

# ***Georgeson Bay (Shore Access 17) Pollinator Restoration and Management Plan 2023***

***Georgeson Bay, Galiano Island, British Columbia***



*Photo taken on April 12, 2023 from upper aspect of Zone 2*

*To fulfil the requirements of ER390 of the Restoration of Natural Systems Certificate Program*

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### **Abstract**

In 2017, the Capital Regional District Galiano Island Parks and Recreation Commission (GIPRC) invested considerable resources in an attempt to control the spread of spurge-laurel (*Daphne laureola*) at Shore Access 17 on Active Pass Drive, Galiano Island, British Columbia (the Project). The initial efforts were proven unsuccessful, and this invasive species had persisted, presenting an ongoing management challenge. Therefore, ecological restoration proved to be a potential solution to replace invasive species at this location with native species, and hopefully reduce the management costs of invasive species overtime. Therefore, with the collaboration of the University of Victoria Restoration of Natural Systems Program, the GIPRC, and funding partners, the restoration of Shore Access 17 became possible.

This report documents the restoration completed at Georgeson Bay (Shore Access 17) on Galiano Island, British Columbia, as of April 2023, with continued restoration work ongoing. This report builds off of work and information completed and collected by Brittany Boyd ER390 with report titled 'Restoration of Habitat for Native Plants & Pollinators on Southern Galiano Island, BC'. This report is also intended to be an update to the previously written management plan for this Project titled 'Georgeson Bay Pollinator Habitat Restoration Project – Restoration Plan 2021-2022' authored by Andrew Simon. A total of 773 individual native plant species have been planted and 120 hours of invasive species removal has occurred as of April 2023.

### ***Acknowledgements***

I acknowledge the land of which we are guests for this Project of the traditional territories of the Penelakut, Hwlitsum, and Tsawwassen First Nations, and of other Hul'qumi'num-speaking peoples. This Project has been made possible by Andrew Simon, Dr. Nancy Shackleford, Galiano Island Parks and Recreation Commission, Galiano Island community volunteers, University of Victoria Restoration Club volunteers, TD Friends of the Environment, Kristen Miskelly and Satinflower Nurseries, Adam Huggins and the Galiano Conservancy Association, Rob Underhill and Mayne Island Conservancy, Brittany Boyd, Michael Carothers, Lora Morandin. And those who will continue to build and progress the Project in the future (Deanna Shrimpton!).



## Introduction

Within the coastal Douglas-fir ecosystem of British Columbia, old growth forests have been lost to human interference and development since the 1800s. Logging, farming, forest fire suppression, and invasive species have all impacted the native coastal Douglas-fir forests present today (*Coastal Douglas-fir Ecosystems*, 1999). Galiano Island, one of the Southern Gulf Islands is no exception. Where bare ground or disturbed areas are present on Galiano Island, so are invasive species. Invasive species have the ability to alter native plant communities and replace a healthy and diverse plant community with a monocrop of invasive species leaving little floral variability for pollinators. Coastal Douglas-fir ecosystems are the most endangered ecosystems in British Columbia, and therefore make them an attractive prospect for restoration projects (*Coastal Douglas-fir Ecosystems*, 1999). With future climate scenarios and anticipated extended periods of drought on Galiano Island, planting diverse native plant communities with varying phenology can aid in sustaining healthy pollinator communities and creating resilient ecosystems (Simon, 2020).

## Background

### Study Area

Galiano Island is located within the Coastal Douglas Fir (CDF) Biogeoclimatic Zone moist maritime (CDFmm) zone. The Coastal Douglas-fir Zone covers a small area of British Columbia's south coast, including a band of lower elevation along southeastern Vancouver Island, the Gulf Islands, and a fringe of mainland along the Georgia Strait. This zone is protected by the rain shadow of the Vancouver Island and Olympic mountains and warmed by air from the Pacific (B.C. Ministry of Forests , 1999). It has warm, dry summers and mild, wet winters. The mean annual temperature ranges from 9.2 to 10.5 C (degrees Celsius). Mean annual precipitation varies from 647 to 1263 millimeters (mm) (Nuszdorfer & Demarchi).

Coastal Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) is the most dominant tree in this zone found in a range of sites from dry rock outcrops to moist valley bottoms. In upland Douglas-fir forests, salal (*Gaultheria shallon*) and dull Oregon-grape (*Berberis nervosa*) are common understory plants; in rock outcrop areas, arbutus (*Arbutus menziesii*) and Garry oak (*Quercus garryana*) are common tree species growing with Douglas-fir. Snowberry (*Symphoricarpos albus*) and oceanspray (*Holodiscus discolor*) are well adapted to these open, dry ecosystems. In moister forests areas, Douglas-fir, grand fir (*Abies grandis*), western redcedar (*Thuja plicata*), and big-leaf maple (*Acer macrophyllum*) grow together with understory plants such as sword fern (*Polystichum munitum*) and trillium (*Trillium ovatum*). Skunk cabbage (*Lysichiton americanus*) and red alder (*Alnus rubra*) are typical of wet swampy areas, along with Indian plum (*Oemleria cerasiformis*), salmonberry (*Rubus spectabilis*), and red elderberry (*Sambucus racemosa*) (B.C. Ministry of Forests , 1999).

The vegetation of the CDF includes about 50 rare species restricted to the zone. Most of these are at the northern limit of their distribution and include species of seaside, aquatic, rock outcrop, and forested habitats. Soils in the CDF are generally derived from morainal, colluvial, and marine deposits. The accumulation of organic materials in semi- to well-decomposed organic deposits is uncommon. Soils are usually Brunisols, grading with increased precipitation to Humo-Ferric Podzols. Zonal soils are mostly Drystric or Eutric Brunisols (Nuszdorfer & Demarchi).

