



Quadra Hill Forests: Ecological Restoration Prescription

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Goals

1. Accelerate the recovery of a young Douglas-fir plantation to a mature Douglas-fir forest with old-growth characteristics, including the full range of natural species composition, ecological structures, and ecological processes.
2. Promote biodiversity.
3. Promote carbon sequestration and increase stored carbon over time.
4. Incorporate measures to mitigate risks of wildfire.
5. Provide empirical data to assess effectiveness of restoration treatments in achieving goals 1 through 4.

Target Site

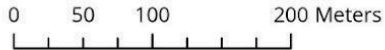
The treatment area is located on the Quadra Hill property (Rem DL58), a 47-hectare parcel with a broad history of logging, gravel extraction, and agricultural related land disturbance. The total area of the property assessed for forest restoration treatments is approximately 9 hectares in size. Of this area, for the purposes of experimental design and long-term monitoring, approximately 2 contiguous hectares will be reserved as a control where no treatments are implemented. Additionally, roughly 2.65 hectares of the assessment area is characterized by young broadleaf dominated forest stands where current conditions are achieving the project goals and no treatments have been prescribed.

A detailed baseline ecological assessment report was completed for the property (Quadra Hill Baseline Report, January 2023, prepared by Adam Huggins and Michelle Thompson) and provides the underlying information and mapping used for this prescription.



DL 58 - Ecological Communities +

NAD 1983 UTM Zone 10N
 Transverse Mercator
 Date: January 2023
 Created by: Galiano Conservancy Association



<p>1 Polygon #</p> <p>Protected Areas</p> <p>Property Lines</p> <p>Ecological Communities</p> <p>Primary Access Roads</p> <p>Density Plots (Letter)</p> <p>Veg Plots & Photo Points (#)</p>	<p>1A Ecological Community</p> <p>Ecological Communities</p> <p>Stage and Composition</p> <p>Marsh - Swamp Complex</p>	<p>Legend</p> <p>Disturbed Swamp</p> <p>Pole-sapling Broadleaf Forest</p> <p>Pole-Sapling Conifer Forest</p> <p>Pole-Sapling Mixed Forest</p> <p>Young Broadleaf Forest</p> <p>Young Conifer Forest</p> <p>Mature Conifer Forest</p> <p>Mature Mixed Forest</p> <p>Rural Ag / Structures</p> <p>Treed Pasture</p> <p>Porlier Pass Road RoW</p>
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Figure 1: DL 58 Ecological Community Polygons and associated plots from Huggins & Thompson, 2023

Table 1, below, lists the ecological community Polygons that were assessed for forest restoration treatments, along with their general prescription type. For Polygon numbers in relation to the landscape, see Figure 1, above.

Polygon	Size	Prescription Type
Poly 19	2.05 ha	Treatment / Control
Poly 20	0.81 ha	Treatment
Poly 21	0.98 ha	Treatment
Poly 22	0.70 ha	Treatment / Control
Poly 23	1.43 ha	No Treatment
Poly 24	0.31 ha	No Treatment
Poly 25	0.85 ha	No Treatment / Control
Poly 30	1.31 ha	Treatment
Poly 31	0.64 ha	No Treatment
Total Area	9.08 ha	

Table 1: Size and prescription type for select polygons within DL 58

Table 2, below, lists the areas selected for treatment (or as the control) and outlines the treatment type for each area. For Treatment Area numbers in relation to the landscape, see Figure 2, below.

