District Lot 85 Ecological Overview Report

Prepared by Keefer Ecological Services Ltd.

2025-05-28

Table of Contents

List of Figures

List of Tables

1. Summary

1.1. Scope and Objectives

Keefer Ecological Services Ltd. (KES) was contracted to undertake an ecological inventory of District Lot 85 to describe the current condition of the property's terrestrial ecosystems, which may be relied upon as necessary in future land management. This report has been prepared as an *Ecological Overview Report* in accordance with the Islands Trust regulatory requirements for Galiano Island, as outlined in the Galiano Island Official Community Plan Bylaw No. 108 and the Development Approval Information Bylaw No. 148, 2012. It includes all required report components consistent with other Ecological Overview Reports reviewed and accepted by the Islands Trust, including terrestrial ecosystem mapping, identification of sensitive ecosystems, assessment of potential development impacts, and mitigation recommendations. In addition, this report provides an analysis of the area and distribution of ecological communities as they relate to the proposed site plan, meeting the expectations for ecological overview reporting within designated Development Permit Areas (DPAs).

1.2. Contributors

Table 1. Project contributors.

Name	Title	Organization
Mike Keefer, MSc, PAg (#1972)	Senior ecologist	Keefer Ecological Services Ltd.
Andrew Simon, MSc	Biodiversity Specialist & GIS Analyst	Keefer Ecological Services Ltd.
Emma Cooke, BSc	Junior GIS Analyst	Keefer Ecological Services Ltd.
Mikayla Davis, BSc, RPBio (#4430)	Biologist	Keefer Ecological Services Ltd.

2. Parcel Location and Identification

District Lot 85 (PID: 009-625-259) is located on the northeast coast of Galiano Island, British Columbia (BC), off Bodega Beach Drive, at approximately 48.988798°, -123.554665° (Fig. 1).

3. Indigenous Land Acknowledgment

District Lot 85 lies in the traditional territories of Penelakut, Hw'litsum, and Tsawwassen First Nations, and other Hul'qumi'num-speaking peoples.

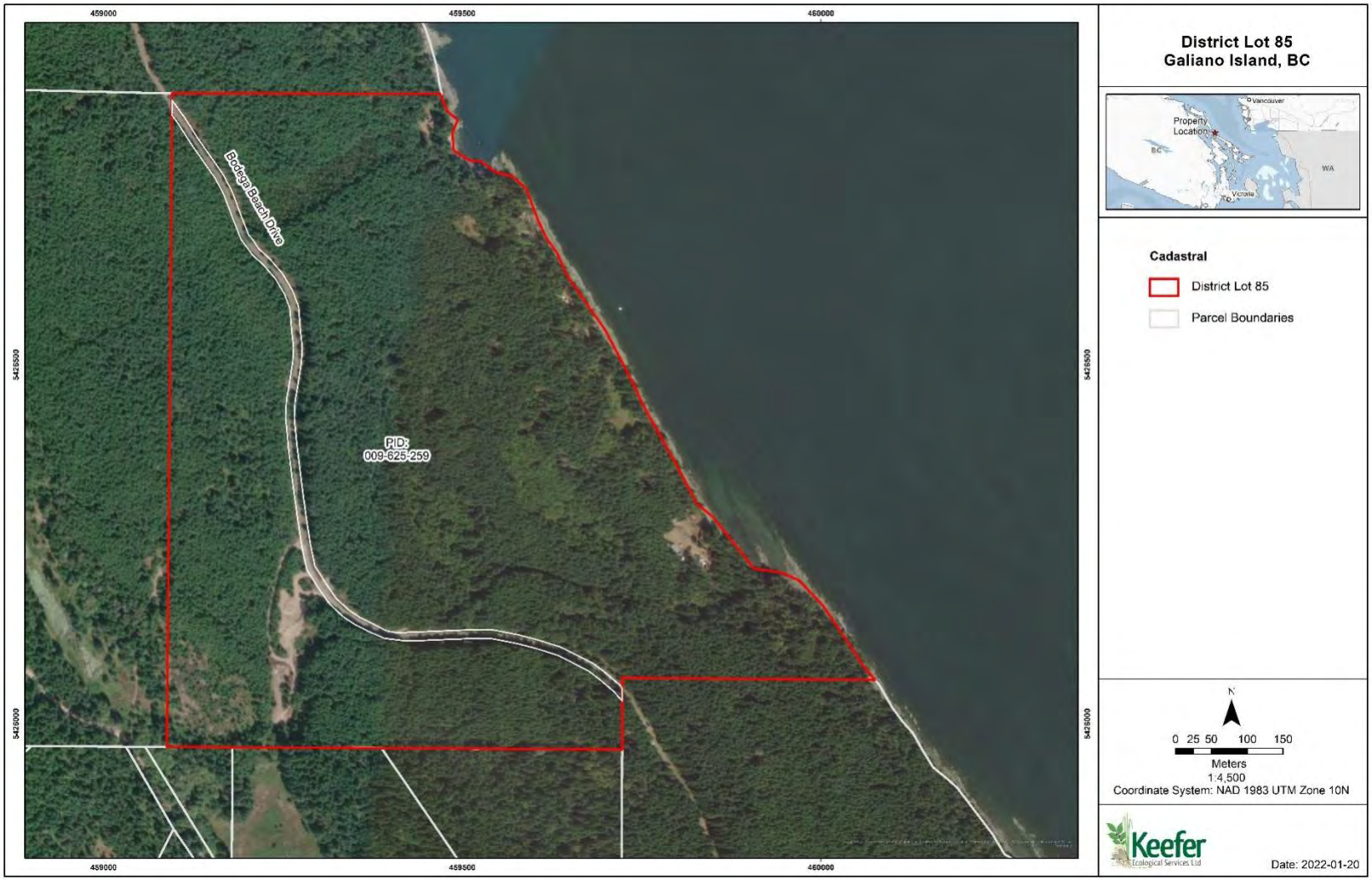

Figure 1. Distict Lot 85.