### ***Goals and Objectives***

This project was developed as a comprehensive approach to addressing the challenges of invasive species management and to restore the ecological integrity of the site in partnership with community members and local and regional conservation agencies, as well as to honor the Indigenous cultural history of the site with the installation of signage, art, and/or public infrastructure. The project is intended to focus on providing a diversity of floral resources for pollinators. The project has been ongoing with involvement from multiple parties and previous students. The Goals and Objectives outlined below are for the purpose of my scope of the Project from 2021 to 2023.

#### **Goal 1: Assist with community engagement and supporting Brittany Boyd with Zone 1 restoration.**

##### Objectives:

- Contribute to pollinator workshop series,
- Assist with prescription development for Zone 1 subzones,
- Planting of Zones 1f & g, and
- Invasive species removal within Zone 1.

#### **Goal 2: Develop restoration prescriptions for Zones 2 and 3, and execute restoration activities.**

##### Objectives:

- Complete and coordinate invasive species removal,
- Develop native planting prescriptions, and
- Complete planting and seeding activities.

#### **Goal 2: Complete monitoring of restoration activities, and provide recommendations.**

##### Objectives:

- Complete and collect monitoring data, and
- Make recommendations based on monitoring information collected, and for future restoration activities.

## Methodology

### Site Description

Shore Access 17 (the Project) lies to the east of Mount Galiano, on Active Pass Drive, in a watershed that supports a relatively rich ecological community within the Coastal Douglas-fir Biogeoclimatic Zone. The area under management by the GIPRC is approximately 2,000 square meters (m<sup>2</sup>) in size. Although the area has been heavily modified over the course of the last century, it still retains a cross-section of native vegetation characteristics of this ecological community. Given the hydrology of this relatively moist ecosystem, there is a higher chance of restoration success as plants would be subject to a decreased stress of summer drought (Boyd, Carrothers, Claeys, & Simon, 2021). Figure 1 below shows the location of the Project on Galiano Island, British Columbia. The composition of the native plant community is characteristic of the ecosystem type, with an overstory of big-leaf maple (*Acer macrophyllum*), and shrubs such as Nootka rose (*Rosa nutkana*), snowberry (*Symphoricarpos albus*), and oceanspray (*Holodiscus discolor*) in the understory (Boyd, Carrothers, Claeys, & Simon, 2021).

Over 12 exotic species have been documented on the Project site, including spurge-laurel (*Daphne laureola*), cut-leaf blackberry (*Rubus laciniatus*), Himalayan blackberry (*Rubus discolor*), common hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), and Scotch broom (*Cytisus scoparius*) (Boyd, Carrothers, Claeys, & Simon, 2021) as well as additional species not mentioned.