Treatment Area	Size	Treatment
1	0.9 ha	Treatment, Chain Hoist
2	1.3 ha	Treatment, Felling
3	1.0 ha	Treatment, Felling
4	2.1 ha	Control, No Treatment
5	2.0 ha	Treatment, Felling
Total Area	7.3 ha	

Table 2: Treatment and size for treatment areas within DL 58



DL 58 - Forest Restoration

NAD 1983 UTM Zone 10N

1:4200

Date: March, 2024

Created by: Galiano Conservancy Association

0 25 50 100 Meters

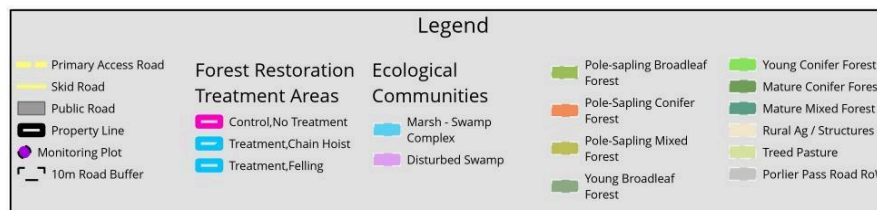


Figure 2: Forest restoration Treatment Areas, with treatment type and permanent monitoring plots identified

Control Area

The control area is just over 2 hectares in size. It includes a portion (roughly half) of Polygons 19, 22 and 25, representing a contiguous cross-section of flat bench and steep slope between two ridgelines. The biophysical character and size of the control area is analogous to that found in the remaining portions of Polygons 19, 22, and 25, where treatments will be applied, therefore providing opportunities for direct comparison.

Monitoring

Establish 10 permanent, staked, 7.98 m radius plots (200m²). Two plots will be randomly located within each of the treatment polygons (19, 20, 21, and 30) and two plots located in the control area (Polygon 19). It is recommended that the following data be collected:

- vegetation species by layer (% cover)
- CWD volume determined by size and decay class
- tree density
- tree volume (dbh / ht)
- photo point at plot centre with shots in each of the cardinal directions, as well as photographs of any unique composition and structures, with an explanation
- calculation of carbon storage/sequestration in woody material based on volumes of standing trees and CWD
- changes in carbon storage/sequestration in soils (requires additional capacity/partnerships)

Access

The site is accessed from the end of Melissa Road along an old gravel driveway / logging road that bisects or skirts all of the treatment polygons. The old road becomes steep where it heads up to the top of Quadra Hill and is used to access Polygons 19, 21, 22 and the upper portions of 30. It is in a generally passable condition with some ruts and erosion that require 4WD during the rainy seasons.

It is recommended that any timber/debris removal that requires intensive use of the steep sections of the road by larger trucks and machinery be completed over the summer and shoulder seasons.

General Approach

The treatment areas will consist of two broad treatment approaches to trees that are thinned:

- Leave in place —The majority of the treatment area, where thinned trees will be left in place to decompose naturally

- Fuel reduction fire break —Areas within 10 m either side of the main access road where coarse and fine materials will be removed from the site for use in wetland restoration treatments elsewhere on the property

In areas subject to 'leave in place', thinned trees will be cut, bucked to get the stem on the ground, limbed, topped, and lopped, so that as much of the top and limbs are on the ground as possible. The tops and limbs of cut trees will be lopped and scattered in situ. Tops and limbs will be well distributed throughout the treatment units, meaning there will not be large accumulations and piles of tops and limbs.

In "fire break" areas, trees will be felled towards the access road and will be bucked into consistent lengths (16 to 20 feet) suitable for retrieval by an excavator and transport by a dump truck, in preparation for being removed from the site. Trees will be limbed and topped, with this fine material gathered, hauled to the road edge, and piled by hand. Bucked stems and piles of fine material will be loaded with an excavator into dump trucks and transported a short distance downhill to the wetland restoration site. This material will be scattered across areas that have been physically decompacted by an excavator, and placed intentionally in and around restored wetlands to increase the structural complexity of the constructed habitat.

Thinning treatments will be implemented using both hand powered techniques and using standard power tools. Hand powered methods will be employed exclusively in Polygon 20 (Treatment Area 1). Hand powered treatments will be completed using a chain hoist, cable, and pulley system. In all other Polygons, felling will be completed by certified tree fallers using standard power equipment.