4. Acknowledgment

The owner hereby acknowledges and agrees that the following is an accurate description of the property, as of the reference date of this agreement.

5. Encumbrances

As of 2021, there were seven registered titles on DL 85, each representing one of the owners, with one owner having two registered titles. All registered titles have the same Legal Notations and Charges, Liens and Interests on them, as follows:

- Easement EE21559 over District Lot 88 except part in Plan 27287, Galiano Island, Cowichan District
- Bylaw Contravention Notice, Municipal Act, Section 700, See EM84025
- Easement FB158458 over part of Lot A, Plan VIP56353 except part in Plan VIP61539, included in Plan VIP84749
- Easements appurtenant to District Lots 70, 71, 77, 78, 79, 80, 86, 92, 93, 94 and 95 are also registered on title.

6. General Description

District Lot 85 is located on the northeast coast of Galiano Island, British Columbia, Canada. The property comprises approximately 60 ha of mostly forested land, including 1 km of shoreline along the Georgia Strait, and lies adjacent to Ecological Reserve 128, which abuts the property's southern boundary. District Lot 85 was subject to extensive clear-cut logging by MacMillon Bloedel in the early 1980s, and most of the property was subsequently restocked with Douglas-fir. This historical impact is clearly visible in early Landsat satellite imagery (Fig. 2). Because of these logging practices, most of the forested ecosystems of DL85 are now in an immature seral stage, with Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) establishing a canopy, and species such as grand fir (*Abies grandis*), western redcedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*) regenerating in the understory. The most recent logging event is a clear-cut at the southwestern extent of the property, which dates to 2003.

The most notable anthropogenic impact on DL85 is an extensive gravel pit (~1.4 ha in size), which is currently operational. There are also several cleared rural areas that lie toward the property's shoreline, with numerous small structures such as sheds and outhouses. Other anthropogenic impacts include Bodega Beach Drive, and a network of skidder trails, all of which have significantly impacted the soils and potentially the underlying water table.

District Lot 85 lies within the Coastal Douglas-fir moist maritime (CDFmm) Biogeoclimatic Zone: an ecoregion with a semi-Mediterranean climate that supports the highest density of species at risk in the province of British Columbia (BC CDC, 2021a). In this densely populated region, habitat loss and fragmentation continue to pose the greatest threats to ecological communities. Cumulative anthropogenic impacts associated with these threats include human-induced changes to predator-prey dynamics, which have resulted in increasing browsing pressures by deer and, in turn, diminished native plant abundances, as well as other higher level trophic effects (*e.g.*, Martin et al., 2011). Other impacts include long-term declines in wildlife populations resulting from fragmentation of surrounding matrix habitat (Shackelford et al., 2018); the dispersal of exotic plant and animal species (Marx et al., 2016; Shackelford et al., 2018); and numerous stressors associated with climate change (Austin et al., 2008; Klassen et al., 2015; Salathé et al., 2008; Spies et al., 2010).

Figure 2. Landsat imagery dating to December 1985 shows a recent clear-cut spanning DL85 (outlined in red) as well as DL86 to the north and DL87 to the west. This logging event dates to 1981/'82. Source: Google Earth.

7. Property Access

District Lot 85 can be accessed from the end of Bodega Beach Drive, approximately 30 km from the ferry terminal at Sturdies Bay, Galiano Island, BC.

8. Significance of the Land and the Amenities

Although heavily impacted by a history of clear-cut logging, the forested ecosystems of District Lot 85 remain relatively intact ecologically, with most of the property comprising maturing seral stages of ecological communities that are of critical conservation concern within British Columbia (BC CDC 2021a). Over the course of the last century, Coastal Douglas-fir (CDF) forests have been dramatically diminished,

fragmented by logging and land conversion for agriculture and urbanization. Approximately 90% of the CDF has been logged as of the 1990s, leaving <1% of its forested ecosystems in a mature or old growth state (Austin et al., 2008). The ecological value of DL85 thus largely lies in the potential of its young forests to become restored as healthy mature forests representing rare ecosystem types that are otherwise dwindling in British Columbia (see Section 10.3).

The history of industrial forestry practices on DL85 is complex, with forests dating to several different logging events. The greater extent of the property's forested ecosystems date to an extensive clear-cut logging event that occurred in 1981/'82, though a small patch to the southeast extent of the land dates to a more distant event in 1966. The most recent logging event is a clear cut to the southwestern extent of the property, which dates to 2003. A small extent of DL85's forests have been retained in a mature state (dating to earlier logging events, est. 1927, and another older event), setting a benchmark for how the property's young forests might mature if conserved. The ecological value of these forests will continue to increase with age as stand structure become more complex, giving rise to an increasing number of microhabitats for species. The property also holds value as a carbon sink, and as matrix habitat providing connectivity with adjacent forested communities, including a buffer around the mature conifer forests that extend across Ecological Reserve 128 and Crown Land to the south.

Lands known to be culturally significant to Indigenous peoples are located nearby at Dionisio Point, known as *Quelus* in Hul'qumi'num, as well as to the northwest, within the 29.1 ha Penelakut First Nation reserve. The cultural importance of DL85 is currently unattested and lies beyond the scope of this report.