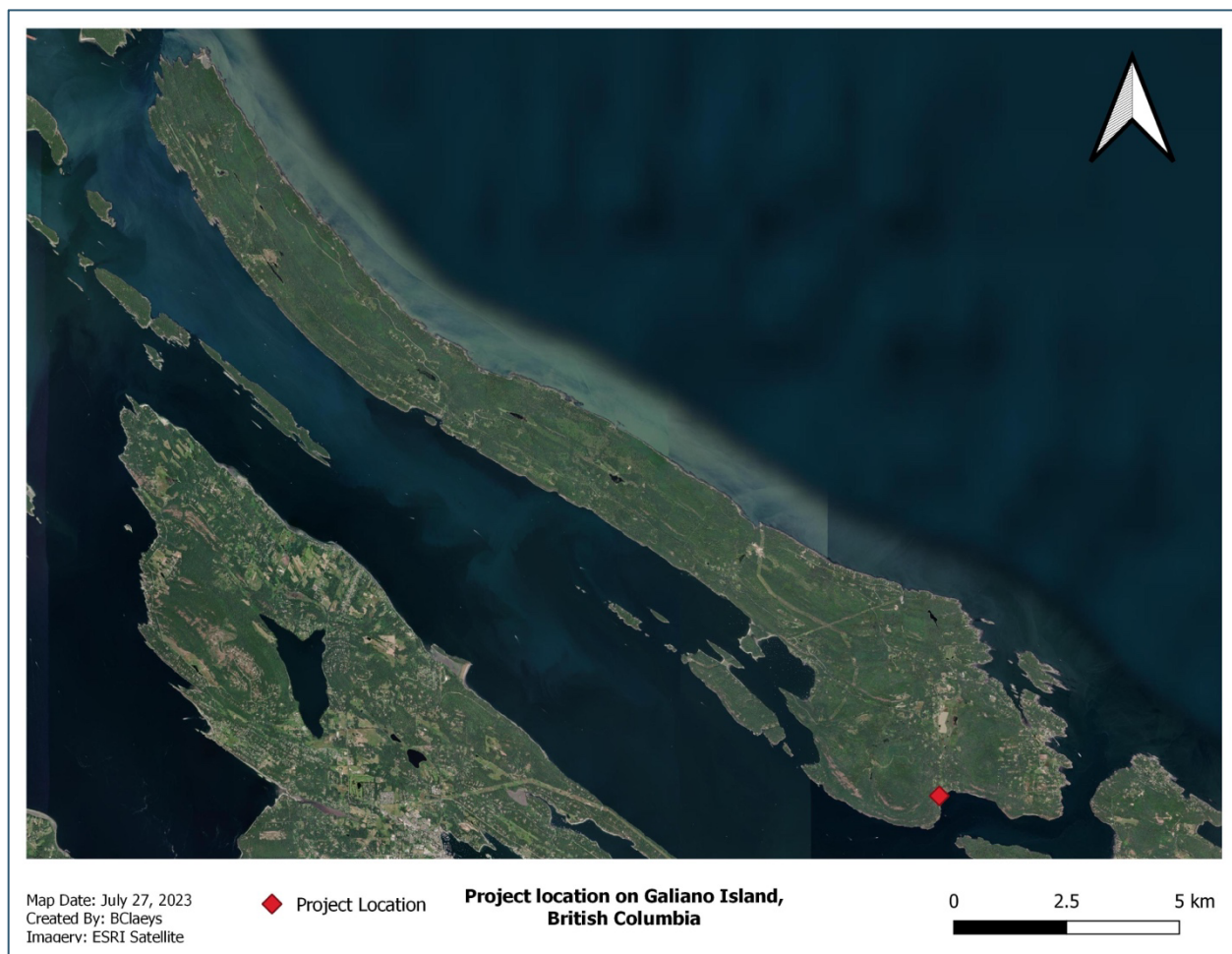


Figure 1 Location of the Project on Galiano Island



## Management Zones

The Project has been divided into three management zones based on their ecological context and existing plant community presence. An additional fourth zone has also been included for potential future restoration activities, but no restoration activities or prescriptions have been developed for this zone to date (Zone 4). Figure 2 below shows the management zones overlaid on orthoimagery. Appendix A provides detailed management prescriptions which include the management polygon, photos, description of zone, Terrestrial Ecosystem Mapping (TEM) results, area of management zone, management concerns, management goals, activities completed, species planted, and species seeded.

### Zone 1

Zone 1 has been entirely fenced off from deer, it has moderate cover of big-leaf maple (*Acer macrophyllum*) but also has exposed areas on the east side of the zone. Various periods of burlap were laid within this zone for smothering exotic grasses. Invasive species within this zone included spurge-laurel (*Daphne laureola*), Himalayan blackberry (*Rubus discolor*), Scotch broom (*Cytisus scoparius*), English hawthorn (*Crataegus monogyna*), and orchard-grass (*Dactylis glomerata*). This zone, specifically subzones 1f and g are intended to be the focal point of this Project as the herbaceous pollinator meadow and where Indigenous cultural history is intended to be honored through signage and potentially other infrastructure.

### Zone 2

Zone 2 has some cover of big-leaf maple primarily on the south side of the zone, but it is mostly exposed. It has shallow rocky soils. It was primarily covered in Himalayan blackberry (*Rubus discolor*), spurge-laurel (*Daphne laureola*), and also some exotic grass cover where blackberry and spurge-laurel were not present. Some areas of this zone may be vulnerable to erosion due to steep slopes and current lack of vegetative cover.

### Zone 3

Zone 3 is dominated by an overstory of big-leaf maple (*Acer macrophyllum*), and had a large infestation of spurge-laurel (*Daphne laureola*). This zone is relatively intact but required spurge-laurel removal. This zone is vulnerable to erosion as some of the slopes are relatively steep.



Figure 2 2023 Management Zones



### ***Invasive Species Management***

Understanding the biology of invasive species aids in the management and prevention of them. The invasive species which presented the largest management concern, mainly by occupying the most cover within the Project area included: spurge-laurel (*Daphne laureola*), Himalayan blackberry (*Rubus discolor*), Scotch broom (*Cytisus scoparius*), English hawthorn (*Crataegus monogyna*), and orchard-grass (*Dactylis glomerata*). Detailed information on spread and removal of these species are outlined below.

#### ***Spurge-laurel (Daphne laureola)***

Spurge-laurel spreads by both seed and roots, to remove this species, mature plants should be cut at the stem below the soil line in the summer months. Regenerating seedlings should be hand pulled (Garry Oak Ecosystems Recovery Team, *Best Practices for Invasive Species Management in Garry Oak and Associated Ecosystems: Daphne (Daphne laureola)*, 2007). This plant is toxic and therefore burning of plant materials is not a suitable option.

#### ***Himalayan blackberry (Rubus discolor)***

Himalayan blackberry spreads by seeds (this species is a prolific seed producer), but drooping shoots can also develop roots which allows it to spread. The canes should be cut back to expose the root, and then the root requires removal from the ground (Garry Oak Ecosystems Recovery Team, *Best Practices for Invasive Species Management in Garry Oak and Associated Ecosystems: Evergreen Blackberry (Rubus laciniatus) and Himalayan Blackberry (Rubus armeniacus/discolor/procerus)*, 2002).

#### ***Scotch broom (Cytisus scoparius)***

If the stems of Scotch broom are smaller than a pencil then it can be pulled in late fall to end of January when soils are moister, if broom plants are larger than a pencil, then they can be cut with loppers (Garry Oak Ecosystems Recovery Team, *Best Practices for Invasive Species Management in Garry Oak and Associated Ecosystems: Scotch Broom (Cytisus scoparius)*, 2002).

#### ***Common/English hawthorn (Crataegus monogyna)***

English hawthorn reproduces by seed, seedlings can be hand pulled but large trees must be cut down. Avoid cutting plants when they are full of ripe fruit as they will be dispersed when moving and disposing of plant material. The cut stumps will resprout unless the roots are removed or the cut surface is treated with herbicide. Burning or flaming the cut surface with a torch may reduce sprouting or the stumps could be grinded during the winter when native species are dormant (Washington State Noxious Weed Control, n.d.)

#### ***Orchard-grass (Dactylis glomerata)***

Orchard-grass is a perennial, cool-season, tall-growing bunch-grass which does not have rhizomes or stolons; therefore, the primary mode of spread is via seed heads. The best way to manage this species is by mowing or clipping seed heads (dead-heading) (Kantner, 2011) Orchard-grass does not re-sprout from stems or leaves and therefore can be piled without issue, however large amounts of dead grass material present the potential for an increased nitrogen load to the soil, and should be removed for composting or disposal off-site (Garry Oak Ecosystems Recovery Team, *Best Practices for Invasive Species Management in Garry Oak and Associated Ecosystems: Orchard-grass (Dactylis glomerata)*, 2007). Non-chemical control options for Orchard-grass including grazing, prescribed burning, mowing and cutting, and tillage are all identified as having poor control (<50%). Digging or hand pulling has been identified as having good control 80-95% (Weed Control in Natural Areas in the Western United States, 2013). A number of controls have been used for managing orchard-grass in Garry oak ecosystems. Flaming with a roof torch or cutting below the plant crown can be used on isolated plants or small patches. Mowing can be used on larger areas after the wildflowers have bloomed but repeated mowing is required annually and over several years. Ploughing or the use of barriers such as landscape fabric is recommended in areas with no native species (Orchardgrass, n.d.)