In all treatment areas and prior to thinning, lower limbs of standing trees will be lopped to a minimum of 2m in height. Pruning is desirable to improve access for fallers, reduce fire hazard, and improve wood quality. While pruning adds to the cost of ecological restoration, the benefits will accrue in the short term through improved community safety, and in the long term from higher wood quality in trees cut under any potential future ecosystem-based forestry prescriptions.

The pattern of thinning treatments should generally align with natural successional processes including:

- more uniformly applied targeting of smaller diameter Douglas-fir to mimic natural stem exclusion in a dense stand
- patchy removal of main canopy trees to mimic natural gap formation resulting from wind, disease, and snow press

Tree selection and thinning density in all areas will be guided by site specific factors including species, form, surrounding vegetation, and forest structure. Collectively these are referred to as “Anchors” and are detailed below.

Anchors

“Anchors” are a way of describing the trees, understory plants, other stand-level composition, and ecological structures that will be retained, protected, and/or encouraged through ecological restoration treatments.

Trees

- Leaving good quality and diverse tree species mixtures are favoured over tree spacing. However, as a general guideline, the density of the original old-growth Douglas-fir stands ranged from 80—130 stems/hectare in the dominant and co-dominant height classes. To provide a precautionary buffer for climate change and disturbance, the target stand density following ecological restoration treatments should not be below 300 overstory “leave” trees. Generally, 40 to 60% of live main canopy trees will be thinned. Smaller shade-tolerant trees in the stand - including western red cedar, western hemlock, and grand fir - that are left to comprise a multiple layer canopy beneath the main canopy are not considered to be part of this target stand density
- All live broadleaf trees will be retained
- Well-formed, and larger diameter Douglas-fir will be favoured
- Western red cedar, grand fir, and western hemlock will be retained as shade-tolerant, multiple layer canopy trees. Where these tree species are in a co-dominant or dominant position in the stand, they may be retained over smaller Douglas-fir, and/or retained in conjunction with Douglas-fir
- Where trees with structural deformities are encountered and there are not well-formed trees as options to leave, the trees with structural deformities will be left
- All snags >30 cm diameter will be retained. If snags pose a hazard to work, a safe work zone will be established around the snag and the snag retained
- Where practical and safe, small snags (< 30 cm diameter) will be retained, however, this may be practically difficult as many small snags are likely to be knocked over during felling operations

Shrubs

- Where there are natural openings in the stand, which contain native shrub communities at various levels of vigour, trees found around, or over-topping these areas will be cut. An adequate-size opening will be created to provide for adequate light conditions to accommodate the persistence of the shrubs in question

Old stumps and remnant coarse woody debris

- Old stumps and rotting wood are remnants from the forests that existed on the site prior to industrial logging. These features and the soils around them may act as hubs of diversity or refugia for fungal networks, bacteria, micro-fauna, and other organisms as the stand transitions from the clearcut to a mature forest. Consideration should be given to retaining trees growing in close association with these features, whose root systems may be benefiting from and/or promoting the related biological communities

Carbon Sequestration and Storage

Findings from studies examining the impacts of restoration thinning on carbon conducted in neighbouring DL63 suggest that total storage of carbon in live wood, ten years post treatment, will be statistically similar on both treated and untreated sites. It is hypothesized that the thinned stems left on site will serve to increase total carbon stores as CWD in the short term (10 to 50 years) and may contribute to longer term soil carbon pools and soil biomass capacity. As thinned stems decay the residual trees will increase radial and height growth, which will serve to counterbalance carbon lost through decay processes.

Deer Management and Exclusion

Lacking predators, native Columbian black-tailed deer occur in high densities on Galiano Island and are known to limit native understory regeneration and diversity through continuous browse pressure. To allow for diverse, native understory regeneration in thinned areas, a portion of treatment Areas 4 and 5 will be fenced to exclude deer.