9. Methods

9.1. Terrestrial Ecosystem Mapping

Terrestrial ecosystem mapping (TEM) stratifies a landscape into map polygons based on ecological variables such as climate, vegetation, physiography, surficial material, bedrock geology, and soil (Resource Inventory Committee, 1998). Based on the Biogeoclimatic Ecosystem Classification (BEC) system, which was first developed to classify and manage forested ecosystems of British Columbia, the TEM methodology is currently applied to map both forested and non-forested communities, supporting ecosystem-based land management practices in a diverse range of landscapes throughout BC.

Ecological inventory and mapping of DL85 first entailed the interpretation of satellite imagery, LiDAR, and existing geospatial data to divide the landscape into recognizably distinct areas, which were circumscribed as polygons in a geographic information system (GIS). Field work was then conducted by trained ecologists with expertise in terrestrial ecosystem mapping and the ecology and biodiversity of the CDF Zone, to validate and classify the ecological communities represented on the landscape. Preliminary terrestrial ecosystem mapping was then refined based on field data using spatial analysis tools in QGIS and ArcGIS, to improve the delineation of polygons and ascribe attributes to each community.

Terrestrial ecosystem mapping of DL85 was developed according to RISC standards (Resource Inventory Committee, 1998), meeting the requirements of survey intensity level 1—a level appropriate for an area of the scale of the property. Ecosystem attribution included sites series, structural stage, and site modifiers. Polygons were classified with up to three ecosystem components or deciles, representing each community present as a fraction of total percent land cover. Components with less than 5% cover were not noted. Site series and map code descriptions used for the attribution of ecosystems are described in Section 10.1 of this report.

Field work was conducted on November 3rd, 4th, and 8th,2021. Due to the timing/seasonality of this survey, as well as a limited budget, comprehensive species inventory was beyond the scope of this contract. Ecological communities were broadly classified and characterized primarily in terms of forest composition and structure. The resulting TEM for DL85 provides a summary of the condition and extent of the ecological communities represented on the land, which may serve as the basis for ecosystem-based land management, and to inform sampling designs for future inventories. Site classifications are also analysed in relation to the proposed site plan, to estimate the spatial extent of ecological communities falling within each region of the proposed development.

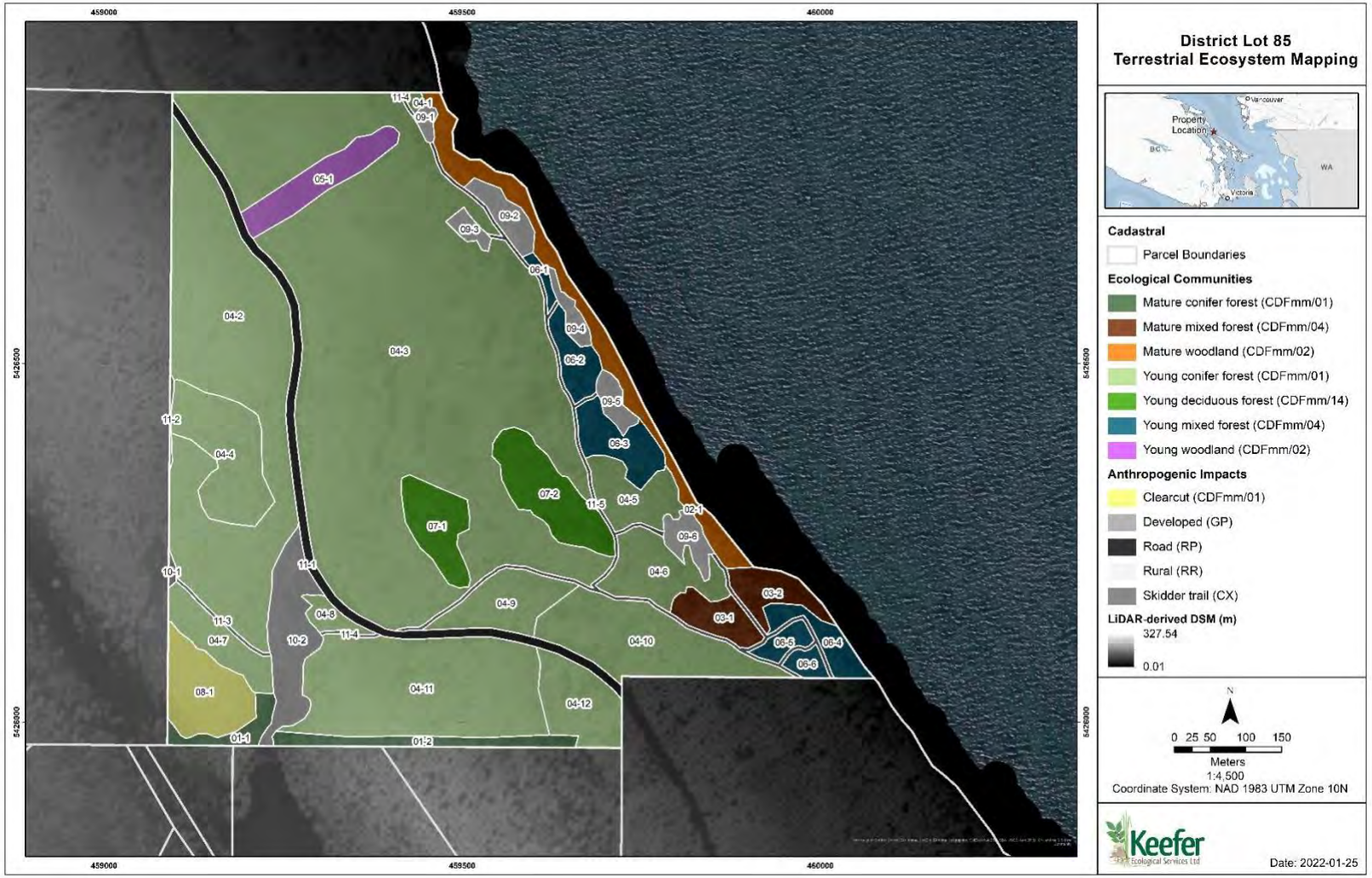

Figure 3. Terrestrial Ecosystem Map of DL85. Base map: LiDAR-derived Digital Surface Model.