### ***Native Plant and Seed Selection***

The selection of native plants and seeds were chosen based on phenology to support an array of pollinator species, deer resistance, and those species that would be well suited to the ecological conditions present within the Project area.

### ***Deer-resistance***

Due to the shallow soils in Zone 2 and 3, and to allow more budget to be used on plants rather than caging; deer-resistant species were primarily selected for these zones. The deer-resistant species selected for Zone 2 and Zone 3 included: tall Oregon-grape (*Berberis aquifolium*), yarrow (*Achilleum millefolium*), woolly sunflower (*Eriophyllum lanatum*), Lemmon's needlegrass (*Achnatherum lemmonii*), Roemer's fescue (*Festuca roemerii*), blue wildrye (*Elymus glaucus*), sea blush (*Plectritis congesta*), slough sedge (*Carex obnupta*), dull Oregon-grape (*Berberis nervosa*), salal (*Gaultheria shallon*), Western fescue (*Festuca occidentalis*), and Columbia brome (*Bromus vulgaris*).

## Phenology

Plant selection considered the phenology of native species to ensure there was floral availability for pollinators during all growing months, especially during conditions of drought. See below Figure 3 the flowering months for all species (excluding graminoid and fern species) planted for the Project.



Figure 3 Phenology of species planted. Scale is in months, February to September (Month 2 to 9).

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**Seeding**

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Three different seed mixes were selected for the Project. These included a farewell-to-spring (*Clarkia amoena*) and woolly sunflower (*Eriophyllum lanatum*) seed mix, a sea blush (*Plectritis congesta*) seed mix, and a blue wildrye (*Elymus glaucus*) and California oatgrass (*Danthonia californica*) seed mix. These mixes were seeded in Zones 1-3. Based on discussions with Kristen Miskelly of Satinflower Nurseries (Miskelly, 2022) seeding is generally not successful in areas with a high amount of leaf litter. Due to the Project being dominated by an overstory of big-leaf maple (*Acer macrophyllum*), there is a high amount of leaf litter across all management zones. Therefore, seeding occurred after the leaves had fallen for the year; areas were raked clear of leaf litter and general debris (primarily debris from Himalayan blackberry [*Rubus discolor*]), and then the seed was raked into the cleared areas in patches rather than broadcasting seed over the area. Farewell-to-spring (*Clarkia amoena*) and woolly sunflower (*Eriophyllum lanatum*) were especially attractive for seed selection as these species have been identified as consistently harboring high bee abundance and species richness (Anderson, Costner, Best, & Langellotto, 2022). Additionally woolly sunflower (*Eriophyllum lanatum*) has also been documented as having high drought tolerance, and establishes quickly to provide erosion control (Gucker & Shaw, 2021). In ecosystems similar to those found on Galiano Island, annuals tend to germinate during late fall rains, concentrating primary productivity during the wettest phase of the year, and to flower in early spring, surviving periods of low soil moisture availability as seeds. Perennials maintain primary productivity longer, and flower later, drawing from the tail end of the wet season resource pulse and persisting through drought in vegetative form (Simon, 2020). For these reasons it is important to consider the phenology and life cycle of plants during restoration projects to aid in maximizing the floral availability for pollinators and to maximize the resilience of the native plants to seasonal drought.



## Monitoring

Plant health and herbivory data was collected using a three-point scale to prevent any subjectiveness since multiple personnel would be collecting the plant monitoring data. Table 3 provides a description of the plant health scale and Table 4 provides a description of the plant herbivory scale.

**Table 1 Plant Health Scale**

Health Score (0-2)	Description
0	Dead
1	Unhealthy
2	Healthy

**Table 2 Plant Herbivory Scale**

Herbivory Score (0-2)	Description
0	Heavy herbivory, expected to affect the survival of the plant unless immediate action is taken
1	Light herbivory, some herbivory but not expected to affect the survival of the plant
2	No herbivory observed

## Results

### Invasive Species Removal and Management

Invasive species removal and management hours have been estimated over the course of the Project to determine time invested into maintenance, management, and removal of invasive species, with the goal of having reduced time and cost invested as the seed bank is depleted and native plants begin establishing.

A total of 120 volunteer hours have been spent on the removal of invasive species within all management zones. Additionally, 52.3 volunteer hours have been spent removing invasive species in Zone 1, 39.5 hours in Zone 2, and 28.7 in Zone 3. There have been 39.5 hours spent removing spurge-laurel, 79 hours removing Himalayan blackberry, and 2 hours removing orchard-grass. Scotch broom was primarily removed in 2020 and the time spend removing this species was not tracked.

### Native Planting and Seeding

A total of **773** plant individuals and diversity of **59** different plant species were planted at the Georgeson Bay restoration project from October 2021 to April 2023. The dates of plantings and seeding events include October 29, 2021 (planting of Zone 1 [subzones a, b, c, d, e]), November 26, 2022 (planting of Zone 1f&g; planting of 12 black hawthorn [*Crataegus douglasii*] throughout Zone 1; planting Zone 2; planting Zone 3; as well as some seeding in all zones), and April 13, 2023 (planting of some bulbous plants in Zone 1f&g (Great camas [*Camassia leichtlinii*], farewell-to-spring [*Clarkia amoena*], white fawn lily [*Erythronium oregonum*], chocolate lily [*Fritillaria affinis*], and pretty shootingstar [*Primula pulchellum*]). A total of **26 trees, 273 shrubs, 323 forbs/ferns, and 151 grasses** were planted during this period.

