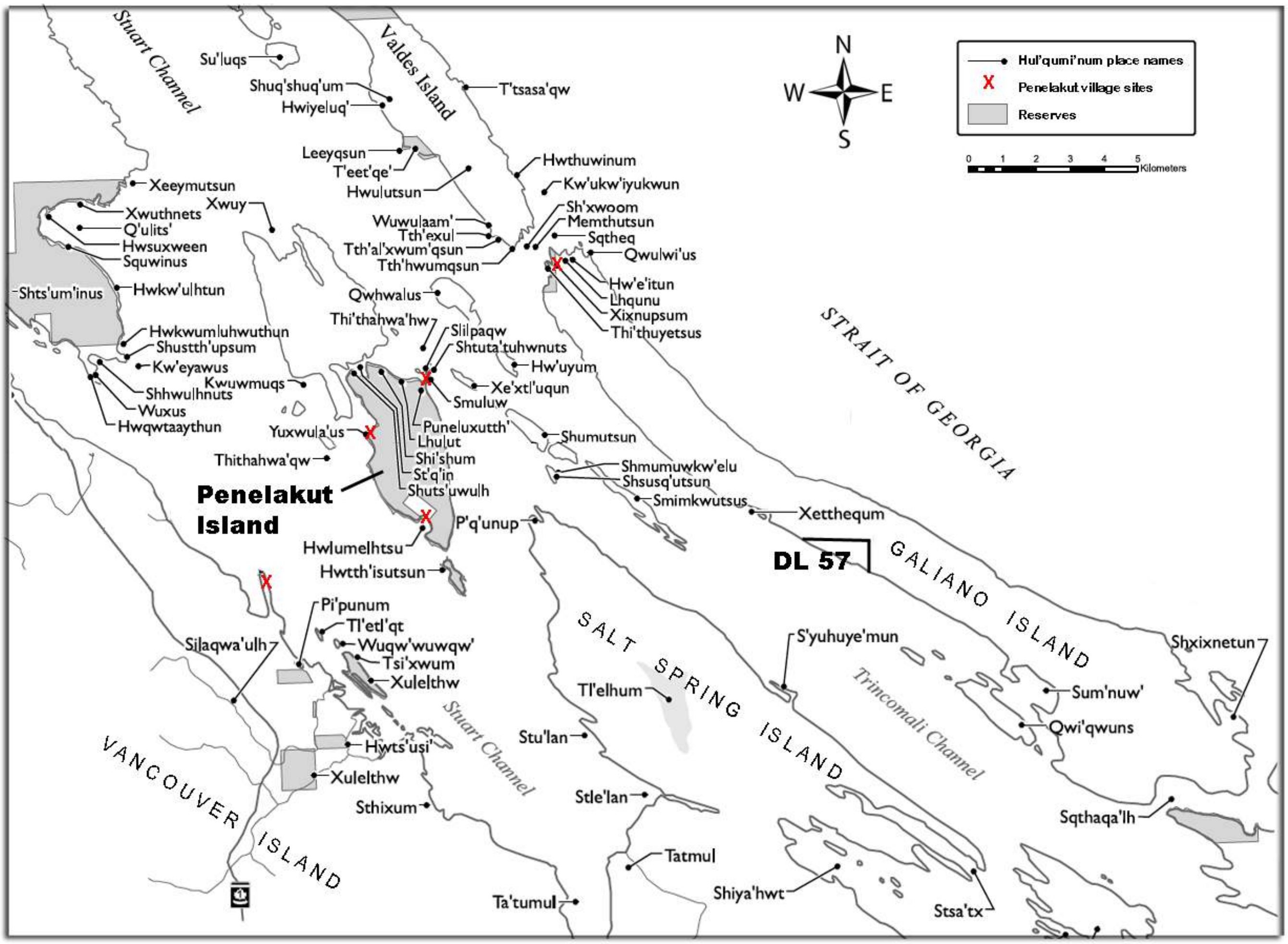

Figure 25: Map of core Penelakut territory with Hul'qumi'num place names, reserves, and Penelakut / Lamalchi village sites.

Galiano Island was frequently used by Penelakut and Hul'qumi'num people for fishing, hunting, resource gathering, and refuge. There was a small, mostly seasonal village called Xixnupsum at the northern tip of Galiano, on the south side of Sqtheq, or Porlier Pass (Figure 25). Areas of intensive and frequent use have been identified as Sptheq, Sum'nuw' (Montague Harbor), and Sqthaqa'lh (Active Pass) (Evans *et al*., 2005). Not coincidentally, these areas have been selected and protected as local and Provincial parks. Xetthequm (Retreat Cove) was also a focal site of use, the closest in terms of distance to the Learning Centre. While there is no specific reference to the land that now makes up DL 57 in the historical or anthropological literature (GLCMC, 2013), the presence of the Crystal Cove and the proximity to Xetthequm suggest that the Hul'qumi'num would occasionally undertake hunting and harvesting activities on the site. If a special significance was attributed to this place, it has been lost to time or kept a secret (Renwick-Shield & Weller, 2015). Interestingly, however, the western coast of Galiano was host to the drama of the protracted chase and eventual apprehension, on June 2, 1863, of several of the wanted Lamalchi warriors (or "criminals") by the Royal British Navy and the Penelakut si'em Hulkalakstun at Mt. Sutil (Arnett, 1999). It may well be that the spirit of rebelliousness lives on in this place.

Settlers

Until the gold rush of 1858, the SGLs remained largely unknown to British settlers. The influx of miners en route to the Fraser River from Victoria established a transportation corridor through Active (then Plumper's) Pass, or Sqthaqa'lh, at the south end of Galiano Island, which infringed directly upon Hul'qumi'num harvesting territory and resulted in a number of violent conflicts, many of which were likely never recorded (Arnett, 1999). Henry Georgeson, the namesake of Georgeson Bay, was among the first British settlers of Galiano in 1858 (Gulf Islands Branch B.C. Historical Association, 1961), well before the island had come under de facto jurisdictional control by the colonial powers. The return of many unsuccessful miners to the Colony of Vancouver Island the following year created pressure for James Douglas to open up Hul'qumi'num territory to British settlement, and an illegal system of preemption was established, of which many early settlers - including Georgeson - partook (ibid).

The records of preemption on DL 57 indicate a high turnover typical of claims in these early days (Table 5). Once legally "settled" by John Walker in 1896, the property was used for homesteading, farming, and light logging for half a century. Hazel Kreiss (née Scholefield), daughter of Oscar Eichenwald and Edith Scholefield, shared her childhood reminiscences of a homestead farm - with cows, chickens, and vegetables - and a thirteen room house (situated overlooking crystal cove) with Galiano resident Gary Moore in 2012 (Renwick-Shields & Weller, 2015).

Table 5: DL 57 title and tenure from 1888 to present. From GLCMC, 2013.

Name	Tenure	Date
G. Dishaw	Preemption	?
Joseph Ganner	Preemption	6 March 1888
W. W. Beall	Preemption	25 February 1889
J. W. Walker	Preemption	9 May 1892
John W. Walker	Crown Grant	27 November 1896
John Shaw	Fee Simple	6 January 1897
Edith Elizabeth Scholefield	Fee Simple	26 January 1932
Francis Austin Graham	Fee Simple	6 January 1948
Galiano (Olympia) Co-operative Association	Fee Simple	6 January 1948
William Alexander Campbell	Fee Simple	14 March 1958
W. A. Campbell & Lennis Shirley Campbell	Fee Simple	10 August 2007
GCA	Fee Simple	15 February 2012

What is clear from the early aerial photographs and memories is that these activities were concentrated on the western half of the property (the site of current GCA permaculture projects), away from the NPFF. When Bill Campbell bought the property but maintained his residence elsewhere, a series of young, itinerant "caretakers" continued to practice light agriculture on the property; it wasn't until 1997 that Bill moved to the property and began logging it (Renwick-Shields & Weller, 2015). In the intervening years, even the original clearings had begun to fill in, leaving the property almost completely forested. As a result, the NPFF site was forested (very likely with original old growth) as of July 2005 (Figure 26). Most of the timber on site was finally removed between 2005 and 2010, although the lone Grandmother Cedar remained until the transfer of title to the GCA in February of 2012 halted the saw at the last possible moment - the marks are still clearly visible.

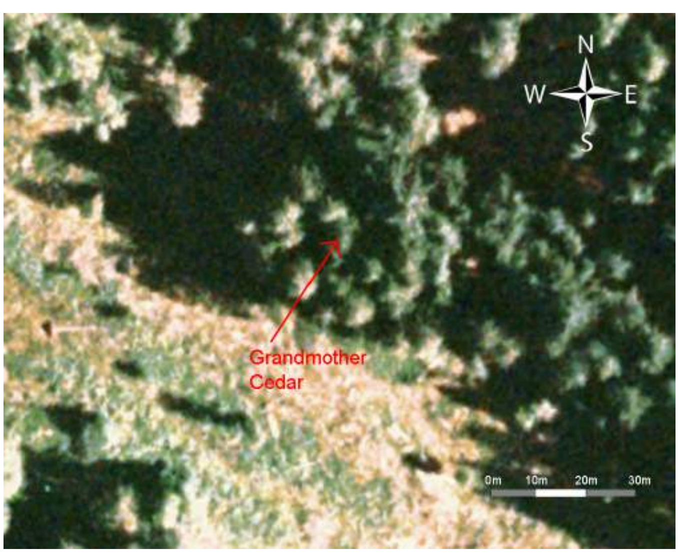

Figure 26: NPFF site on July 16, 2005. From Google Earth.

What remains, then, is a site with minimal historical significance to either Hul'qumi'num or settler societies, and that has only within the last couple decades been dislocated from an otherwise relatively stable ecological trajectory (longer term changes in faunal composition and density notwithstanding). Site selection was motivated not by historical significance, but instead by the site's proximity to the Learning Centre building, the presence of the Grandmother Cedar, and favourable topography. Approached as straightforward ecological restoration, this site possesses a clear ecological trajectory, with relatively intact reference ecosystems nearby.

While facilitating the speedy recovery of the site to western redcedar forest would be a worthy goal, this would miss the opportunity to acknowledge the ongoing effects of colonization on Galiano and in the SGIs, as well as to create a learning and healing space for the various communities that call Galiano home. Higgs *et al.* (2014) argue that the role of history in restoration ecology is changing from that of a "template" to that of a "guide", opening a static, single trajectory to multiple, process-based trajectories that should reflect the livelihood needs of the expanded community. With the NPFF, it may be possible to maintain ecological and human-centered trajectories side by side as a collaborative process mediated by the demands of intercultural reconciliation and local livelihoods.

Objective E: Solicit input and insight from community leaders through formal consultation

Collaboration and Consultation

The forceful colonization and settlement of Hul'qumi'num territory was justified and paralleled by the imposition of a Eurocentric worldview over the Hul'qumi'num worldview, which "reflects a spiritual relationship with the environment and an obligation to manage responsibly the use of resources" (HTG, 2006). Today, while indigenous knowledge and wisdom are widely recognized, sought after, and required in management and decision making processes, many attempts to engage indigenous communities have failed as a result of the same imposition of Eurocentric values (von der Porten *et al.*, 2015). In some cases, this is because the institutions involved are "deploying the techniques derived from [collaborative] models but oriented towards capturing indigenous support" (Menzies, 2015, p. 6), resulting in one-sided consultation processes. In other cases, non-indigenous parties initiate collaborative projects or consultations in good faith but unconsciously impose a Eurocentric approach on the process.

Von der Porten *et al.* (2015) underscore that First Nations, especially in unceded territories, cannot be approached and treated as "stakeholders," but instead must be recognized as sovereign nations with a strong interest in self-determination. They outline six general recommendations for collaborative practice with indigenous peoples within their traditional territories:

- ❖ Approach indigenous peoples as self-determining nations rather than as one of many stakeholders or participants
- ❖ Identify and engage with existing environmental governance processes by indigenous nations
- ❖ Create opportunities for relationship building
- ❖ Choose venues and processes of decision making that reflect indigenous values
- ❖ Provide resources to indigenous nations to level the playing field in terms of capacity for collaboration
- ❖ Instead of trying to bridge existing strategies with indigenous peoples, try to support indigenous nations in their own continued environmental decision making and self-determination

Menzies (2004) provides an excellent case study in detail for how these recommendations can be put into practice on the ground. Nevertheless, he acknowledges that the ongoing legacy of colonization often engenders a "palatable feeling of distrust and unease toward … external agencies, especially when they come asking for something" (p. 25). To address this, he calls for a "reversal of the power roles" (Menzies, 2015, p.