10. Description and Mapping of Natural State

10.1. Ecological Classifications

The terrestrial ecosystem mapping developed for DL85 circumscribes four recognizable ecological communities and several additional land cover types, including forested ecosystems at different stages of ecological succession and non-forested anthropogenic communities (Fig. 3). Forested ecosystems fall within several biogeoclimatic units (CDFmm/01, CDFmm/02, CDFmm/04m CDFmm/14) which are described in the following section. Unforested ecosystems (CDFmm/00) have been classified using a set of more generic map codes, including roads, skidder trails, gravel pits, and rural areas (RP, CX, GP, RR). These forested and non-forested communities are tabulated (Table 2) and described below, in descending rank order of area covered.

Table 2. Ecological communities and land cover types mapped at District Lot 85.

Ecological community	Biogeoclimatic Unit	Map Codes	Polygons	Area (ha)	% Total Area
Young conifer forest	Douglas-fir / dull Oregon grape (CDFmm/01)		04-1–12	43.2	72
Anthropogenic	CDFmm/00 CDFmm/01 (clear cut)	CX, GP, RP	08-1, 09-1–6, 10-1–2	6.8	11
Young mixed forest	grand fir / dull Oregon-grape CDFmm/04		06-1–6	2.7	4
Young deciduous forest	red alder / slough sedge [black cottonwood] CDFmm/14		07-1–2	2.3	4
Mature woodlands	Douglas-fir - arbutus CDFmm/02		02-1	1.7	3
Mature mixed forest	grand fir / dull Oregon-grape CDFmm/04		03-1–2	1.2	2
Mature conifer forest	Douglas-fir / dull Oregon grape CDFmm/01		01-1–2	1.0	2
Young woodlands	Douglas-fir - arbutus CDFmm/02		05-1	1.0	2

Figure 4. Young conifer forests are the most extensive ecological community represented on DL85.

Young conifer forest – Douglas-fir / dull Oregon grape

CDFmm / 01 – *Pseudotsuga menziesii / Mahonia nervosa*

Young conifer forests (Polygons 04-1–12), comprising 43.2 ha, represent about 72% of DL85 by area. About 39.7 ha of these forests date to forestry activities ca. 1981/'82 when the property was clear-cut logged by MacMillan Bloedel. The remainder (3.5 ha) dates to a harvest event that occurred ca. 1966. The leading age class of trees in these stands is thus ~40 and ~55 years old respectively as of the date of this ecological overview report. Conifer forests in the CDFmm/01 site series form the dominant forest matrix of the CDF biogeoclimatic zone, occurring at middle- to upper-slope positions, on all aspects, and are characterized by a moderately dry (submesic to mesic) soil moisture regime and a poor to medium soil nutrient regime (BC CDC, 2021c). The youngest age class represented on DL85 comprises densely stocked forests at an early stage of self-thinning, whereas the older young conifer forests are somewhat more open, at a more advanced stage of self-thinning. Both age classes might benefit from mechanical thinning as a treatment measure. Over the course of ecological succession, these young forests will age to become mature conifer forests such as those represented in Polygons 01-1 and 01-2, described below.

Douglas-fir forms the canopy of these young conifer forests (Fig. 4), with a scattered occurrence of arbutus (*Arbutus menziesii*), bigleaf maple (*Acer macrophyllum*), bitter cherry (*Prunus emarginata*), red alder (*Alnus rubra*), western hemlock, and western redcedar. The understory is poor, with sparse

patches of salal (*Gaultheria shallon*), oceanspray (*Holodiscus discolor*), evergreen huckleberry (*Vaccinium ovatum*), red huckleberry (*Vaccinium parviflorum*), dull Oregon grape (*Berberis nervosa*), sword fern (*Polystichum munitum*), and trace occurrences of species such as Scouler's willow (*Salix scouleriana*) and hairy honeysuckle (*Lonicera hispidula*). On all sites, the moderately well-developed moss layer is dominated by Oregon beaked-moss (*Eurhynchium oreganum*), with sparse occurrences of electrified cats-tail moss (*Rhytidiadelphus triquetrus*), and step moss (*Hylocomium splendens*). Despite differences in soil moisture regime, trees in young conifer forests were comparable in size to those in the moister young mixed forest community (CDFmm/04) documented in this report, perhaps because these mixed forests lie toward the foreshore of the property where edaphic factors are relatively poor despite moister conditions. Western redcedar appeared healthy throughout the young conifer forests of DL85, with robust regeneration of western redcedar noted in some areas (*e.g.*, Polygon 04-11).

At the drier end of the spectrum, toward the shoreline, DL85's young conifer forest ecosystems mostly transition to open woodland environments classified in the CDFmm/02 site series, with arbutus (*Arbutus menziesii*) and shore pine (*Pinus contorta* ssp. *contorta*) becoming more prevalent. Downslope, in lowland areas of the landscape, they transition to mixed forests classified in the CDFmm/04 site series, and deciduous forests in the CDFmm/14 site series, with an increasing occurrence of bigleaf maple, bitter cherry, black cottonwood (*Populus trichocarpa*), red alder, and western redcedar.

Figure 5. An active gravel pit and associated access roads covers an area of approximately 1.4 ha (Polygon 10-2).