A total of **411** native plants were planted in Zone 1 (subzones a, b, c, d, e); these consisted of **18 trees, 188 shrubs, 98 forbs, six ferns, and 101 grasses**. Appendix B outlines comprehensive plant lists for Zones 1, 2, and 3. Some plants in Zone 1 were flagged but not all.

Zone 1f & g which are the subzones intended to be the herbaceous pollinator meadow and the focal point for this Project were planted with **174 forbs** and a mix of seeding farewell-to-spring (*Clarkia amoena*), woolly sunflower (*Eriophyllum lanatum*), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), and sea blush (*Plectritis congesta*). All plants in Zone 1f & g were flagged.

Zone 2 included a total of **110** plants consisting of **eight trees, 42 shrubs, 30 forbs, and 30 grasses**. As well as a mix of seeding farewell-to-spring (*Clarkia amoena*), woolly sunflower (*Eriophyllum lanatum*), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), and sea blush (*Plectritis congesta*).

Zone 3 included a total of **78** plants, consisting of **43 shrubs, 15 ferns, and 20 grasses**. No trees were planted within in this zone due to the existing overstory of big-leaf maple (*Acer macrophyllum*). Some sea blush (*Plectritis congesta*) seeds were also spread within this zone. All plants in Zone 2 and 3 were flagged.

Seed mix volumes included:

- Farewell-to-spring (*Clarkia amoena*)/woolly sunflower (*Eriophyllum lanatum*): 190 grams/500 seeds;
- California oatgrass (*Danthonia californica*)/blue wildrye (*Elymus glaucus*): 100 seeds; and
- Sea blush (*Plectritis congesta*): 100 seeds

Seed was spread across all zones and exact amounts or areas seeded are unknown. Although most locations seeded were flagged. Plants were purchased from Satinflower Nurseries, Galiano Conservancy, and Mayne Island Conservancy. Seed was purchased from Satinflower Nurseries. Figure 4 and 5 below outline the distribution of species planted within management zones as well as number of individuals planted per zone split out by stratum.

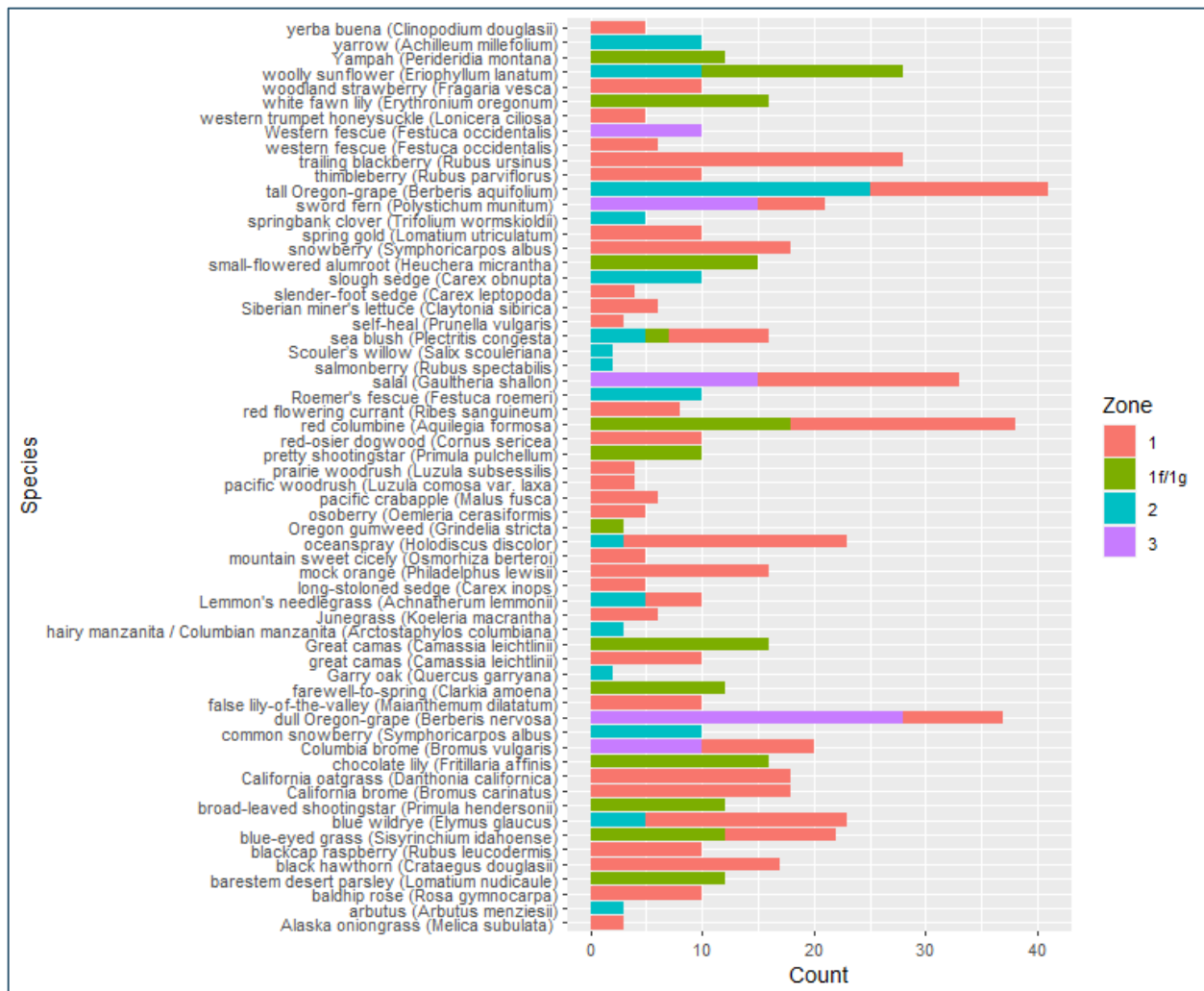


Figure 4 Planted species distribution across Management Zones (Zone 1 includes subzones a, b, c, d, and e).