19), with the agenda being generated and set by indigenous communities.

Collaboration in Context

This affirmation of self-determination is explicit in the Hul'qumi'num's "A Call to Action" report:

> Aboriginal governance of traditional territories — the traditions and laws respecting issues relating to the harvesting and management of resources for food, social and ceremonial purposes, and to maintain a moderate livelihood — has been operating on a parallel but separate track from that of Crown governance of the lands and resources in British Columbia. The lack of recognition by the Crown of First Nations territorial jurisdictions has exacerbated the differences of the parallel approaches (Olding *et al.*, 2008).

While the Consultation Policy is intended primarily for legally mandated Crown consultation, key issues that impede consultation are applicable to dealings with third parties. They are as follows:

- Inadequate consultation
- Lack of resources
- Rigid timelines
- Unclear process and information
- Unreasonable behaviour

10. Use & value diversity

Thus, it is incumbent upon a third party to fully recognize Hul'qumi'num sovereignty, acknowledge traditional title, and accommodate for the limited capacity and diverse priorities of Hul'qumi'num communities. In addition, it is necessary to recognize that **any and every aspect of this project is subject to change in response to a truly collaborative process**, should the invitation to such be accepted. In light of the above, I make the following recommendations regarding pursuing the involvement of the Penelakut:

- Approach the Penelakut Tribe not as one of several stakeholders, but instead as a sovereign nation with full jurisdiction
- Ensure appropriate protocols are followed in contacting and inviting community members to participate
- Provide transportation and resources to participants to facilitate participation
- Ensure that the venue and process for collaboration are compatible with community members' needs and values
- Pursue and emphasize a process and project that are open-ended and phased, with opportunity to get involved from the outset or at a later date
- Act upon existing relationships and work to form new ones
- Address barriers to traditional harvest (see next section)

Barriers to Traditional Harvest

Objective F: Provide accessible avenues for ongoing hands-on intergenerational involvement

Overview

According to a 2001 Hul'qumi'num study of contemporary use of traditional resources amongst the six member communities, the informants' desire for harvest and use of traditional foods and medicines is matched only by the inadequacy of access to these resources for nearly every species (Feduik & Thom, 2003). Six major barriers to harvest were identified by Hul'qumi'num informants (Figure 27). These are discussed briefly below, followed by recommendations to address each obstacle.

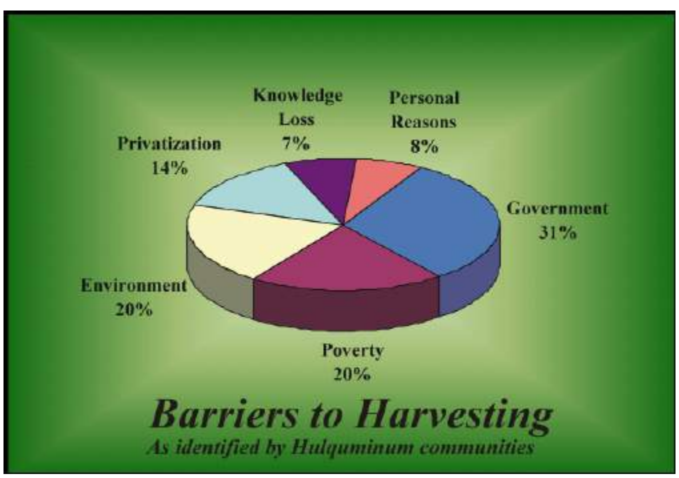

Figure 27: Barriers to harvest as identified by Hul'qumi'num member communities. From Feduik & Thom 2003.

Government

The greatest barrier reported by community informants was governmental regulation: specifically, the difficulty of obtaining permits and the fear of catastrophic penalties for "illegal" harvesting activities (Feduik & Thom, 2003). This barrier pertains primarily to marine resources, and as such may not be necessary or possible to address within the context of this project.

Poverty

The second most commonly cited barrier was poverty, which is a chronic condition for First Nations people throughout Canada (AANDC, 2015). Common limitations were the lack of boat, car, and appropriate gear for harvesting (Feduik & Thom, 2003). The disposable income that allows non-indigenous Canadians to equip themselves to hunt, fish, and access plant gathering locations is sorely lacking in Hul'qumi'num communities.

Environment

The diminished environmental quality of traditional harvesting areas was also of primary concern to many community members. Pollution (including red tides) and scarcity of formerly abundant resources were the main barriers to harvest in this category (Feduik & Thom, 2003). This barrier also applies primarily to marine resources, although overharvesting of terrestrial resources has also played a role in declines.

Privatization

About 84% of traditional Hul'qumi'num territory is now privately owned, with more than half of this land currently held by large companies (HTG). Heavily urbanized areas are often in the most ecologically productive areas (Feduik & Thom, 2003). Thus, access to many important resource gathering sites in the traditional territory is extremely limited. If the previously described barriers are alleviated, it is likely that this barrier will increase dramatically in importance. The re-opening of privatized land, such as DL 57, to the Hul'qumi'num may be a small but significant step to address this issue.

Personal Reasons

Personal reasons, such as age, health, time restrictions, and a range of other factors affect some informants' ability to access traditional resources.

Knowledge Loss

Despite over a century of cultural disruption in the form of colonization and residential schools, intergenerational knowledge loss is considered the least relevant barrier to traditional harvest (Feduik & Thom, 2003). Nevertheless, this barrier is likely to gain in importance if the previous barriers are not appropriately addressed. It will be difficult to maintain adequate levels of knowledge transfer if traditional harvest is not practicable in all but a few contexts.

Recommendations

Regarding the identified barriers, the NPFF project is not well-situated to address those that relate to governmental or personal factors. On the other hand, the NPFF may be seen as a direct response to the environmental barriers mentioned above by increasing the abundance and productivity of traditional food resources. However, poverty, privatization, and knowledge loss may prove to be decisive factors in whether or not Penelakut community members engage with and benefit from the NPFF. In order to address these formidable barriers, I make the following recommendations to the GCA:

- Open access to the NPFF should be clearly extended to all Penelakut members
- Arrange, if possible, to provide well-advertised and convenient transport between Penelakut and the NPFF at regular intervals based on community desire and the harvest calendar
- Provide tools for harvest and maintenance
- Annual harvest events should be held at the NPFF to which the Penelakut are formally invited to attend and organize
- Knowledge holders from Penelakut and Galiano should be regularly contracted to deliver workshops at the NPFF
- Youth from Penelakut and Galiano should be invited to document and participate in NPFF activities; see next section

Participatory Documentation

Objective G: Collaborate with local organizations and websites to host interactive content

Organizational Partners

The following organizations and projects are potential partners to help generate and host online content, as well as to host events at the NPFF.

Salish Harvest

Salish Harvest (www.salishharvest.com) is a website created by the Access to Media Education Society (AMES) in collaboration with Penelakut Health, The Galiano Food Program, Penelakut Island Elementary School, the Galiano Community School, and the GCA. It hosts a collection of videos, pictures, and written entries documenting a series of gatherings from 2012 and 2015 between elders and youth from Penelakut and Galiano to discuss traditional foods and medicines (Salish Harvest). The youth were instrumental in filming and documenting the proceedings. On the site, there are short pieces relating to various aspects of harvesting, processing, and storing wild foods, as well as profiles for over 50 species of plants and animals. While contributions remain open and occasional additions are made, most of the activity for this project occurred between 2012 and 2015.

Biodiversity Galiano

Biodiversity Galiano (http://www.inaturalist.org/projects/biodiversity-galiano-island) is an iNaturalist and Encyclopedia of Life (EOL) project initiated and maintained by Andrew Simon, a former GCA summer student. This platform hosts an ongoing collection of geolocated and photo-identified digital specimens of species on Galiano, with the goal of fully documenting the biological diversity of the island. This project hosts semi-regular bioblitzes and interacts with the Salish Harvest website, allowing profiled species to be geolocated on Galiano.

Gulf Islands Film and Television School

The Gulf Islands Film and Television School (GIFTS), founded in 1995, is the only film and television school in the SGLs. It offers hands-on media training programs and summer camps and is located less than a kilometer from the Learning Centre on Galiano Island.

Galiano Community Food Program

The Galiano Club Community Food Program hosts a variety of gardening, cooking, and educational projects and events.

Objective H: Train and equip local elementary school students to be video documentarians

Youth Engagement

The GCA provides a variety of avenues for youth engagement, including campouts, field trips, and special programs. The elementary-level students of the Galiano Community School were particularly involved in the restoration of the mill site (Hamann-Benoit, 2014), and have regularly visited the GCFF. Recently, a group of young filmmakers from GIFTS completed a short documentary, entitled “A Forest in the Garden”, about the GCFF (Figure 28).

All of the community connections are in place for the GCA to continue to engage local and visiting youth in participating in and documenting the creation of the NPFF. Through GIFTS, a series of short documentaries, much like “A Forest in the Garden”, could be made to document the establishment and evolution of the NPFF over the years. Shorter pieces profiling edible and useful species found in the NPFF can be posted to Salish Harvest and referenced via the Biodiversity Galiano iNaturalist page. iNaturalist, in general, would be an excellent tool to engage school groups in exploring the diversity of life in the NPFF. When appreciable quantities of food start to be produced, the Galiano Community Food Program can co-host harvest and processing events. An annual harvest celebration would be an excellent opportunity for all of these groups to bring generations together at the NPFF.

Figure 28: Still image from “A Forest in the Garden” (Dir. Anna-Marie Krahn), with original Sisiutl carving over entrance.

Objective I: Fund the creation of interpretive signage and indigenous art for the site

Art and Signage

As part of the GCFF project, funds were reserved for the creation of art and interpretive signage. A public contest was conducted to select an artist from the community, resulting in the beautiful original carving of Sisiutl that now adorns the GCFF front gate (Figure 28). The NPFF will create similar opportunities for artistic expression (not to mention a new entrance gate to decorate), and the solicitation of art can be approached in a similar manner. In addition, art can be made *in* the NPFF from materials harvested on-site; the learning circle can provide a good venue for these sorts of creative projects, which