Anthropogenic

CDFmm / 00 – CX, GP, RP, RR | CDFmm/01

Anthropogenic communities cover approximately 6.8 ha (~11%) of DL85. These non-forested areas include skidder trails (CX), rural areas (RR), and permanent road surface (RP). Six sites that have been cleared for rural residential purposes, including numerous small out-structures, have been mapped as rural areas (Polygons 09-1–6). The most heavily impacted area is an extensive (1.4 ha) gravel pit (GP) with several excavation points and a network of access roads throughout Polygon 10-2 (Fig. 5). Bodega Beach Drive was mapped as the only permanent road on DL85. Other roads are limited to skidder trails, which are less frequently used. About 15 feet wide, these old skidder trails often become congested by regenerating trees, though the skidder trail that leads to the rural areas toward the foreshore of the property is more well established and has been ditched and culverted to control drainage. A recent clear cut is also mapped on DL85 (Polygon 08-1), which dates to a logging event in 2003. This clear cut has been mapped as an early seral stage of conifer forest in the CDFmm/01 site series.

Areas mapped as anthropogenic are largely dominated by exotic species. Without ongoing management, these species may present a threat to surrounding natural ecosystems as a source of exotic seed dispersal. Scotch broom (*Cytisus scoparius*) is an invasive species of particular concern, especially where it is established in rural communities proximate to the shoreline (Polygons 09-2 and 09-5). Other exotic species of note on DL85 include tansy ragwort (*Jacobaea vulgaris*), and Canada thistle

(*Cirsium arvensis*), which were found throughout the rural areas and alongside roads and skidder trails. Scotch broom was particularly prevalent in Polygons 09-2, 09-3, 09-5, and in the gravel pit (Polygon 10-2). Native vegetation found throughout these rural areas included several water-loving species, such as slough sedge (*Carex obnupta*) and small-flowered bulrush (*Scirpus microcarpus*), indicative of the relatively moist character of the site as well as the heavily compacted water-table which has induced seasonal flooding in certain sites.

Figure 6. Young mixed forests (Polygon 06-3) stand at the margins of the cleared area in Polygon 09-5.

Young mixed forest – Grand fir / dull Oregon grape

CDFmm/04 – *Abies grandis* / *Mahonia nervosa*

Young mixed forests classified as CDFmm/04 encompass about 2.7 ha (~4%) of DL85. Most of these forests have regenerated from the clear-cut logging event that occurred in 1981/'82, dating their leading trees to ~40 years old (Polygons 06-1–6). However, a patch of mixed forests found at the southeastern edge of the property is older, dating to a logging event in 1966 (Polygons 03-1, 03-2). While this ecological community is generally found in mid-slope positions, on DL85 it is surprisingly well represented toward the foreshore of the property (Fig. 6). Here it is established along a moisture-receiving lower slope with relatively deep soils supporting dense stands of bigleaf maple and western redcedar, which contrasts with the shallow-soiled dry woodland environments that are common along Galiano Island's coast (e.g., Polygon 02-1). Soils are well-drained, with a medium texture, and are moderately dry, with a rich to very rich nutrient regime (BC CDC 2021d). While these communities have

naturally emerged from soils enriched by water flowing from the greater watershed, their hydrological regime has been altered to some extent due to the road and skidder trails that cross the property.

These mixed forests are largely dominated by Douglas-fir, with patches of bitter cherry, red alder, western redcedar, and the occasional occurrence of arbutus and bigleaf maple. The understory is less sparse as compared with the young zonal forests described above, exhibiting a greater percent cover of salal, oceanspray, and sword fern, with patches of vanilla leaf (*Achlys triphylla*), Pacific soft rush (*Juncus effusus* ssp. *pacificus*), and fragrant bedstraw (*Galium triflorum*), indicative of the relatively rich soil moisture and nutrient regime. Mosses such as badge moss (*Plagiomnium insigne*) and palm tree moss (*Leucolepis acanthoneuron*) are common and are also good indicators of this riparian forest community.

Figure 7. A young deciduous forest (Polygon 07-2) featuring broad-leaved trees such as black cottonwood, red alder, and bigleaf maple, with scattered western redcedars interspersed.

Young deciduous forest – Red alder / slough sedge [black cottonwood]

CDFmm/14 – *Alnus rubra* / *Juncus effusus* [*Populus trichocarpa*]

Young deciduous forests (Polygons 07-1–2) classified as CDFmm/14 encompass about 2.3 ha (~4%) of DL85. These forests have regenerated from the same clear-cut logging event in 1981/'82, dating the leading trees to ~40 years old. Deciduous trees such as black cottonwood, red alder, and bigleaf maple form the canopy (Fig. 7), with red elderberry (*Sambucus racemosa*) slough sedge and small-flowered

bulrush occurring in the understory. Deciduous stands occur relatively infrequently across Galiano Island and thus represent an important natural community of DL85.

Figure 8. Facing the Strait of Georgia, the shoreline of DL85 includes a thin strip of mature woodland.

Mature woodlands – Douglas-fir - Arbutus

CDFmm/02 – *Pseudotsuga menziesii / Arbutus menziesii*

About 1.7 ha (~3%) of DL86 comprise mature coastal woodlands classified in the CDFmm/02 site series (Fig. 8). This community occurs in a narrow 10–20 m wide band along the coastline (Polygons 02-1–3), supported by shallow soils which form a thin veneer over the sandstone bedrock. Owing to its slope position and gradient, the soil moisture regime of this community is very dry (xeric) to dry (subxeric), and the soil nutrient regime medium to very poor (BC CDC 2021b). In the overstory, dominant vegetation includes arbutus, shore pine, and Douglas-fir, with a sporadic occurrence of western redcedar, Scouler's willow, red alder, and bigleaf maple. The understory includes evergreen huckleberry, salal, wild rose (*Rosa nootkana*), baldhip rose (*Rosa gymnocarpa*), and trailing blackberry (*Rubus ursinus*), with wetter sections marked by the periodic occurrence of species such as stinging nettle (*Urtica dioica*). Along with mature conifer forests, mature mixed forests, and young deciduous forests mapped on the property, these mature woodlands rank among the most ecologically significant features on DL85.