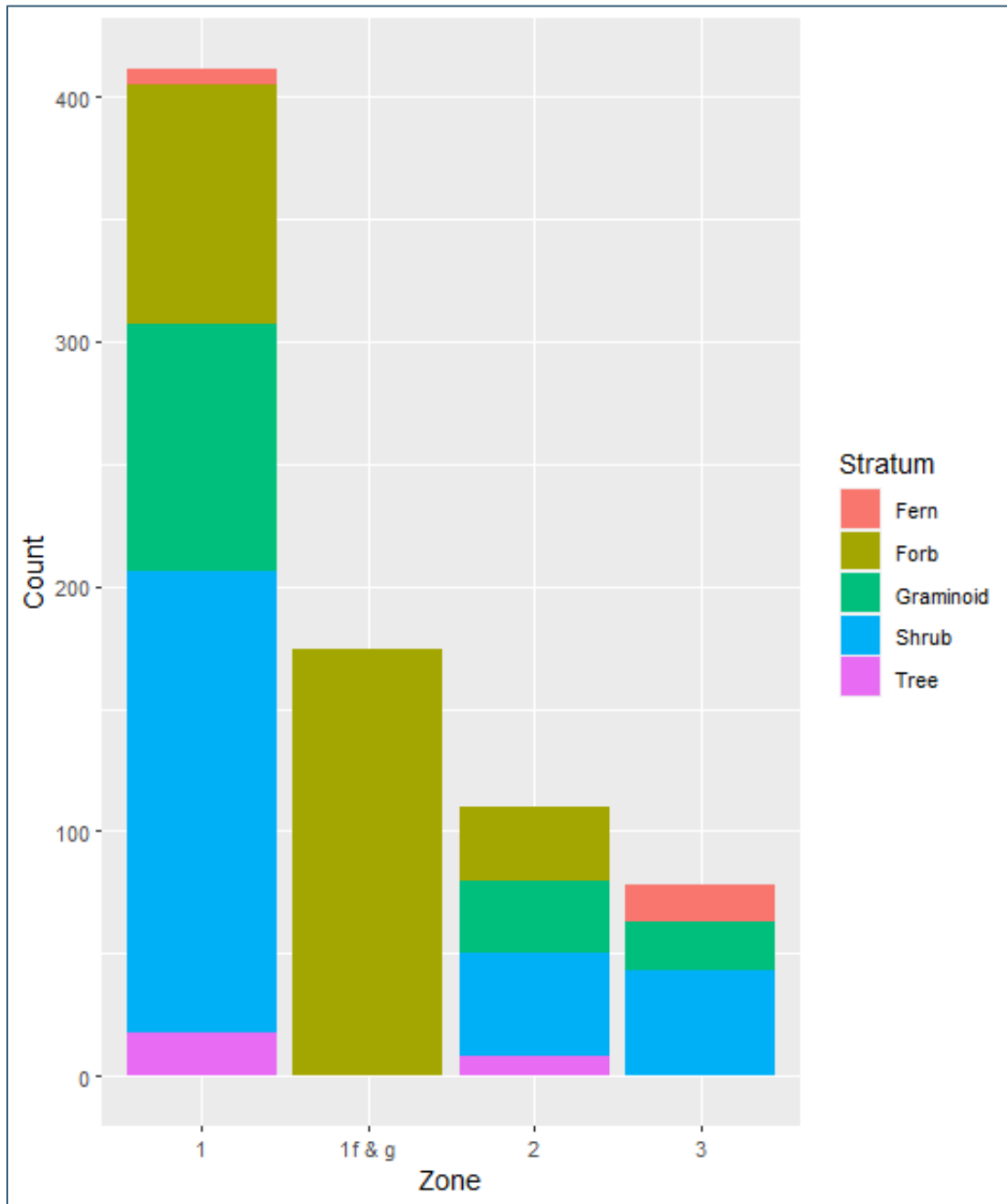


Figure 5 Number of native plants planted per management zone and stratum from Fall 2021 to April 2023 (Zone 1 includes subzones a, b, c, d, and e).

## Monitoring

Monitoring data was collected on April 13 and 14, 2023. Data was collected using Avenza Maps from a map created in QGIS outlining monitoring zones overlaid on orthoimagery collected by Andrew Simon on February 22, 2023. A Keyhole Markup Language Zipped (KMZ) file was exported from the Avenza Map for use in geospatial software (specifically QGIS). For each monitoring point, the zone, species, health score, herbivory score (if applicable), applicable comments, and photo were recorded. This data is held within the KMZ and can be used as reference for future monitoring activities. Figure 6 below includes a summary of the monitoring data collected organized spatially within the zones.

During monitoring of the 773 individual plantings, 320 were monitored in April 2023, and a total of 453 plants have not yet been assessed. Time of year is also a factor in this monitoring as not all species may have been growing yet and some species may have had skewed health results due to potential winter foliage still being present. Ultimately the monitoring data should be considered with these things in mind, and there is likely not enough data present to make any large assumptions about the success of plantings.

Some general observations made during monitoring identified that the bare areas of the Project included cotyledons of spurge-laurel (*Daphne laureola*), indicating regeneration, potentially a result of the seed source from the adjacent property. Other species observed to be inhabiting the bare ground included cotyledons of big-leaf maple (*Acer macrophyllum*), cleavers (*Galium aparine*), hairy bittercress (*Cardamine hirsute*), and purple dead nettle (*Lamium purpureum*).