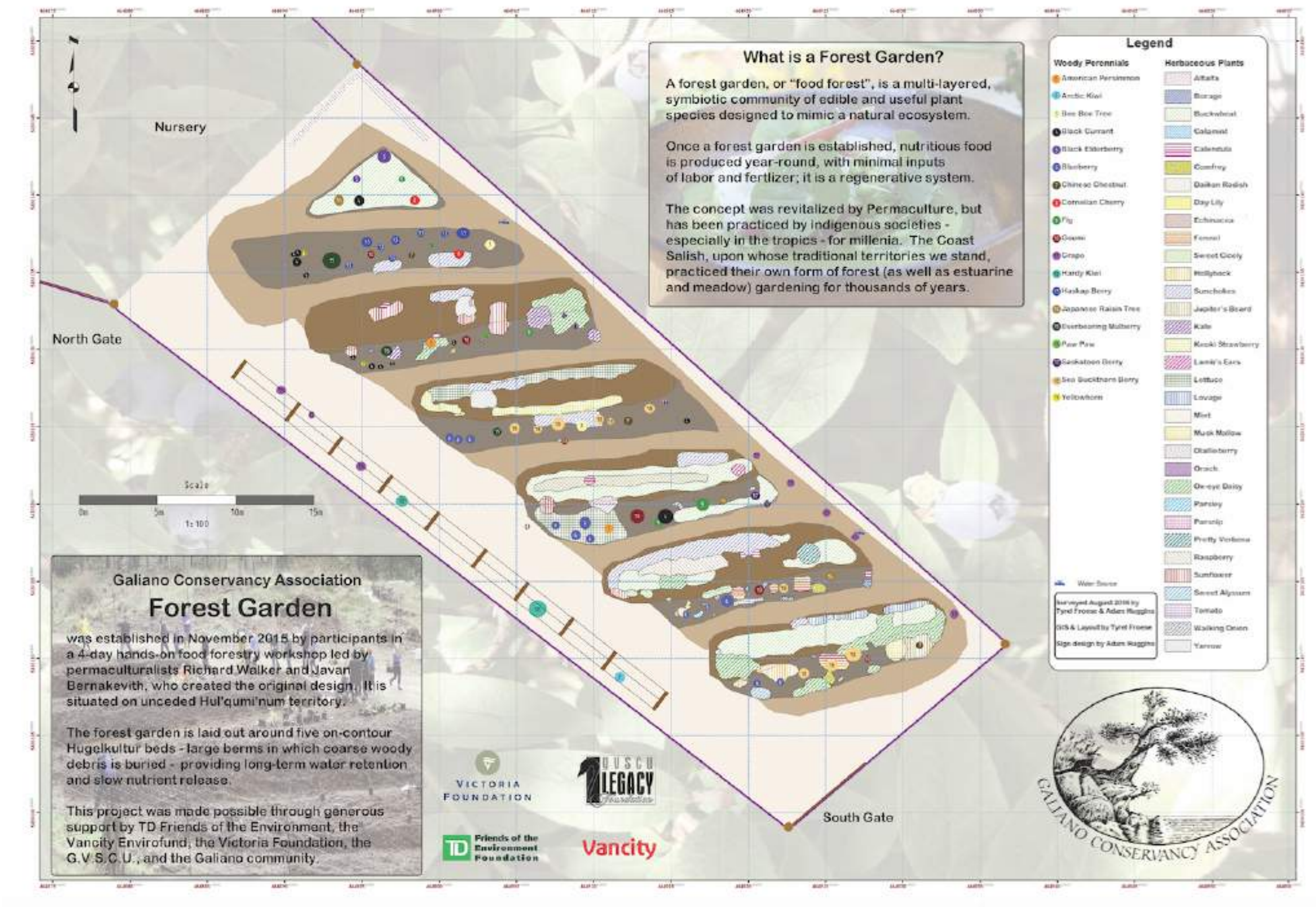

Figure 29: Map of GCFF, produced from mapping by Tyrel Froese and the Author and designed by the Author.

include weaving, carving, wreath-making, plant-pressing, painting, photography, and anthotyping (see Figure 30).

Interpretive signage is also an important feature of many educational landscapes. A detailed map, such as the one produced for the GCFF (Figure 29), can help orient visitors to the site, provide information on the history of the project, clarify project objectives, thank project sponsors, and exhibit 'before' pictures. Mounted in a prominent location, a good map serves both as guide and as an invitation to explore.

Finally, smaller signs to label specific plants or plant communities can be mounted throughout the NPFF to introduce visitors to otherwise unfamiliar species and clarify harvesting protocols, seasons, and etiquette. These can be adapted from the GCA's laminated nursery plant cards.

Figure 30: Anthotype of oceanspray (*Holodiscus discolor*) on a Nasturtium (*Tropaeolum majus*) emulsion, by the Author.

Management

Objective J: Manage succession, wildlife, and fertility to promote productivity of select species

Harmonizing Frameworks

In a series of interviews with expert practitioners of both permaculture and ecological restoration conducted for her Master's thesis, Hyeone Park systematically identified important similarities and differences between the two disciplines, most of which amount to a question of emphasis (2016). The goal of food production is, along with a reduced commitment to historical fidelity, the most significant factor that distinguishes permaculture-style food forestry from ecological restoration in the context of reforestation. Comparing her summation of the common goals of permaculture (Figure 31) with the four principles for planning restoration recently outlined by Suding *et al.* (2015) in response to the 2014 United Nations Climate Summit (Figure 32), this distinction is clearly conceptualized: three of the four primary categories in each map onto each other fairly well, while "diversity of yields" (i.e. production) is emphasized in permaculture, as opposed to the commitment to be "informed by past and future" that defines ecological restoration. A primary aim of the NPFF project, then, is to harmonize these two often distinct priorities.

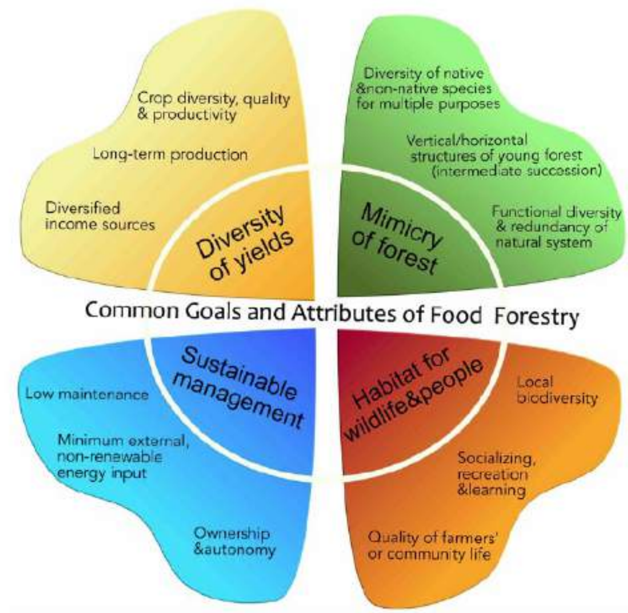

Figure 31: Common goals of food forestry; from Park, 2016.

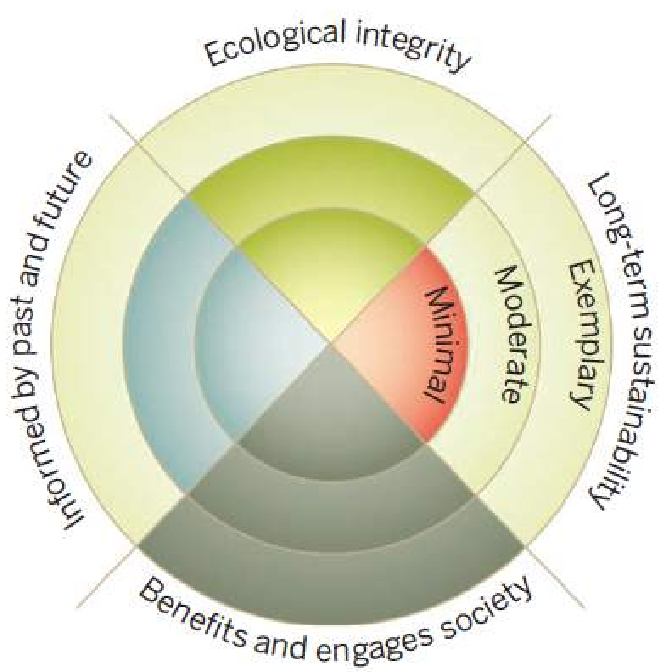

Figure 32: Principles of restoration; from Suding *et al.*, 2015.

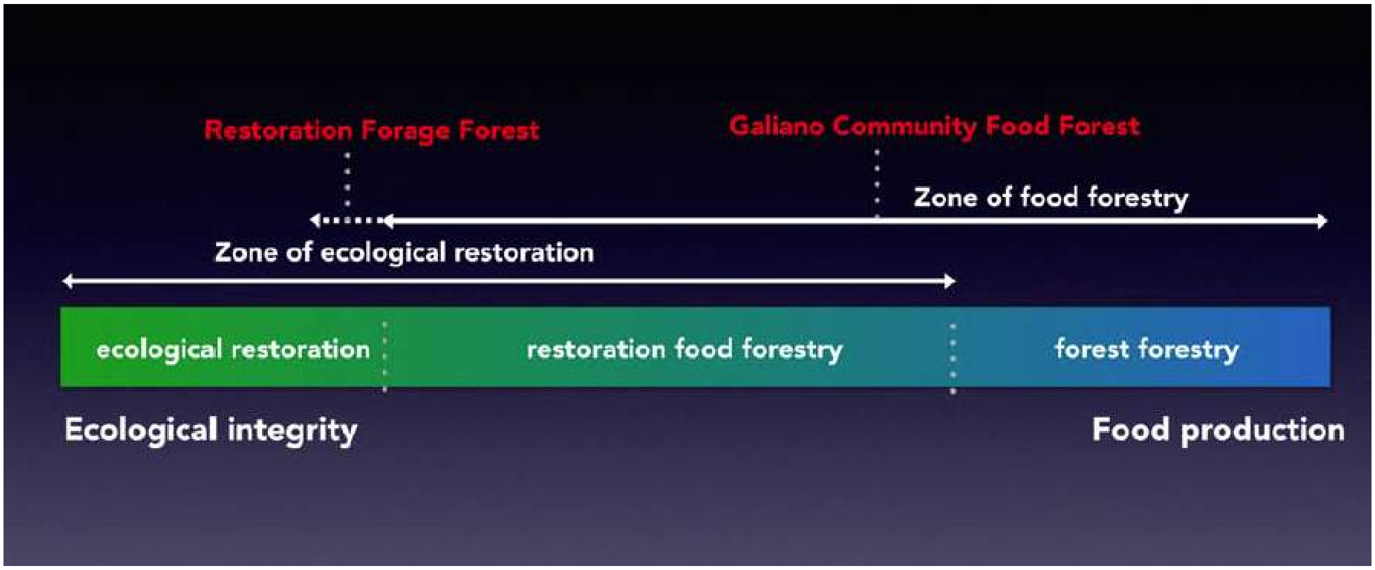

Figure 33: Conceptualization of where the GCA's twin food and forage forest projects lie on a continuum between ecological integrity (and historical fidelity) and food production; from Park, 2016.

Unlike the recently planted GCFF, which is composed almost exclusively of exotic species heavily dependent on irrigation, the NPFF is meant to meet all the criteria of a *bona fide* ecological restoration (Figure 33). By focusing on edible and useful native species that would have been more common on Galiano prior to logging, farming, and the ecological release of mule deer populations, the goal of maintaining historical fidelity can be satisfactorily bridged with the goal of diversity of production. Nevertheless, it is important to recognize that, even under the most favourable of circumstances, human food production puts people in conflict with wildlife and ecological succession, as well as soil nutrient and moisture regimes. The necessity of excluding mule deer in order to establish plants of any kind is a case in point, but other species must be considered as well. In particular, a wide variety of birds are known to use the site for foraging and nesting (see Appendix A). On the other hand, the demands of certain edible species for adequate water and sunlight in the early and later years, respectively, may justify certain hydrological and successional interventions that will alter the "natural" regimes of the site. These management considerations are dealt with below. They are summarized in Table 6, where they can be compared with generalized approaches to management from both permaculture and ecological restoration.

Wildlife

As discussed in the Barriers to Restoration section, mule deer are to be entirely excluded from the site to allow for the establishment of a diversity of plant species and to promote food production. This is justifiable given the excessive local mule deer populations, extensive habitat available to these populations, and the current impossibility of re-introducing appropriate predators to the island.

The site also supports a large variety of avian fauna. The introduction of greater plant species diversity and more varied vegetation structure should benefit the majority of these species while still preserving enough open habitat for species that favor treeless expanses. The primary conflict, then, will be between fruit-eating species, such as cedar waxwings (*Bombycilla cedrorum*) (Figure 34), and food production for human consumption. This can be dealt with in two complementary ways: first, species such as bitter cherry and red-flowering currant can be established to provide uncontested fruit for birds; second, choice edible species should be grouped in clusters that can be easily protected with netting if necessary. For example, a large patch of thimbleberry should be planted in an appropriate location, with outlying shrubs integrated into other plantings. This way, 60-75% of the crop can be protected with a single net while still leaving some production for opportunists (avian or human) and maintaining polycultural plantings.

Water

Wherever possible, plantings are located on soils with compatible moisture regimes. However, certain species - such as red huckleberry and the meadow swales species - may require supplemental water during the dry season. A long hose should be mounted on the Learning Centre building to allow for manual irrigation, especially during the first few years. In addition, the water draining from the outdoor showers near the Learning Centre building could be routed through biofilters beneath the roadway to the swales.