Figure 9. A stand of mature mixed forest lies nearby the shoreline (Polygon 03-2).

Mature mixed forest – Grand fir / dull Oregon grape

CDFmm/04 – *Abies grandis* / *Mahonia nervosa*

Mature mixed forests classified as CDFmm/04 encompass about 1.2 ha (~2%) of DL86 (Fig. 9). These mixed stands (Polygons 03-1, 03-2) have a composition like the young mixed forests described above, though they are older, with more complex stand structure, dating to a logging event in 1966. Alongside the mature conifer forests, mature woodlands, and young deciduous forests mapped on the property, these stands are an ecologically valuable component of DL15's coastal landscape.

Figure 10. A tract of young woodland composed of arbutus and shore pine runs perpendicular to the shoreline in Polygon 05-1, contrasting with the surrounding young conifer forests.

Young woodlands - Douglas-fir - arbutus

CDFmm / 02 – *Pseudotsuga menziesii / Arbutus menziesii*

A narrow tract of young woodland (Polygon 05-1), classified in the CDFmm/02 site series, comprises about 1 ha (~2%) of DL85. This young woodland is composed primarily of arbutus and shore pine (Fig. 10) which, from an aerial view, contrasts strongly with the surrounding young conifer forests. A forestry map of DL85 produced by MacMillan Bloedel Ltd. (Fig. 11) situates this community at the interface between two cut blocks dating to 1981 and 1982. Possibly this site was used as a staging area for logging activities during that time, resulting in more significant impacts on soils and, in turn, delayed ecological succession. It is also possible that edaphic factors (thinner soils) have favoured the establishment of these species here, resulting in the contrasting ecological succession pattern seen in this community.

Figure 11. Forestry Map of DL15 produced by MacMillan Bloedel Ltd..

Figure 12. Mature conifer forests form a small band at the southern extent of DL85, coextensive with the large tract of mature conifer forests that surround Galiano Island's unique bog community in Ecological Reserve 128 (foreground).

Mature conifer forest – Douglas-fir / dull Oregon grape

CDFmm / 01 – *Pseudotsuga menziesii / Mahonia nervosa*

About 1 ha (~2%) of DL86 is classified as mature conifer forests in the CDFmm/01 site series (previously described). On DL85, these forests are represented in two successional stages: one stand dating to around 1927 (Polygon 01-1) and another older stand that has not been dated (Polygon 01-2). These stands are marginal in occurrence, lying toward the southern extent of the property. Douglas-fir dominates the canopy, with a robust understory of salal and evergreen huckleberry. Along with the mature woodlands, mature mixed forests, and young deciduous forest mapped on the property, these mature conifer forests represent the most significant ecological communities on the land and set a benchmark for how the seral conifer forests may mature if conserved.

10.2. Anthropogenic features

Numerous small structures were mapped on DL85, which, along with the gravel pit, rural areas, roads, and skidder trails established on the property, comprise the anthropogenic impacts on the land (Fig. 13). As described in Section 10.1, these anthropogenic areas are dominated by exotic species and should be managed to minimize the expansion/dispersal of invasives into surrounding intact natural areas.

10.3. Significant Natural Features

The significant natural features of DL85, mapped in Figure 14, include mature conifer forest, mixed forest, and woodlands, as well as young deciduous forests (Polygons 07-1, 07-2) which are marginal in occurrence on Galiano Island. The two deciduous stands mapped on DL85 emerge from moist depressions in the landscape and should be retained to help prevent wildfire and to conserve the natural integrity and habitat diversity of the landscape. Mature conifer forest (Polygons 01-1, 01-2), woodland (Polygon 02-1), and mixed forest communities (Polygons 03-1, 03-2) exist as a relic of mature second-growth forests previously established on the property. These mature communities represent a benchmark for how the property's young forest and woodland communities might develop in the future. Mature conifer forests at the southern extent of the property also form a natural buffer contiguous with an extensive tract of mature conifer forest protected in the adjacent Ecological Reserve 128 (Fig. 12). These natural features, alongside the ecological communities of conservation concern documented in Section 10.4, represent the key ecological values of the landscape and should be central to future conservation and management of the property.