As a summary of health, 14 of 318 individuals monitored were observed to have a health score of zero (0), indicating they were dead or no plant was observed at all indicating a presumed death. For these health scores of zero, five were woolly sunflower (*Eriophyllum lanatum*) from Zone 2, five were unknown species from Zones 2 and 3 (unknown species as a result of plant not being observed), two dead salal (*Gaultheria shallon*) were from Zone 3, and one dead salal (*Gaultheria shallon*) was from Zone 1. A hypothesis could potentially be made from the five dead woolly sunflower (*Eriophyllum lanatum*) observed in Zone 2; it is possible that the soils were too shallow for appropriate roots to establish. With that said, cotyledons of woolly sunflower (*Eriophyllum lanatum*) were observed in some of the seeded areas, indicating seeding could be a more appropriate method due to the shallow soils.

Additionally, the only salal (*Gaultheria shallon*) observed within Zone 1 was dead, where 18 individuals were planted in 2021. Although search effort was limited, it is possible that this species was not well suited to this zone. Further monitoring may assist in understanding if there are any live salal plants within Zone 1.

There were 102 of 318 plants identified with a health score of one (1), and included *Berberis* species, sword fern (*Polystichum munitum*), among others. The remaining 200 species of the 318 monitored, were identified with a health score of two (2) indicating healthy plants. Figure 7 shows plant health data by species monitored in April 2023.

Of the 411 plants planted in Zones 1a, b, c, d, and e, 132 plants were observed and monitored. The remaining 267 were not monitored either due to lack of time or presence. Some of these species were also likely planted in groups so finding each individual may not be feasible. Of the 186 plants planted in Zones 1f & g, none were monitored due to lack of time. Of the 110 plants planted in Zone 2 all were identified except for two where there was a flag but no plant was observed (these were assumed to be dead and given a health score of zero). Of the two Garry oak (*Quercus garryana*) trees planted within Zone 2, the leaves of one tree were just starting to come out and the second tree did not have leaves on it yet (it is unknown the health of this tree, so was given a health score of one). Of the 78 plants planted in Zone 3 all were identified but for three of the individuals there was a flag observed but no plant (therefore was given a health score of zero). Detailed plant health monitoring data is located in Appendix C.

Only uncaged or unfenced species were assessed for herbivory, this included plants in Zone 2 and 3. All plants in Zone 1 are protected by a fence. All trees and non-deer-resistant shrubs were caged in Zone 2, species caged included:

Arbutus (*Arbutus menziesii*), Garry oak (*Quercus garryana*), Scouler's willow (*Salix scouleriana*), Hairy manzanita (*Arctostaphylos columbiana*), Oceanspray (*Holodiscus discolor*), common snowberry (*Symphoricarpos albus*), and some but not all individuals of tall Oregon-grape (*Berberis aquifolium*). No caging occurred in Zone 3. No uncaged species appeared to currently be threatened by herbivory but additional monitoring should be completed. Figure 8 shows plant herbivory monitoring data by species.

Overall, for seed establishment, the farewell-to-spring (*Clarkia amoena*) appeared to be the most successful and most readily observed in April 2023. Other seeded species observed included woolly sunflower (*Eriophyllum lanatum*) and sea blush (*Plectritis congesta*). No seeded grass species were observed but may have been too early in the year or may be a result of lack of search effort. In Zone 3 where sea blush (*Plectritis congesta*) was seeded on eroding slopes there was very limited germination of seeds observed potentially a result of too much soil movement.