Nutrients

Plantings have also for the most part been located on soils with compatible nutrient regimes. Redistribution of woody debris and fast growing deciduous species, such as red alder, bitter cherry, and Scouler's willow (*Salix scouleri*), will help to boost nutrient cycling on site. The specialized nurse stump plantings will require their own unique soil mix, as will the meadow swales (see Planting Scheme section).

Succession

Volunteer tree recruitment should be selectively encouraged in the north and east of the site and mostly curtailed on the south and west of the site. A patchy canopy, with plenty of light, is the goal; over time, trees can be selectively harvested for wood to reduce canopy density. The natural progression towards climax forest should be respected, and species composition modified over time to suit this progression. Burning has precedent on site and in Hul’qumi’num culture, and can be employed to maintain choice patches in early-to-mid succession (Figure 35).

Table 6: Comparison of generalized management approaches between permaculture, ecological restoration, and the NPFF; with reference to Park, 2016.

	Wildlife	Water	Nutrients	Succession
Ecological Restoration	Provide habitat for native species and preserve ecological interactions, genetic diversity, and trophic structuring	Re-establish "natural" hydrology and provide supplemental water only to establish species as necessary; water less over time	Restore nutrient cycling and amend only to establish species as necessary; intervention should trail off over time	Assist in catalyzing and expediting natural succession on site; emphasize self-sustaining pathways and native species
Permaculture	Include domesticated grazers and browsers; provide habitat for pollinators and useful species; protect valuable resources from wildlife when yields are contested; design "pest" management into ecological systems	Creatively minimize water use, but alter hydrology where and when it suits production purposes; provide water to establish species or to maintain otherwise untenable species assemblages	Encourage nutrient cycling, but amend to establish species and promote good yields on an ongoing basis; emphasize nitrogen-fixing species, cover crops, and fodder plants	Manipulate succession in order to promote early-to-mid successional landscapes; emphasize productivity and choice species
GCA NPFF	Exclude mule deer; provide improved habitat for pollinators, insects, birds, and amphibians; produce ample diversity and quantity of food to satisfy humans and wildlife; cluster and net berry crops; address "pest" species as the need arises	Preserve site hydrology and provide supplemental water only to establish species as necessary; encourage the growth of trees in a gradient from northeast to southwest across site to provide shade	Restore nutrient cycling and replace nutrients exported due to logging in the form of woody debris; amend only to establish species as necessary (ex. red huckleberry)	Guide natural succession on site to promote food production while also re-establishing partial canopy; emphasize diversity and productivity while adjusting species over time to suit growth towards climax forest; consider controlled burning in specific areas

Figure 34: cedar waxwing; Minette Layna, CC SA-BY 2.0.

Figure 35: Controlled burn; Senior Airman Stephen J. Otero.

Production

Objective K: Incorporate select edible species into restoration design based on consultation and TEM

Principal Products

The introduction of greater plant diversity and structural complexity to the site will improve habitat and enhance ecosystem services such as moisture and nutrient retention. A primary goal of this project, however, is to also produce appreciable quantities of food and other products from locally native species. While nearly every plant in the planting scheme has some edible, medicinal, or material value, 15 species (Table 7) have been identified as focal points of production for this site based on the Author's experience and the site characteristics. These species have marketable potential and can be gathered *en masse*. They are spread across the site, with 3-4 in each planting area, but should be clustered in their respective areas for ease of harvest and protection against avian fauna. This list and the proportions therein should be fine-tuned by consultation with the Penelakut.

3. Obtain a yield

Secondary Products

In addition to these principal products, a variety of secondary products will be produced. These range from coastal mugwort leaves for the GCA's budding tea business to red alder bark for education and survival scenarios. For the most part, however, production from these species will not be sufficient in quantity or marketability for purposes other than education, snacking, or subsistence. See Appendix B for descriptions of the most common uses of these species; more detailed information is available in Turner, 1995.

Table 7: 15 principal intended products of the NPFF.

Latin Name	**Common Name**	**Product**
Allium cernuum	nodding onion	Chives, bulbs
Amelanchier alnifolia	Saskatoon berry	Berries
Berberis aquifolium	tall Oregon grape	Berries, root bark
Camassia spp.	camas	Corms
Lomatium nudicaule	barestem desert-parsley	Seeds, greens
Malus fusca	Pacific crabapple	Crabapples
Ribes divaricatum	wild gooseberry	Berries
Rosa nutkana	Nootka rose	Petals, hips
Rubus parviflorus	thimbleberry	Berries
Rubus spectabilis	salmonberry	Berries
Sambucus nigra caerulea	blue elderberry	Berries, flowers
Shepherdia canadensis	soopolallie	Berries
Vaccinium ovatum	evergreen huckleberry	Berries
Vaccinium parvifolium	red huckleberry	Berries
Viburnum edule	highbush cranberry	Berries

Harvest

Objective L: Develop harvest calendar and coordinate with appropriate stakeholders

Calendar

Over time, as the NPFF begins to produce consistently, a harvest calendar can be developed to assist in harvest planning and visitor engagement. This should be done primarily by careful observation and note-taking, as harvest times can vary wildly from year to year and microclimate to microclimate. Blooming times for various wildflowers on site can be simultaneously observed. Wildflower blooms and harvest dates can then be phenologically correlated on the harvest calendar, and a circular wildflower "calendar" can be established around the periphery of the learning circle to aid in plant identification and making harvest predictions. This could be an excellent project for future students to consider.

Harvest Celebration

As described earlier in the report, harvest workshops and events can be coordinated with Penelakut, the Galiano Community Food Program, and even Pilgrimme, which has already partnered with the GCA to purchase produce from the GCFF and produce blog posts about preparation of food forest meals (see https://forest2table.com/). These events can then be documented and uploaded on Salish Harvest.

In July, during prime harvest season and before the annual Walkalong for Learning, an annual harvest celebration should be organized to coincide with the (eventual) camas harvest. In the early years, the GCFF can provide much of the food for the festivities, but the NPFF, with its proximity to the Learning Centre building, will provide an ideal venue. Plant walks, pit roasting, tea-making, storytelling, crafts, food processing, and, of course, eating are all possible activities for such a celebration. In addition, dialogue and activities to promote truth and reconciliation between Penelakut and settler peoples can be organized. The ongoing and evolving nature of the project and the centering of traditional foods could provide a good context for the ongoing and evolving conversations that characterize these challenging issues; see Gomes (2012) for descriptions of the role of a harvest and pitcook in rekindling interest in traditional knowledge and partnerships between First Nations and settlers.

Although the NPFF should remain open to community members for harvest year-round, events like those described above serve to bring the community together around food. The unique orientation of the NPFF creates the opportunity to foreground conversations that could not occur on traditional farms or restoration sites.

Monitoring

Objective M: Develop monitoring plan based on recommendations from H.P. Master's thesis

Criterion and Indicators Framework

One of the aims of Park, 2016 was to develop monitoring criteria that could be used to compare the performance of the GCFF and the NPFF in a variety of categories. She adapted the Criterion and Indicators (C&I) framework developed for forest management in the U.S.A. for this purpose and worked with GCA staff to determine a subset of indicators and measurements which would be feasible for the GCA to perform into the future. Each criterion is supported by several indicators, each of which has core measurements and optional measurements; the chosen criteria, indicators, and core measures are summarized in Table 8.

In order for this framework to be effective, indicators must be measured on an annual basis for both sites using consistent techniques. Since these projects represent one of the first (if not *the* first) instances of comparison between a permaculture food forest and a restoration forage forest in North America, careful monitoring and documentation will support potentially groundbreaking studies and observations.

Table 8: GCA C&I monitoring framework; from Park, 2016.

Criterion	Indicator	Core Measure
Integrity of biotic community	Plant diversity (species & structure)	Species richness & cover per structural layer
		Tree density
Habitat quality	Habitat structural diversity	Volume of CWD, SWD, and snags
	Landscape connectivity	Area % of roads and footpaths
Ecological processes	Succession	Photo-point monitoring
Soil	Soil erosion	None or less than 5% exposed soil
Historical fidelity	Historical biological community	Native species richness and cover
Cultural values and social equity	Food security	Destination of products and food produced
	Cultural identity & spiritual values	Indigenous participation
	Life quality of users	Satisfaction, income rates
Economic benefits	Yield	Income from yields
	Employment	Jobs created
Outreach and education	Acquisition of skills, knowledge	# of events, visis; demographics
	Research	# of studies
Resilience and stability	To extreme weather	Crop failure after extreme weather
	Self-regulation	Outbreaks of disease
Economic self-sufficiency	True yield	Input vs. output
Governance	Participation	# collaborators
	Stewardship	# volunteers, hrs.

Objective N: Adjust management and design based on feedback from monitoring results

Adaptive Management

Adaptive management is a loose term for the process of carefully planning and executing a project with ongoing monitoring and incorporating feedback from monitoring into the project design on a continuous basis. The Open Standards for the Practice of Conservation were developed by the antecedents of the Conservation Measures Partnership (CMP) in 2004 to provide a common framework for adaptive management in ecological projects, and are organized into a five-step management cycle (CMP, 2013):

- STEP 1: Conceptualize the Project Vision and Context
- STEP 2: Plan Actions and Monitoring
- STEP 3: Implement Actions and Monitoring
- STEP 4: Analyze Data, Use the Results, and Adapt
- STEP 5: Capture and Share Learning

These steps form a feedback loop (Figure 36) that projects forward and backward in time. Thus, the results from the C&I monitoring framework set forward by Park, 2016 can be recycled into the ongoing process of planning interventions into the GCFF and NPFF. The simple concepts of learning from past actions and adapting to changing circumstances belie the challenges of choosing appropriate measures, engaging in consistent monitoring, correctly analyzing data, and transforming the results into practical steps to be taken moving forward.

Thankfully, Hyeone Park's 2016 Master's Thesis provides a solid foundation from which to engage this process. The thorough GPS mapping and division into 10 m quadrats that enabled the production of the GCFF map (Figure 29) should be repeated for the NPFF to provide a spatial context for this work. As stated previously, the design for this project is meant to evolve over time in response to monitoring feedback, climate change, and community desires. The CMP framework presents a standard process for incorporating new data, ideas, and strategies.

Figure 36: Five-step management cycle; from CMP, 2013.

Objective O: Engage university and college students to continue research on site and report results

Ongoing Study

The GCA has a long history of academic involvement. Every year, between three and six interns from German academic institutions assist in and study GCA projects. Students from the University of Victoria (UVic) often staff the summer student positions and use GCA projects as material for their studies. Dozens of student reports have been generated for the GCA as a result of UVic's ES 441, which takes place over the course of a week at the Learning Centre. The Mill Site Restoration served as the subject of Vincente Hamann-Benoit's (2014) final ER 390 project for the UVic Restoration of Natural Systems Program.

The NPFF, as potentially the first project of its kind on the west coast of North America, will provide a wealth of opportunity for further study and inspiration. Already, two ES 441 student team reports, Hyeone Park's (2013) Master's Thesis, and this report - for ER 390 in the Restoration of Natural Systems Program - have taken the (still non-existent) NPFF as their subjects. Should the GCA continue to explore innovative solutions to relevant ecological and cultural problems, there is little doubt that students will continue to participate in its projects.

Figure 37: ES 441 class at the Learning Centre in July of 2016; the Author is present and easily identified by his bare feet.

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Appendix A: Baseline Survey Results

Site Vegetation Species Inventory

Table 9: Baseline plant species inventory for NPFF site with vegetation layer (A=tree, B=woody perennial, C=herbaceous, D=moss), common names, status (N=native, I=introduced), and notes. Species in blue are considered edible; species in green are considered marginally edible or medicinal. Survey conducted 10/18/2016.