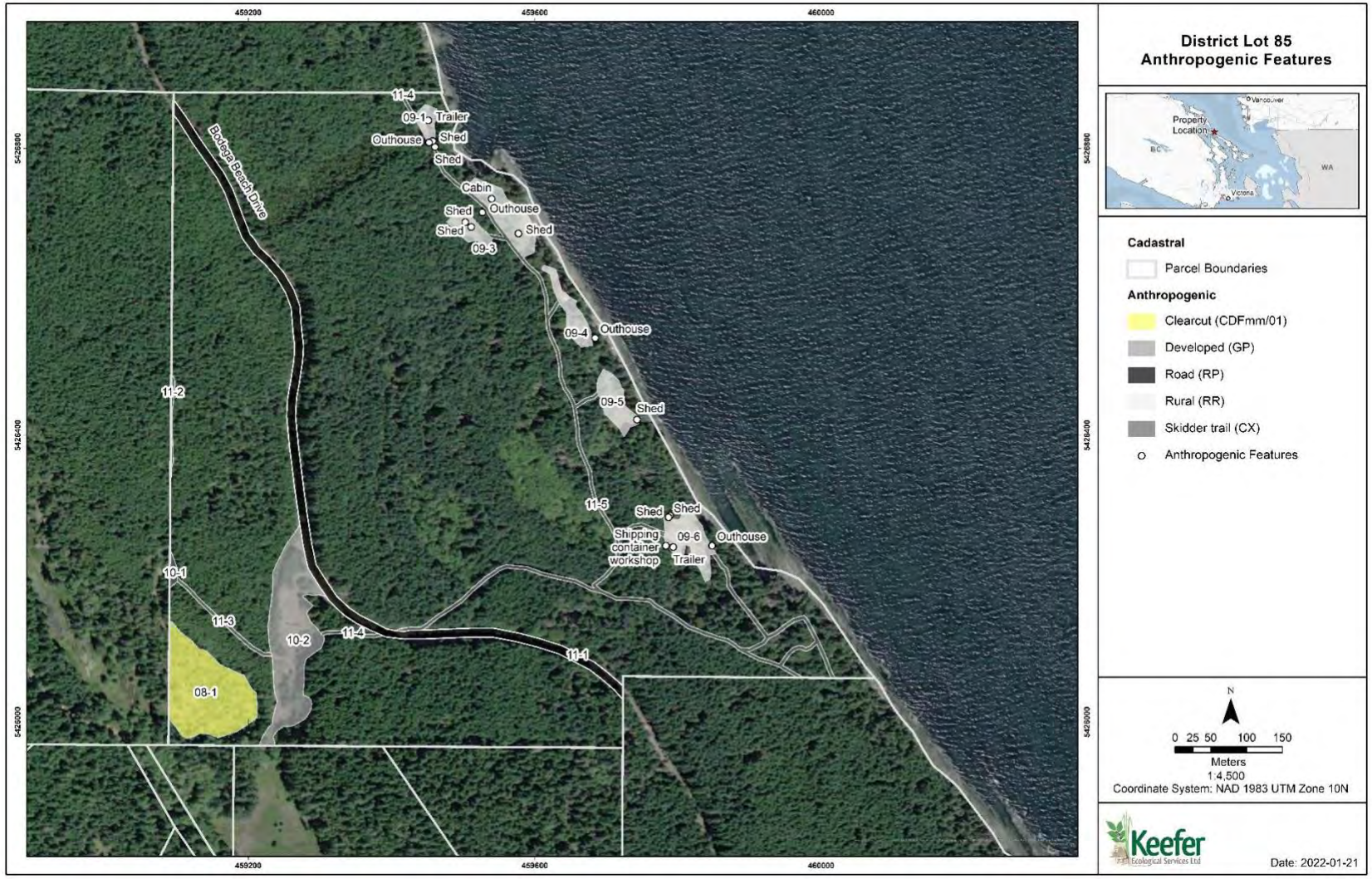

Figure 13. Anthropogenic features mapped on DL85.

Figure 14. Significant natural features mapped on DL85.

10.4. Ranked Ecological Communities

Four ecological communities mapped on DL85 are listed by the BC Conservation Data Centre as at-risk ecosystems (BC CDC, 2021), all of which are red-listed communities considered threatened in British Columbia (Table 3). While these communities are ranked as at-risk in BC regardless of their successional stage, those retained in a mature state are of greater ecological importance and should be prioritized for conservation. A description of these ecological communities, and a summary of their proportional representation across the landscape of DL85, is presented in Section 10.1. Figure 15 identifies the polygons representing each of these communities. Note, however, that these communities are mapped as deciles or components of each polygon, following the TEM methodology described in Section 9.1. Thus, there is one instance where a ranked community coincides with another ranked community within the same polygon (CDFmm/01 and CDFmm/04 are both represented in Polygon 04-4). In this case, the polygon is symbolized according to the dominant community.

Table 3. BC Conservation Data Centre Ranked Ecological Communities.

Ranking	Biogeoclimatic Unit	Ecological community
S1 (2018)	CDFmm /01	Douglas-fir / dull Oregon grape
S2 (2004)	CDFmm /02	Douglas-fir / shore pine - arbutus
S1 (2009)	CDFmm /04	western redcedar / Douglas-fir - Oregon beaked-moss
S1 (2006)	CDFmm/14	red alder / slough sedge [black cottonwood]

Figure 15. Distribution of ecological communities of conservation concern at DL85.

11. Threats to condition and natural state

Climate change

Climate change has ongoing implications for the ecology of the Coastal Douglas-fir BEC Zone, causing increasing forest fire risk and drought stress (Klassen et al., 2015), the signs of which are particularly evident in the decline of western redcedar in the region (Seebacher, 2007). These signs of stress, however, were not conspicuous throughout the forest communities of DL85, perhaps owing to the relatively moist character of the forests established on the property. The western redcedar observed during this survey appeared healthy, and a fair amount of regeneration was also observed in the understory of some communities (e.g., Polygon 04-11). Nevertheless, the forested ecosystems of DL85 remain subject to climatic stressors, including the increasingly severe seasonal drought and winter precipitation predicted under future climate scenarios (Klassen et al., 2015; Salathé et al., 2008; Spies et al., 2010), which may alter the ecological succession of these communities. Ongoing monitoring of the forested ecosystems of DL85, with western redcedar serving as a potential indicator, is recommended.

Cumulative effects

District Lot 85 is surrounded by a matrix of protected and rural land that has been subject to a history of industrial forestry and rural development and continues to be affected by several anthropogenic factors, including climate change. The activities associated with roads, utility corridors, and nearby subdivision development contribute to numerous stressors having cumulative impacts on the surrounding ecology, which may result in diminishing wildlife habitat, intensified grazing by ungulates such as black-tailed deer, and increasing invasion by alien species (Martin et al., 2011; Shackelford et al., 2019; Shackelford et al., 2018).