L	Latin Name	Common Name	Status	Notes
A	*Alnus rubra*	red alder	N	Edible cambium, according to Turner (1995)
A	*Arbutus menziesii*	Pacific madrone	N	Lone individual with missing top; edible berries
A	*Pseudotsuga menziesii*	Douglas-fir	N	Edible cambium, according to Turner (1995)
A	*Thuja plicata*	western redcedar	N	Grandmother Cedar, as well as scattered saplings
B	*Amelanchier alnifolia*	Saskatoon berry	N	Edible berries; lone individual near Grandmother Cedar
B	*Berberis nervosa*	dull Oregon grape	N	Present above cliff; edible berries, medicinal rhizomes
B	*Gaultheria shallon*	salal	N	Edible berries; widespread on site
B	*Holodiscus discolor*	oceanspray	N	Present above cliff
B	*Ilex aquifolium*	English holly	I	Recommend immediate removal
B	*Lonicera hispidula*	hairy honeysuckle	N	Scattered across site on dry, rocky areas
B	*Paxistima myrsinites*	falsebox	N	Present above cliff
B	*Rubus laciniatus*	cutleaf blackberry	I	Recommend immediate removal; edible berries
B	*Rubus leucodermis*	blackcap raspberry	N	Edible berries; widespread on site
B	*Rubus spectabilis*	salmonberry	N	Edible berries; several individuals on north end of site
B	*Vaccinium ovatum*	evergreen huckleberry	N	Edible berries; lone individual on cliff face
B	*Vaccinium parvifolium*	red huckleberry	N	Edible berries; scattered individuals on nurse stumps
C	*Achlys triphylla*	vanilla leaf	N	Tea herb; scattered individuals among bracken ferns
C	*Agrostis capillaris*	colonial bentgrass	I	
C	*Anaphalis margaritacea*	pearly everlasting	N	Medicinal foliage and flowers
C	*Arctium minus*	brudock	I	Edible and medicinal roots, peeled
C	*Athyrium filix-femina*	lady fern	N	Edible rootstock, according to Turner (1995)
C	*Bromus carinatus*	California brome	N	
C	*Cirsium arvense*	Canada thistle	I	Edible peeled roots and stalk
C	*Cirsium vulgare*	bull thistle	I	Edible peeled roots and stalk
C	*Dactylis glomerata*	orchard grass	I	
C	*Digitalis purpurea*	foxglove	I	

L	Latin Name	Common Name	Status	Notes
C	*Elymus glaucus*	blue wild rye	N	
C	*Elymus repens*	couch grass	I	
C	*Epilobium angustifolium*	fireweed	N	Edible shoots
C	*Equisetum telmateia*	giant horsetail	N	Tea herb
C	*Galium aparine*	cleavers	I	Tea herb
C	*Gamochaeta ustulata*	purple cudweed	I	Scattered along southwestern ridgeline
C	*Geranium molle*	dovesfoot geranium	I	
C	*Heuchera micrantha*	crevice alumroot	N	Present in cliff face; medicinal roots
C	*Holcus lanatus*	velvet grass	I	
C	*Hypochaeris radicata*	cat's-ear	I	
C	*Juncus effusus*	common rush	N	
C	*Linnaea borealis*	twinflower	N	
C	*Mycelis muralis*	wall lettuce	I	
C	*Nemophila parviflora*	oak nemophila	N	
C	*Plantago lanceolata*	English plantain	I	Good indicator of compaction; edible leaves and seeds
C	*Poaceae spp.*	-	-	Unidentified grasses
C	*Polystichum munitum*	sword fern	N	Edible rootstock, according to Turner (1995)
C	*Prunella vulgaris*	self-heal	N	Variety of medicinal uses
C	*Pteridium aquilinum*	bracken fern	N	Edible rootstock and fiddleheads, with caution (Turner, 1995)
C	*Ranunculus repens*	creeping buttercup	I	
C	*Rubus ursinus*	trailing blackberry	N	Edible berries; widespread on site
C	*Rumex acetosella*	sheep sorrel	I	Edible leaves
C	*Scirpus microcarpus*	small-fruited bulrush	N	Dominant in this area; good indicator of polygon extent
C	*Senecio vulgaris*	common groundsel	I	*S. sylvaticus* may also be present
C	*Silene coronaria*	rose campion	I	
C	*Sonchus asper*	prickly sow-thistle	I	Edible, bitter herb
C	*Stellaria graminea*	common starwort	N	
C	*Trientalis latifolia*	starflower	N	Several individuals at base of Grandmother Cedar
C	*Torilis arvensis*	hedge parsley	I	*T. japonica* may also be present
C	*Urtica dioica*	stinging nettles	N	Edible leaves, after cooking / maceration / drying
C	*Vicia sativa*	common vetch	I	
D	*Kindbergia oregana*	Oregon beaked moss	N	Growing on ground, rocks, and wood
D	*Polytrichum spp.*	haircap moss	N	Growing in exposed soil near ridge top; on old wood?

Graminoids and Forbs

Table 10: Introduced graminoid and forb inventory of the NPFF site; can be managed as a group.

Latin Name	Common Name	Notes
Agrostis capillaris	colonial bentgrass	Scattered throughout the site
Carex sp.	unidentified sedge #1	Will identify by Oct. 2017
Carex sp.	unidentified sedge #2	Will identify by Oct. 2017
Dactylis glomerata	orchard grass	Scattered throughout the site
Galium aparine	cleavers	Scattered throughout the site
Geranium molle	dovesfoot geranium	Infrequent on north half of site
Holcus lanatus	velvet grass	Scattered throughout the site
Hypochaeris radicata	cat's-ear	Dominant groundcover on south half of site
Juncus effusus	common rush	Dominant groundcover on north half of site
Mycelis muralis	wall lettuce	Infrequent but scattered across site
Plantago lanceolata	English plantain	Frequent across the south half of the site on compacted areas
Poaceae sp.	unidentified grass #1	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #2	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #3	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #4	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #5	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #6	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #7	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #8	Will identify by Oct. 2017
Poaceae sp.	unidentified grass #9	Will identify by Oct. 2017
Ranunculus repens	creeping buttercup	Frequent across the north half of the site
Rumex acetosella	sheep sorrel	Infrequent but scattered across site
Senecio vulgaris	common groundsel	Infrequent but scattered across site
Sonchus asper	prickly sow-thistle	Infrequent but scattered across site
Torilis arvensis	hedge parsley	Scattered throughout the site
Vicia sativa	common vetch	Infrequent but scattered across site

Quadrat Vegetation Species Inventories

Table 11: Baseline plant species inventory for NPFF site with vegetation layer (A=tree, B=woody perennial, C=herbaceous, D=moss), percent cover, and notes, by quadrat (see Figure 4 for quadrat locations). Species in blue are considered edible; species in green are considered marginally edible or medicinal. Survey conducted 10/18/2016.

Quadrat	L	Species	%	Notes
1	B	*Gaultheria shallon*	17	Edible berries
	B	*Ilex aquifolium*	3	Recommend immediate removal
	C	*Hypochaeris radicata*	15	
	C	*Poaceae spp.*	15	Unidentified grasses
	C	*Cirsium arvense*	10	Edible peeled roots and stalk
	C	*Agrostis capillaris*	10	
	C	*Bromus carinatus*	10	
	C	*Rubus ursinus*	5	Edible berries
	C	*Pteridium aquilinum*	5	Edible rootstock and fiddleheads, with caution (Turner, 1995)
	C	*Dactylis glomerata*	5	
	C	*Rumex acetosella*	3	Edible leaves
	C	*Juncus effusus*	2	
	C	*Arctium lappa*	<1	Edible and medicinal roots, peeled
	C	*Vicia spp.*	<1	
2	B	*Gaultheria shallon*	10	Edible berries
	B	*Lonicera hispidula*	10	
	B	*Rubus leucodermis*	5	Edible berries
	B	*Ilex aquifolium*	<1	Recommend immediate removal
	C	*Pteridium aquilinum*	60	Dominant in this area; good indicator of polygon extent
	C	*Hypochaeris radicata*	10	
	C	*Bromus carinatus*	10	
	C	*Rubus ursinus*	5	Edible berries
	C	*Dactylis glomerata*	5	
	C	*Cirsium vulgare*	5	Edible peeled roots and stalk
	C	*Cirsium arvense*	5	Edible peeled roots and stalk
	C	*Ranunculus repens*	5	
	C	*Poaceae spp.*	5	Unidentified grasses
	C	*Digitalis purpurea*	2	
	C	*Mycelis muralis*	2	

Quadrat	L	Species	%	Notes
	C	*Polystichum munitum*	1	Edible rootstock, according to Turner (1995)
	C	*Juncus effusus*	1	
	C	*Vicia spp.*	<1	
	C	*Galium aparine*	<1	Tea herb
	C	*Achlys triphylla*	<1	Tea herb; produces pleasing insect repellent odor when dried
3	B	*Rubus leucodermis*	3	Edible berries
	B	*Gaultheria shallon*	2	Edible berries
	B	*Alnus rubra*	<1	Saplings; edible cambium, according to Turner (1995)
	C	*Agrostis capillaris*	60	
	C	*Juncus effusus*	50	
	C	*Equisetum telmateia*	10	Tea herb
	C	*Poaceae spp.*	5	Unidentified grasses
	C	*Ranunculus repens*	5	
	C	*Holcus lanatus*	5	
	C	*Cirsium arvense*	3	Edible peeled roots and stalk
	C	*Pteridium aquilinum*	1	Edible rootstock and fiddleheads, with caution (Turner, 1995)
4	B	*Gaultheria shallon*	10	Edible berries
	B	*Rubus spectabilis*	5	Edible berries
	B	*Rubus laciniatus*	3	Recommend immediate removal; edible berries
	B	*Rubus leucodermis*	2	Edible berries
	B	*Alnus rubra*	<1	Saplings; edible cambium, according to Turner (1995)
	C	*Scirpus microcarpus*	60	Dominant in this area; good indicator of polygon extent
	C	*Juncus effusus*	20	
	C	*Equisetum telmateia*	10	Tea herb
	C	*Elymus repens*	10	
	C	*Holcus lanatus*	10	
	C	*Polystichum munitum*	5	Edible rootstock, according to Turner (1995)
	C	*Rubus ursinus*	5	Edible berries
	C	*Poaceae spp.*	5	Unidentified grasses
	C	*Agrostis capillaris*	5	
	C	*Galium spp.*	3	Probably G. aparine; may be G. trifidum; tea herb
	C	*Cirsium arvense*	3	Edible peeled roots and stalk
	C	*Digitalis purpurea*	3	
	C	*Urtica dioica*	2	Edible leaves, after cooking / maceration / drying

Quadrat	L	Species	%	Notes
	C	*Athyrium filix-femina*	2	Edible rootstock, according to Turner (1995)
	C	*Epilobium angustifolium*	<1	Edible shoots
	C	*Vicia spp.*	<1	
5	B	*Gaultheria shallon*	25	Edible berries
	B	*Lonicera hispidula*	10	
	B	*Rubus leucodermis*	5	Edible berries
	B	*Thuja plicata*	2	Saplings
	C	*Polystichum munitum*	60	Edible rootstock, according to Turner (1995)
	C	*Bromus carinatus*	20	
	C	*Hypochaeris radicata*	10	
	C	*Rubus ursinus*	10	Edible berries
	C	*Anaphalis margaritacea*	5	Medicinal foliage and flowers
	C	*Digitalis purpurea*	3	
	C	*Cirsium arvense*	3	Edible peeled roots and stalk
	C	*Elymus glaucus*	3	
	C	*Torilis arvensis*	2	
	C	*Silene coronaria*	<1	
	C	*Cirsium vulgare*	<1	Edible peeled roots and stalk
	D	*Polytrichum spp.*	5	Growing in exposed soil near ridge top; on old wood?
6	B	*Rubus leucodermis*	3	Edible berries
	B	*Thuja plicata*	2	Saplings
	C	*Agrostis capillaris*	60	
	C	*Poaceae spp.*	20	Unidentified grasses
	C	*Plantago lanceolata*	15	Good indicator of compaction; edible leaves and seeds
	C	*Cirsium arvense*	10	Edible peeled roots and stalk
	C	*Juncus effusus*	10	
	C	*Hypochaeris radicata*	10	
	C	*Pteridium aquilinum*	5	Edible rootstock and fiddleheads, with caution (Turner, 1995)
	C	*Polystichum munitum*	5	Edible rootstock, according to Turner (1995)
	C	*Ranunculus repens*	5	
	C	*Bromus carinatus*	5	
	C	*Vicia spp.*	<1	
7	A	*Thuja plicata*	4	Grandmother Cedar

Quadrat	L	Species	%	Notes
	A	*Arbutus menziesii*	1	Lone Pacific madrone with missing top; edible berries
	B	*Gaultheria shallon*	5	Edible berries
	B	*Lonicera hispidula*	3	
	C	*Hypochaeris radicata*	30	
	C	*Bromus carinatus*	15	
	C	*Poaceae spp.*	15	Unidentified grasses
	C	*Agrostis capillaris*	10	
	C	*Rubus ursinus*	5	Edible berries
	C	*Silene coronaria*	3	
	C	*Polystichum munitum*	2	Edible rootstock, according to Turner (1995)
	C	*Pteridium aquilinum*	2	Edible rootstock and fiddleheads, with caution (Turner, 1995)
	C	*Digitalis purpurea*	2	
	C	*Geranium molle*	2	
	C	*Galium aparine*	2	Tea herb
	C	*Mycelis muralis*	2	
	C	*Torilis arvensis*	2	
	C	*Ranunculus repens*	2	
	C	*Cirsium arvense*	1	Edible peeled roots and stalk
	C	*Cirsium vulgare*	1	Edible peeled roots and stalk
	C	*Vicia spp.*	<1	
8	A	*Pseudotsuga menziesii*	20	Edible cambium, according to Turner (1995)
	A	*Thuja plicata*	10	
	A	*Alnus rubra*	5	Edible cambium, according to Turner (1995)
	B	*Berberis nervosa*	15	Present above cliff; edible berries, medicinal rhizomes
	B	*Gaultheria shallon*	10	Edible berries
	B	*Lonicera hispidula*	10	
	B	*Rubus leucodermis*	10	Edible berries
	B	*Holodiscus discolor*	5	Present above cliff
	B	*Paxistima myrsinites*	5	Present above cliff
	B	*Ilex aquifolium*	<1	Recommend immediate removal
	C	*Polystichum munitum*	10	Edible rootstock, according to Turner (1995)
	C	*Torilis arvensis*	10	
	C	*Elymus glaucus*	10	
	C	*Poaceae spp.*	10	Unidentified grasses

Quadrat	L	Species	%	Notes
	C	*Digitalis purpurea*	5	
	C	*Cirsium vulgare*	5	Edible peeled roots and stalk
	C	*Mycelis muralis*	2	
	C	*Heuchera micrantha*	<1	Present in cliff face; medicinal roots
	D	*Kindbergia oregana*	20	Growing on ground, rocks, and wood

Quadrat Soil Pits and Landscape Context

The following eight pages consist of images of the soil pits and landscape context for each of the eight site assessment quadrats, taken October 18, 2016. See Figure 4 for Quadrat locations on site.

Figure 38: Soil pit for Quadrat 1, showing presence of rounded and angular fragments, charcoal layer, and loamy sand horizon; water table visible bottom right.

Figure 39: Landscape context of Quadrat 1, a gently sloping upper drainage blanketed in shrubs, grasses, and forbs.

Figure 40: Soil pit for Quadrat 2, showing enriched Ah horizon, loamy sand B horizon, and charcoal layer.

Figure 41: Landscape context for Quadrat 2, a gently sloping middle drainage dominated by bracken fern.

Figure 42: Soil pit for Quadrat 3, showing increasing dominance of finer sediments, gleying, and water table.

Figure 43: Landscape context for Quadrat 3, a very gentle lower slope dominated by common rush, horsetails, and grasses.

Figure 44: Soil pit for Quadrat 4, showing extensive gleying, heavy silt and clay, and high water table.

Figure 45: Landscape context for Quadrat 4, a slight depression in a flat plain dominated by small-fruited bulrush.

Figure 46: Soil pit for Quadrat 5, showing high coarse fragment content and sandstone bedrock within 60 cm of surface.

Figure 47: Landscape context for Quadrat 5, a moderately sloping north-facing slope blanketed with shrubs and ferns.

Figure 48: Soil pit for Quadrat 6, showing compaction, dominance of finer particles, charcoal layer, mottling, and water table.

Figure 49: Landscape context for Quadrat 6, a gently sloping drainage compacted by machinery and blanketed in grasses.

Figure 50: Soil pit for Quadrat 7, showing high mixed fragment content, loamy sand horizon, charcoal layer, and sandstone bedrock.

Figure 51: Landscape context for Quadrat 7, a gently sloping drainage blanketed by grasses adjacent to and including the Grandmother Cedar, top left.

Figure 52: Soil pit for Quadrat 8, showing enriched LFH and Ah horizons, high coarse fragment content, and sandstone bedrock at 50 cm.

Figure 53: Landscape context for Quadrat 8, a moderate southwest-facing slope beneath a 2-5 m high sandstone cliff (inset); vegetation includes mature Douglas-fir and red alder.

Non-comprehensive Wildlife Species List

Table 12: Vertebrate species observed by the author making use of the site between 2016 and 2017, with notes.

Class	Latin Name	Common Name	Notes
Mammalia	*Odocoileus hemionus*	mule deer	Significant evidence of browsing throughout site
Aves	*Bombycilla cedrorum*	cedar waxwing	Frequently seen and heard in groups
	Buteo jamaicensis	red-tailed hawk	Frequently seen flying overhead
	Cathartes aura	turkey vulture	Frequently seen flying overhead
	Catharus ustulatus	Swainson's thrush	Frequently heard in trees; rarely seen
	Colaptes auratus	northern flicker	Frequently seen and heard; uses wildlife trees
	Contopus cooperi	olive-sided flycatcher	Occasionally heard in trees; rarely seen
	Empidonax difficilis	Pacific-slope flycatcher	Frequently heard in trees; rarely seen
	Empidonax hammondii	Hammond's flycatcher	Frequently heard in trees; rarely seen
	Empidonax traillii	willow flycatcher	Frequently heard in trees; rarely seen
	Haliaeetus leucocephalus	bald eagle	Frequently seen flying overhead
	Hirundo rustica	barn swallow	Frequently seen flying overhead
	Junco hyemalis	dark-eyed junco	Frequently seen and heard
	Melospiza melodia	song sparrow	Frequently seen and heard
	Pipilo maculatus	spotted towhee	Occasionally seen and heard
	Piranga ludoviciana	western tanager	Occasionally seen and heard during the summer
	Poecile rufescens	chestnut-backed chickadee	Frequently seen and heard
	Selasphorus rufus	rufous hummingbird	Occasionally seen and heard
	Spinus pinus	pine siskin	Frequently seen and heard
	Spinus tristis	American goldfinch	Frequently seen and heard during the summer
	Tachycineta bicolor	tree swallow	Frequently seen flying overhead
	Tachycineta thalassina	violet-green swallow	Frequently seen flying overhead
	Troglodytes aedon	house wren	Frequently seen; nests in Grandmother Cedar
	Troglodytes pacificus	Pacific wren	Occasionally heard in the trees
	Turdus migratorius	American robin	Frequently seen and heard
	Zonotrichia leucophrys	white-crowned sparrow	Frequently seen and heard

Appendix B: Proposed Plant Lists

Proposed Planting Area Specific Plant Lists

Table 13: Garry oak Meadow Garden planting area proposed planting list.

Status	Latin Name	Common Name	Notes
Phase 1	*Achillea millefolium*	yarrow	Meadow swales
	Allium cernuum	nodding onion	Meadow swales
	Amelanchier alnifolia	Saskatoon berry	Peripheral hedgerows; scattered plantings
	Arbutus menziesii	Pacific madrone / arbutus	Rocky, dry peripheral areas
	Arctostaphylos columbiana	hairy manzanita	Southwest corner of site
	Berberis aquifolium	tall Oregon grape	Peripheral hedgerows; scattered plantings
	Berberis nervosa	dull Oregon grape	Southeast corner of site; transitional to Northeast Slope planting area
	Camassia leichtlinii	great camas	Meadow swales
	Camassia quamash	common camas	Meadow swales
	Dodecatheon spp.	shooting star	Meadow swales
	Festuca roemeri	Roemer's fescue	Meadow swales; nursery stock can be divided
	Lomatium nudicaule	barestem desert-parsley	Meadow swales
	Quercus garryana	Garry oak	Spaced evenly across planting area
	Rubus leucodermis	blackcap raspberry	Scattered plantings
	Shepherdia canadensis	soopolallie	Scattered plantings
	Sisyrinchium idahoense	Idaho blue-eyed grass	Meadow swales
	Vaccinium parvifolium	red huckleberry	On select nurse stumps
Optional	*Arctostaphylos uva-ursi*	kinnikinnick	Consider establishing as groundcover near entrance
	Claytonia perfoliata	miner's lettuce	Consider including on meadow swales
	Collinsia parviflora	blue-eyed Mary	Consider including on meadow swales
	Fritillaria lanceolata	chocolate lily	Consider including on meadow swales

Status	Latin Name	Common Name	Notes
	Holodiscus discolor	oceanspray	On rocky, dry parts of site
	Lomatium utriculatum	spring gold	Consider including on meadow swales
	Oemleria cerasiformis	osoberry	Companion plant for Garry oak trees
	Perideridia gairdneri	Gairdner's yampah	Consider including on meadow swales
	Plectritis congesta	sea blush	Consider including on meadow swales
	Prunus emarginata	bitter cherry	On rocky, dry parts of site; when all else fails
	Ranunculus occidentalis	western buttercup	Consider including on meadow swales
	Symphoricarpos albus	snowberry	Companion plant for Garry oak trees
	Triteleia hyacinthina	fool's onion	Consider including on meadow swales

Figure 54: Proposed locations of Garry oak Meadow Garden swale berms, with pathways serving as depressions. Relative proportions and positions will shift based on spatial considerations and contour. Swales can be established over time as desired, depending on the success of the initial plantings. Stumps can be removed or incorporated into berms.

Table 14: Core planting area proposed plant list.

Status	Latin Name	Common Name	Notes
Phase 1	*Amelanchier alnifolia*	Saskatoon berry	Scattered plantings on drier areas
	Artemisia suksdorfii	coastal mugwort	Periphery of learning circle
	Berberis aquifolium	tall Oregon grape	Scattered plantings on drier areas
	Berberis nervosa	dull Oregon grape	Transitional to Northeast Slope planting area
	Clinopodium douglasii	yerba buena	Periphery of learning circle
	Fragaria vesca	woodland strawberry	Periphery of learning circle
	Polypodium glycyrrhiza	licorice fern	On shady side of select nurse stumps
	Prunus emarginata	bitter cherry	Scattered across area
	Ribes divaricatum	wild gooseberry	Production plantings in favourable areas
	Ribes sanguineum	red-flowering currant	Transitional to Northeast Slope planting area
	Rosa gymnocarpa	baldhip rose	Transitional to Northeast Slope planting area
	Rubus leucodermis	blackcap raspberry	Scattered plantings
	Shepherdia canadensis	soopolallie	Production plantings in favourable areas
	Vaccinium ovatum	evergreen huckleberry	Production plantings in favourable areas
	Vaccinium parvifolium	red huckleberry	On select nurse stumps
Optional	*Cerastium arvense*	field chickweed	Consider including on periphery of learning circle
	Holodiscus discolor	oceanspray	On rocky, dry parts of site
	Lilium columbianum	tiger lily	Consider including on periphery of learning circle
	Linnaea borealis	twinflower	Consider including on select nurse stumps
	Philadelphus lewisii	mock-orange	For ornamental value near learning circle
	Rubus ursinus	trailing blackberry	Consider including on select nurse stumps

Table 15: Southwest Slope planting area proposed plant list.

Status	Latin Name	Common Name	Notes
Phase 1	*Amelanchier alnifolia*	Saskatoon berry	Hedgerow along ridgeline
	Berberis aquifolium	tall Oregon grape	Hedgerow along ridgeline
	Rubus leucodermis	blackcap raspberry	Scattered plantings
	Vaccinium ovatum	evergreen huckleberry	Production plantings along base of slope and paths
	Vaccinium parviflorum	red huckleberry	On select nurse stumps
Optional	*Arctostaphylos columbiana*	hairy manzanita	Consider establishing on ridgeline
	Arctostaphylos uva-ursi	kinnikinnick	Consider establishing as ridgeline groundcover
	Brodiaea coronaria	crown brodiaea	Consider establishing as ridgeline groundcover
	Eriophyllum lanatum	woolly sunflower	Consider establishing as ridgeline groundcover
	Holodiscus discolor	oceanspray	On rocky, dry parts of site
	Paxistima myrsinites	falsebox	Consider establishing on ridgeline
	Prunus emarginata	bitter cherry	On rocky, dry parts of site; when all else fails
	Pseudotsuga menziesii	Douglas-fir	Consider establishing a few if recruitment is poor
	Taxus brevifolia	Pacific yew	Consider if unsuccessful elsewhere

Table 16: Northeast Slope planting area proposed plant list.