Direct anthropogenic threats associated with development

Invasive species

On DL85, several invasive species, including Scotch broom, tansy ragwort, bull thistle, and Himalayan blackberry, were noted during this baseline inventory. Each species requires a particular management regime to ensure they are effectively controlled. Any further modification of the lands, including construction, maintenance, and the everyday use of trails and other infrastructure, may increase the abundance of invasive species on DL85. Management plans should account for potential increases in these activities in the future, to ensure the integrity of the property's ecosystems.

12. Representation of ecological communities in relation to site plan

A conceptual lot layout for DL85 is being developed by McElhanney Consulting Services Ltd. for the proposed rezoning of DL85 (Fig. 16). This site plan delineates five rural residential lots (10 ha) and a resource lot (2.8 ha) as developable portions of the property, as well as a covenanted F3 forestry lot (20

ha). Additionally, the proponents propose to set aside land for an amenity lot (0.9 ha), parkland (22.3 ha), and road dedication (3.6 ha), to be considered as public amenities in exchange for the rezoning of the property. Table 4 summarizes the proportional representation of DL85's ecological communities in relation to the proposed covenanted, developable, and transfer portions of the land, organized in descending rank order of area covered.

Table 4. Intersection of ecological communities and site plan.

Ecological Communities	Area	Covenant	Developable		Transfer		
		Forestry	Rural	Resource	Amenity	Parkland	Road
Young conifer forest	43.2 ha	34%	14%	3%	2%	42%	5%
Anthropogenic	6.8 ha	14%	22%	20%		22%	22%
Young mixed forest	2.7 ha	32%	50%			18%	
Young deciduous forest	2.3 ha	94%	6%				
Mature woodland	1.7 ha	22%	76%			2%	
Mature mixed forest	1.2 ha	100%					
Mature conifer forest	1 ha			10%		90%	
Young woodland	1 ha		2%		8%	78%	12%

13. Development Permit Areas

There are three Development Permit Areas (DPAs) mapped on DL85, including: DPA 2, Shoreline; DPA 3, Tree Cutting and Removal; and DPA 7, Steep Slope / Moderate Hazard. The developable area proposed in the Site Plan intersects with each of these three DPAs.

Within these designations, land alteration, construction and subdivision are restricted until a development permit is obtained.

Consideration for each of these DPAs with respect to the proposed site plan lies beyond the scope of this Ecological Overview Report.

Figure 16. Conceptual lot layout of DL85 intersected with map of ecological communities

14. References

Austin, M.A., Buffet, D.A., Nicholson, D.J., Scudder, G.G.E., & Stevens, V. (2008). Taking nature's pulse: the status of biodiversity in BC. http://www.biodiversitybc.org/assets/pressReleases/BBC_StatusReport_Web_final.pdf

BC Conservation Data Centre (2021a). *BC Species & Ecosystems Explorer*. https://a100.gov.bc.ca/pub/eswp/.

B.C. Conservation Data Centre (2021b). Ecological Community Summary: Douglas-fir - arbutus. https://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=20273.

B.C. Conservation Data Centre (2021c). Ecological Community Summary: Douglas-fir / dull Oregon-grape. https://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=20601.

B.C. Conservation Data Centre (2021d). Ecological Community Summary: grand fir / dull Oregon-grape. https://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=20226.

Klassen, H., Saunders, S. C., Kranabetter, J. M., MacKinnon, A., Griesbauer, H., & Fitzpatrick, O. (2015). Establishment of an interdisciplinary project to evaluate ecological implications of climate change in dry south coast forest ecosystems. *Technical Report-Ministry of Forests, Lands and Natural Resource Operations, British Columbia*, (086).

Martin, T. G., Arcese, P., & Scheerder, N. (2011). Browsing down our natural heritage: deer impacts on vegetation structure and songbird populations across an island archipelago. *Biological Conservation*, *144*(1), 459-469.

Marx, H. E., Giblin, D. E., Dunwiddie, P. W., & Tank, D. C. (2016). Deconstructing Darwin's Naturalization Conundrum in the San Juan Islands using community phylogenetics and functional traits. *Diversity and Distributions*, *22*(3), 318-331.

Resources Inventory Committee. (1998). Standard for terrestrial ecosystem mapping in British Columbia. https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/tem_man.pdf

Salathe Jr, E. P., Steed, R., Mass, C. F., & Zahn, P. H. (2008). A high-resolution climate model for the US Pacific Northwest: Mesoscale feedbacks and local responses to climate change. *Journal of Climate*, *21*(21), 5708-5726.

Seebacher, T. M. (2007). *Western redcedar dieback: possible links to climate change and implications for forest management on Vancouver Island, BC* (Doctoral dissertation, University of British Columbia).

Shackelford, N., Murray, S. M., Bennett, J. R., Lilley, P. L., Starzomski, B. M., & Standish, R. J. (2019). Ten years of pulling: Ecosystem recovery after long-term weed management in Garry oak savanna. *Conservation Science and Practice*, *1*(10), e92.

Shackelford, N., Standish, R. J., Ripple, W., & Starzomski, B. M. (2018). Threats to biodiversity from cumulative human impacts in one of North America's last wildlife frontiers. *Conservation Biology*, *32*(3), 672-684.

Spies, T. A., Giesen, T. W., Swanson, F. J., Franklin, J. F., Lach, D., & Johnson, K. N. (2010). Climate change adaptation strategies for federal forests of the Pacific Northwest, USA: ecological, policy, and socio-economic perspectives. *Landscape ecology*, *25*(8), 1185-1199.