Status	**Latin Name**	**Common Name**	**Notes**
Phase 1	*Abies grandis*	grand fir	On or near CwBg - Foamflower area
	Acer macrophyllum	bigleaf maple	On northern half of area
	Berberis nervosa	dull Oregon grape	On rocky parts of southern half of area
	Heracleum maximum	cow parsnip	On or near CwBg - Foamflower area
	Oemleria cerasiformis	osoberry	On or near CwBg - Foamflower area
	Ribes divaricatum	wild gooseberry	Transitional from Core planting area
	Ribes sanguineum	red-flowering currant	On southern half of area, with as much shade as possible
	Rosa gymnocarpa	baldhip rose	On southern half of area, with as much shade as possible
	Rubus leucodermis	blackcap raspberry	Scattered plantings
	Rubus parviflorus	thimbleberry	On or near CwBg - Foamflower area
	Taxus brevifolia	Pacific yew	Grove on periphery of CwBg - Foamflower area
	Vaccinium ovatum	evergreen huckleberry	Transitional from Core planting area
	Vaccinium parviflorum	red huckleberry	On select nurse stumps
	Viburnum edule	highbush cranberry	On CwBg - Foamflower area
Optional	*Acer douglasii*	Douglas maple	Consider on rocky parts of southern half of area
	Achlys triphylla	vanilla leaf	Consider on CwBg - Foamflower area
	Cardamine nuttallii	Nuttall's toothwort	Consider in shady areas after trees mature
	Cornus nuttallii	western dogwood	Consider on CwBg - Foamflower area
	Corylus cornuta cornuta	beaked hazelnut	Consider on rocky parts of southern half of area
	Heuchera micrantha	crevice alumroot	Consider on rocky parts of southern half of area
	Holodiscus discolor	oceanspray	On rocky, dry parts of site
	Lonicera hispidula	hairy honeysuckle	Consider on rocky parts of southern half of area
	Osmorhiza berteroi	mountain sweet cicely	Consider in shady areas after trees mature
	Prunus emarginata	bitter cherry	On rocky, dry parts of site; when all else fails
	Tsuga heterophylla	western hemlock	Consider in appropriate location

Table 17: Basin planting area proposed plant list.

Status	Latin Name	Common Name	Notes
Phase 1	*Acer macrophyllum*	bigleaf maple	Along northeastern periphery
	Crataegus douglasii	black hawthorn	On southern half of area
	Epilobium angustifolium	fireweed	Scattered individuals to create seedbank
	Lysichiton americanus	skunk cabbage	Small planting in *Scirpus microcarpus* patch
	Malus fusca	Pacific crabapple	Grove on northern half of area
	Rhamnus purshiana	cascara	Grove on northern half of area
	Rosa nutkana	Nootka rose	Several thickets on northern half of area
	Rubus parviflorus	thimbleberry	Production plantings on southern half of area
	Rubus spectabilis	salmonberry	Production plantings on northern half of area
	Sambucus nigra caerulea	blue elderberry	Production planting on southern half of area
	Salix scouleriana	Scouler's willow	Scattered to provide shade
	Sambucus racemosa	red elderberry	Grove on northern half of area
	Spiraea douglasii	hardhack	Thicket on northern half of area
	Vaccinium parvifolium	red huckleberry	On select nurse stumps
Optional	*Aquilegia formosa*	western columbine	Consider as part of future herbaceous marsh garden
	Cornus sericea	red-stem dogwood	On northern half of area
	Erythranthe guttatus	yellow monkeyflower	Consider as part of future herbaceous marsh garden
	Lonicera involucrata	twinberry	On northern half of area
	Myrica gale	sweet gale	Consider on wettest part of site
	Oemleria cerasiformis	osoberry	On southern half of area
	Oenanthe sarmentosa	water parsley	Consider in *Scirpus microcarpus* patch
	Physocarpus capitatus	Pacific ninebark	On northern half of area
	Populus trichocarpa	black cottonwood	Consider along northern fenceline
	Potentilla anserina pacifica	Pacific silverweed	Consider as part of future herbaceous marsh garden
	Trifolium wormskioldii	streambank clover	Consider as part of future herbaceous marsh garden
	Viola glabella	stream violet	Consider as part of future herbaceous marsh garden

Seed Mixes for Exposed Soil

Table 18: Seed mix for southern (dry) half of site, with proportions.

Latin Name	Common Name	Proportion	Notes
Achnatherum lemmonii	Lemmon's needlegrass	10%	Still need source
Bromus carinatus	California brome	20%	GCA - collect from LC
Cerastium arvense	field chickweed	5%	Still need source
Clarkia amoena	farewell-to-spring	5%	SNP $10.00 / g
Claytonia perfoliata	miner's lettuce	10%	SNP $0.55 / g
Elymus glaucus	blue wild rye	10%	SNP $1.50 / g
Epilobium densiflorum	dense-flowered willowherb	5%	GCA - collect from LC
Festuca roemeri	Roemer's fescue	10%	GCA - collect from nursery
Lupinus bicolor	bicolored lupin	5%	SNP $8.00 / g
Lupinus polycarpus	small-flowered lupin	5%	SNP $6.50 / g
Ranunculus occidentalis	western buttercup	10%	SNP $5.00 / g
Triteleia hyacinthina	fool's onion	5%	SNP $6.00 / g

Table 19: Seed mix for northern (wet) half of site, with proportions.

Latin Name	Common Name	Proportion	Notes
Claytonia perfoliata	miner's lettuce	10%	SNP $5.25 / g
Deschampsia cespitosa	tufted hairgrass	20%	SNP $.055 / g
Epilobium angustifolium	fireweed	10%	GCA - collect from LC
Erythranthe guttatus	yellow monkeyflower	10%	SNP $9.00 / g
Hordeum brachyantherum	meadow barley	10%	SNP $0.50 / g
Plectritis congesta	sea blush	10%	GCA - collect from nursery
Solidago lepida	Canada goldenrod	10%	SNP $5 / g
Stachys chamissonis	Cooley's hedge nettle	10%	SNP $5.50 / g
Symphyotrichum subspicatum	Douglas' aster	10%	SNP $4 / g

Comprehensive Phase 1 Plant List

Table 20: Proposed planting list for NPFF by layer, including alternative names, site status (A=absent from site but present on Galiano, P=present on site, O=absent from Galiano but native to SGLs), parts of plant used, compatible site series (*italics* indicates compatibility with some site modification), appropriate zones, desired quantity, and notes. Hul'qumi'num names are referenced from Seymour (n.d.).

Layer	Hul'qumi'num Name	Latin Name	Common Name	Status	Edible Parts	Medicinal Parts	Useful Parts	Site Series	Zone	Quantity	Notes
TREE	t'a'hw	*Abies grandis*	grand fir	A	Spring Tips	-	Boughs	DG, RF	4-5	3	
	q'umun'ulhp	*Acer macrophyllum*	bigleaf maple	A	Flowers	-	Bark, Wood	RC, RF	4-5	3	
	kwulala'ulhp	*Alnus rubra*	red alder	P	Cambium	Bark	-	RC, RF, DG	3-5	-	On-site recruits; Nitrogen Fixer
	qaanlhp	*Arbutus menziesii*	Pacific madrone	P	Berries	-	Wood	*DO, RK*	1	3	
	metthun'ulp	*Crataegus douglasii*	black hawthorn	A	Haws	Flowers, Fruit	-	RC, RF	2-5	3	
	qwa'upulhp	*Malus fusca*	Pacific crabapple	A	Crabapples	-	-	RC, RF	2-5	5	
		Prunus emarginata	bitter cherry	A	Cherries	Bark	Wood	DG, DO, RK	1-4	5	
	ts'sey'	*Pseudotsuga menziesii*	Douglas-fir	P	Spring Tips	-	Bark, Wood	DG, DO, RF, RK	4-5	-	On-site recruits
	p'hwulhp	*Quercus garryana*	Garry oak	A	Acorns	-	Bark, Wood	*DO, RK*	1	5	
	qey'hulp	*Rhamnus purshiana*	cascara	A	-	Bark	-	RC, RK	4-5	3	
		Salix scouleriana	Scouler's willow	A	-	-	Twigs	RC, RK, RF	4-5	3	
	tuxwa'tsulhp	*Taxus brevifolia*	Pacific yew	P	Aril	Bark	Wood	RC, RF, RK	3-5	2	
	xpey'	*Thuja plicata*	western redcedar	P	-	Foliage	Bark, Wood	DG, RC, RF, RK	2-5	-	On-site recruits
SHRUB	tushnets	*Amelanchier alnifolia*	Saskatoon berry	A	Berries	-	-	DO, DG, RK	1-3	15	
	qi'qun'aanlhp	*Arctostaphylos columbiana*	hairy manzanita	A	Berries	-	-	DO, RK	1	1	
	luluts'ulhp	*Berberis aquifolium*	tall Oregon grape	A	Berries	Root Bark	-	DO, DG, RK	1-3	25	Excess plants in nursery

Layer	Hul'qumi'num Name	Latin Name	Common Name	Status	Edible Parts	Medicinal Parts	Useful Parts	Site Series	Zone	Quantity	Notes
	sunii'ulhp	*Berberis nervosa*	dull Oregon grape	P	Berries	Root Bark	-	DG, RF, RK	3-5	15	Excess plants in nursery
	t'eqe'	*Gaultheria shallon*	salal	P	Berries	-	Foliage	DG, RC, RF, RK	2-5	-	On-site recruits
	tth'uxwun'	*Oemleria cerasiformis*	osoberry	A	Plums	-	-	RC, RK	1-3	5	
	t'em'hw	*Ribes divaricatum*	wild gooseberry	A	Berries	-	-	*RK*	1-3	15	
	sqwuliius	*Ribes sanguineum*	red-flowering currant	A	Currants	-	-	DG, RF, RK	1-3	5	
	qel'qulhp	*Rosa gymnocarpa*	baldhip rose	A	Rose Hips	Petals	-	DG	4-5	5	Excess plants in nursery
	qel'qulhp	*Rosa nutkana*	Nootka rose	A	Rose Hips	Petals	-	RC, RF	3-4	15	Excess plants in nursery
	culqáma'	*Rubus leucodermis*	blackcap raspberry	P	Berries	-	-	DO, DG, RC, RF, RK	3-5	20	Also on-site recruits
	t'uqwum'	*Rubus parviflorus*	Thimbleberry	A	Berries, Shoots	-	-	RC, RF, RK	1-3	15	
	lila'ulhp	*Rubus spectabilis*	salmonberry	P	Berries, Shoots	Leaves	-	RC, RF, RK	2-5	20	Excess plants in nursery
	†huykwikw	*Sambucus nigra caerulea*	blue elderberry	O	Flowers, Berries	Flowers, Berries	Wood	*RK*	1-3	5	Consider introducing
	tth'iwuq'	*Sambucus racemosa*	red elderberry	A	Flowers, Berries	Flowers, Berries	Wood	RC, RF, RK	3-5	3	
	sxwesum	*Shepherdia canadensis*	soopolallie	A	Berries	-	-	*DO, RK*	1	15	Nitrogen Fixer
	t'eets'ulhp	*Spiraea douglasii*	hardhack	A	-	Leaves	-	RC	4-5	3	
		Vaccinium ovatum	evergreen huckleberry	P	Berries	-	-	DG, RF, RK	1-3	15	

Layer	Hul'qumi'num Name	Latin Name	Common Name	Status	Edible Parts	Medicinal Parts	Useful Parts	Site Series	Zone	Quantity	Notes
	sqw'uqwtsus	*Vaccinium parvifolium*	red huckleberry	P	Berries	-	-	RC, RF, RK	1-4	10	Stump plantings
		Viburnum edule	highbush cranberry	O	Berries	-	-	RC, RF, RK	1-3	5	Consider introducing
HERB		*Achillea millefolium*	yarrow	A	-	Whole Plant	-	*RK*, DO, DG	1-3	15	Meadow swales
		Artemisia douglasii	coastal mugwort	A	-	Whole Plant	-	*RK*, DO, DG	1-2	5	Learning circle
		Dodecatheon spp.	shooting star	O	Greens	-	-	*RK*		25	Meadow swales
	lulutthulp	*Epilobium angustifolium*	fireweed	P	Shoots	Whole Plant	-	DG, RC, RF, RK	3-5	5	
		Festuca roemeri	Roemer's fescue	A	-	-	-	*RK*, DO, DG	1	20	Meadow swales; excess plants in nursery
	yaala'	*Heracleum maximum*	cow parsnip	O	Shoots, Seeds	-	-	RF, RK	2-5	5	Consider introducing
	q'uxmin	*Lomatium nudicaule*	barestem desert-parsley	O	Greens, Seeds	Whole Plant	Seeds	*RK*, DO, RK	1	25	Meadow swales
	ts'a'kw'a'	*Lysichiton americanus*	skunk cabbage	A	Root	Root	Leaves	RC	4-5	3	
	tl'usip	*Polypodium glycyrrhiza*	licorice fern	A	-	Rhizome	-	RC, RK	1-3	5	Stump plantings
	sqw'iil'muhw	*Rubus ursinus*	trailing blackberry	P	Berries	Leaves	-	DG, RC, RF, RK	1-5	-	On-site recruits
		Sisyrinchium idahoense	Idaho blue-eyed grass	A	-	-	-	*RK,* DO, DG	1	20	Meadow swales
	tth'uxtth'ux	*Urtica dioica*	stinging nettles	P	Greens, Seeds	Whole Plant	Stems	RC, RF, RK	3-5	-	On-site recruits

Layer	Hul'qumi'num Name	Latin Name	Common Name	Status	Edible Parts	Medicinal Parts	Useful Parts	Site Series	Zone	Quantity	Notes
GROUND		*Clinopodium douglasii*	yerba buena	A	Foliage	Leaves	-	DG, RF, RK	1-5	5	Learning circle
	stsi'yu	*Fragaria vesca*	woodland strawberry	A	Berries	-	-	DG, RF, RK	1-2	20	Learning circle
GEO		*Allium cernuum*	nodding onion	A	Greens, Bulbs	-	-	DO, RK	1	25	Excess plants in nursery
	speenhw	*Camassia quamash*	common camas	A	Corms	-	-	DO, RK	1	50	Meadow swales
	speenhw	*Camassia leichtlinii*	great camas	A	Corms	-	-	DO, RK	1	50	Meadow swales

Figure 55: Panorama of proposed NPFF design in 10-15 years, viewed from the southwest; northwest gate is at far left, southeast gate at far right

Appendix C: Budget

Project Budget

Table 21: Abbreviated budget for NPFF, not including staff, overhead, or planning; some values are simplified.

Category	**Item**	**Price per**	**Quantity**	**Price Total**	**Source**
Consultation	AMES	$250	5	$1250	
	Facility	$150	1	$150	
	Food	$15	20	$300	
	Honorariums (Galiano)	$160	8	$1280	
	Honorariums (Penelakut)	$500	4	$2000	
	Transportation	$100	4	$400	
Documentation	AMES	$250	10	$2500	
	Editing	$250	5	$1250	
	Educators	$200	10	$2000	
	Equipment	-	-	$2500	
	Facility	$255	2	$510	
	Food	$15	60	$900	
	Honorariums (Galiano)	$160	6	$960	
	Honorariums (Penelakut)	$500	4	$2000	
	Mentors	$200	12	$2400	
	Transportation	$150	6	$900	
	Website / Social Media	-	-	$500	
Interpretation	Art & Installation	-	-	$3000	
	Printing	-	-	$1200	
	Sign / Map Design	-	-	$1000	
Materials	Burlap	-	-	$300	

Category	Item	Price per	Quantity	Price Total	Source
	Fencing	$10	300	$3000	
	Gate materials	-	-	$500	
	GPS / GIS	$200	5	$1000	
	Hosing	$200	1	$200	
	Learning circle cover	-	-	$1800	
	Mulch	-	-	$300	
	Soil amendments	-	-	$300	
	Stakes & Flagging	$0.25	500	$125	
	Tools (Monitoring)	-	-	$2000	
	Tools (Restoration)	-	-	$2500	
	Wood Chips	-	-	$900	
Plants - Trees	*Abies grandis*	$10.00	3	$30.00	Fraser Thimble Farms (FTF)
	Acer macrophyllum	$20.00	3	$60.00	Galiano Conservancy (GCA)
	Alnus rubra	$10.00	0	$0.00	GCA
	Arbutus menziesii	$10.00	3	$30.00	GCA
	Crataegus douglasii	$20.00	3	$60.00	GCA
	Malus fusca	$15.00	5	$75.00	Saanich Native Plants (SNP)
	Prunus emarginata	$10.00	5	$50.00	Still need source
	Pseudotsuga menziesii	$10.00	0	$0.00	GCA
	Quercus garryana	$20.00	5	$100.00	GCA
	Rhamnus purshiana	$10.00	3	$30.00	FTF
	Salix scouleriana	$10.00	3	$30.00	GCA
	Taxus brevifolia	$15.00	3	$45.00	Still need source
	Thuja plicata	$10.00	0	$0.00	GCA
Plants - Shrubs	*Amelanchier alnifolia*	$10.00	15	$150.00	GCA
	Arctostaphylos columbiana	$20.00	3	$60.00	cbarett.chris@gmail.com

Category	Item	Price per	Quantity	Price Total	Source
	Berberis aquifolium	$5.00	25	$125.00	GCA
	Berberis nervosa	$10.00	15	$150.00	GCA
	Gaultheria shallon	$4.00	0	$0.00	FTF
	Oemleria cerasiformis	$10.00	4	$40.00	GCA
	Ribes divaricatum	$10.00	15	$150.00	FTF
	Ribes sanguineum	$10.00	5	$50.00	GCA
	Rosa gymnocarpa	$10.00	5	$50.00	GCA
	Rosa nutkana	$10.00	15	$150.00	GCA
	Rubus leucodermis	$5.00	15	$75.00	GCA
	Rubus parviflorus	$10.00	15	$150.00	GCA?
	Rubus spectabilis	$10.00	20	$200.00	GCA
	Sambucus nigra caerulea	$15.00	5	$75.00	Still need source
	Sambucus racemosa	$20.00	3	$60.00	GCA
	Shepherdia canadensis	$15.00	15	$225.00	Still need source (4 from GCA)
	Spiraea douglasii	$20.00	3	$60.00	GCA
	Vaccinium ovatum	$10.00	15	$150.00	FTF / MIC
	Vaccinium parvifolium	$10.00	10	$100.00	FTF
	Viburnum edule	$10.00	5	$50.00	GCA
Plants - Herbs	*Achillea millefolium*	$3.50	15	$52.50	SNP
	Artemisia suksdorfii	$7.00	5	$35.00	SNP
	Dodecatheon spp.	$4.00	25	$100.00	SNP
	Epilobium angustifolium	$5.00	5	$25.00	Still need source
	Festuca roemeri	$5.00	10	$50.00	GCA
	Heracleum maximum	$7.00	5	$35.00	SNP
	Lomatium nudicaule	$7.00	25	$175.00	SNP
	Lysichiton americanus	$10.00	3	$30.00	SNP
	Polypodium glycyrrhiza	$4.00	5	$20.00	SNP

Category	Item	Price per	Quantity	Price Total	Source
	Rubus ursinus	$4.00	0	$0.00	SNP
	Sisyrinchium idahoense	$5.00	20	$100.00	GCA
Plants - Ground	*Clinopodium douglasii*	$5.00	5	$25.00	GCA
	Fragaria vesca	$3.50	20	$70.00	SNP
Plants - Geo.	*Allium cernuum*	$5.00	25	$125.00	GCA
	Camassia quamash	$3.50	50	$175.00	GCA
	Camassia leichtlinii	$3.50	50	$175.00	GCA
Plants - Seed	Various species	-	-	$500.00	See Appendix B
Plants - TOTAL				$4272.50	
Site Prep	Construction	$200	8	$1600	
	Machine Work	$150	8	$1200	
Project - TOTAL				TBD	

Project Funding

Table 22: Funding sources for the NPFF project.

Source	Amount	In-Kind
Access to Media Society		$2,800
Canada Summer Jobs	$2,090	
Ecoaction Grant	$54,450	
Galiano Conservancy Association	$5,000	$27,770
Gencon Grant	$10,000	
UVic Student Contributions		$5,000
TOTAL	$71,540	$30,575

Appendix D: Timeline

Table 23: Tentative timeline for NPFF project completion.

Date	**Who**	**What**	**Notes**
July 2017	ATH	Complete rough draft of report	Completed
July 2017	ATH; GCA staff	Present report and flag design on site	Completed
August 2017	ATH	Final report submitted to UVic and GCA	Completed
October 6, 2017	ATH; GCA staff; Penelakut FN	Formal workshop and consultation	Scheduled
October 2017	ATH; GCA staff; machine op.	Machine work on site	Scheduled
Sep. - Oct. 2017	ATH; GCA staff	Source nursery stock, materials	In process
October 2017	ATH; GCA staff; volunteers	Fencing and site preparation	TBD
November 2017	ATH; GCA staff; volunteers; students	Final preparation, PP monitoring, and planting	TBD
December 2017	ATH; GCA staff; volunteers	Record plant measurements and observations	TBD
Jan. - Mar. 2018	GCA staff; volunteers	Check for winter die-off; additional planting	TBD
Jan. - May 2018	GCA staff; artists; volunteers; students	Create signage, map, art for site	TBD
May - Aug. 2018	GCA staff; volunteers; summer students	Ongoing monitoring; supplemental watering	TBD
August 2018	GCA staff; Penelakut FN; community	1st Annual Harvest Celebration	TBD
Onwards!	GCA staff; volunteers	Ongoing monitoring and maintenance	Ongoing

Acknowledgements

This project represents the culmination of years of work by GCA staff, students, and community members. Senior members of the GCA staff and board, including the late Ken Millard, laid the foundations and provided the impetus and the inspiration for this project. Since then, GCA staff, including Keith Erickson, Eric Jacobsen, Jenna Falk, Tanya Inglis, Reed Osler, and Cedana Bourne have held this vision, working to further develop upon this foundation and secure funding to proceed.

Dr. Eric Higgs, a professor at the University of Victoria School of Environmental Studies, has supported this project both intellectually and practically, by hosting a recurring field course in which students create project proposals and designs for the GCA. Current and former Environmental Studies students Tami Schiefelbein, Emily Potts, Lindsay Kathrens, Amelita Kucher, Sulgi Drysdale, and Nick Terris all contributed to reports that were used to inform this restoration plan. Rhia Ironside and Ilana Fonariov both assisted in site assessment and mapping. Dr. Valentine Schafer provided project support and oversight. Hyeone Park wrote a fantastic master's thesis for the project that I drew upon heavily. Andrew Simon, Lauren Magner, and Tanya Inglis put a roof over my head when I needed it.

I am personally indebted to Keith Erickson for giving me the opportunity to take part in such a unique step in the ongoing process of healing the land, and to the many teachers I have had over the years: Oliver Kellhammer, Corrina and Marc Robbi, Kristen and James Miskelly, Starhawk, Nancy Turner, Cease Wyss, Theo Fitanides, Eric Higgs, Brenda Beckwith, Darcy Matthews, Kurt Kroesche, and many others. I am also grateful for the unceasing love and support of my family and friends.

Finally, I wish to once again acknowledge the First Peoples of this land - the Penelakut, Lamalchi, and HTG - and of all the lands I have been blessed to call home, including the Muwekma Ohlone, Musqueam, Squamish, Tsleil-waututh, Lekwungen, Saanich, and Mississauga. I hope that this document may serve as a small piece of a collective foundation for meaningful reconciliation between Nations, communities, and people. May all beings be happy.