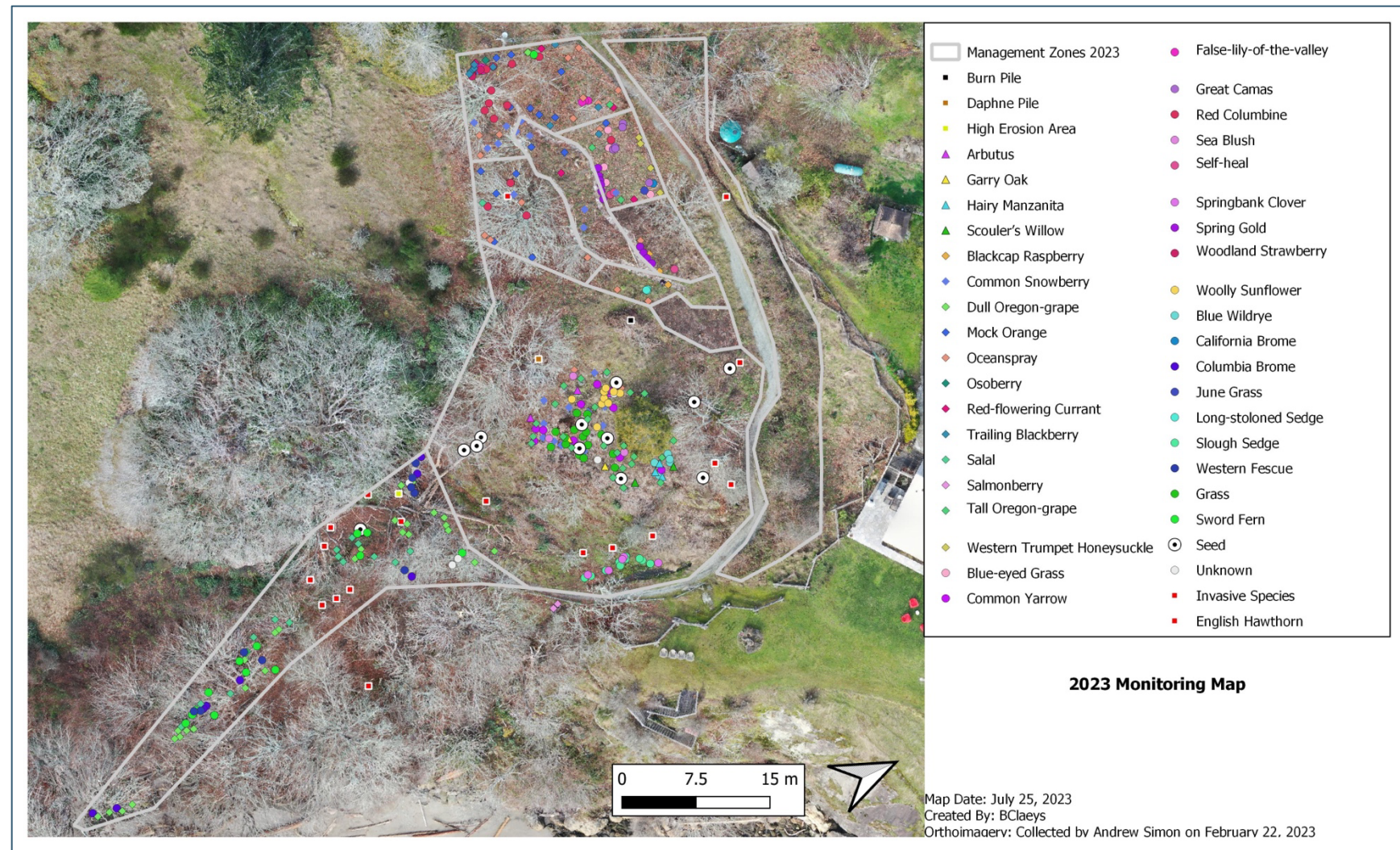


Figure 6 Map showing plants monitored from April 13-14, 2023. Data only includes species monitored and not all species planted to date, data presented also doesn't include any dead species.

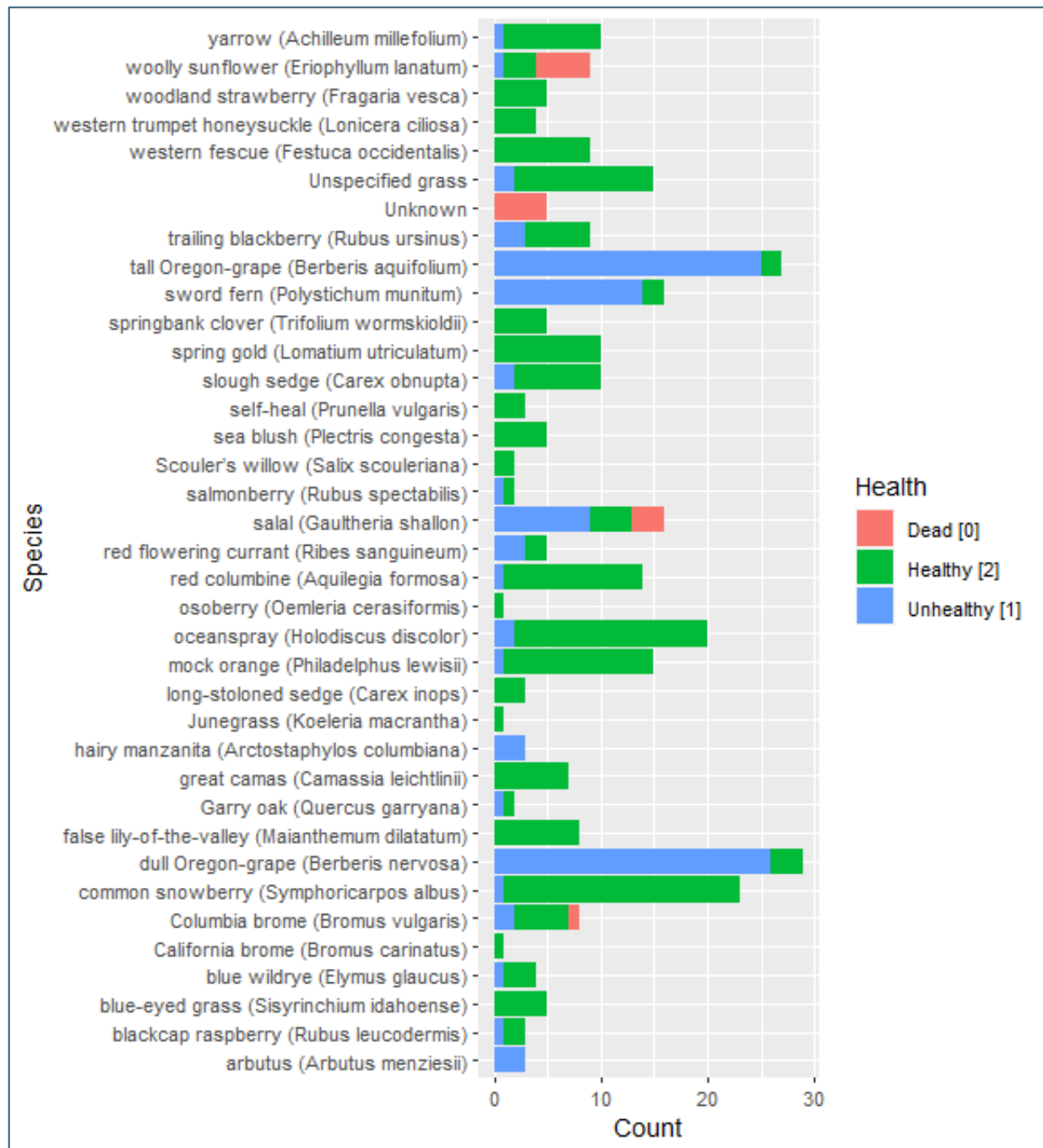


Figure 7 Plant health data by species from April 2023 monitoring, does not included all species planted and only those monitored in April 2023 (unknown species are those which could not be identified due to death or were not present, and therefore were assumed to be dead).

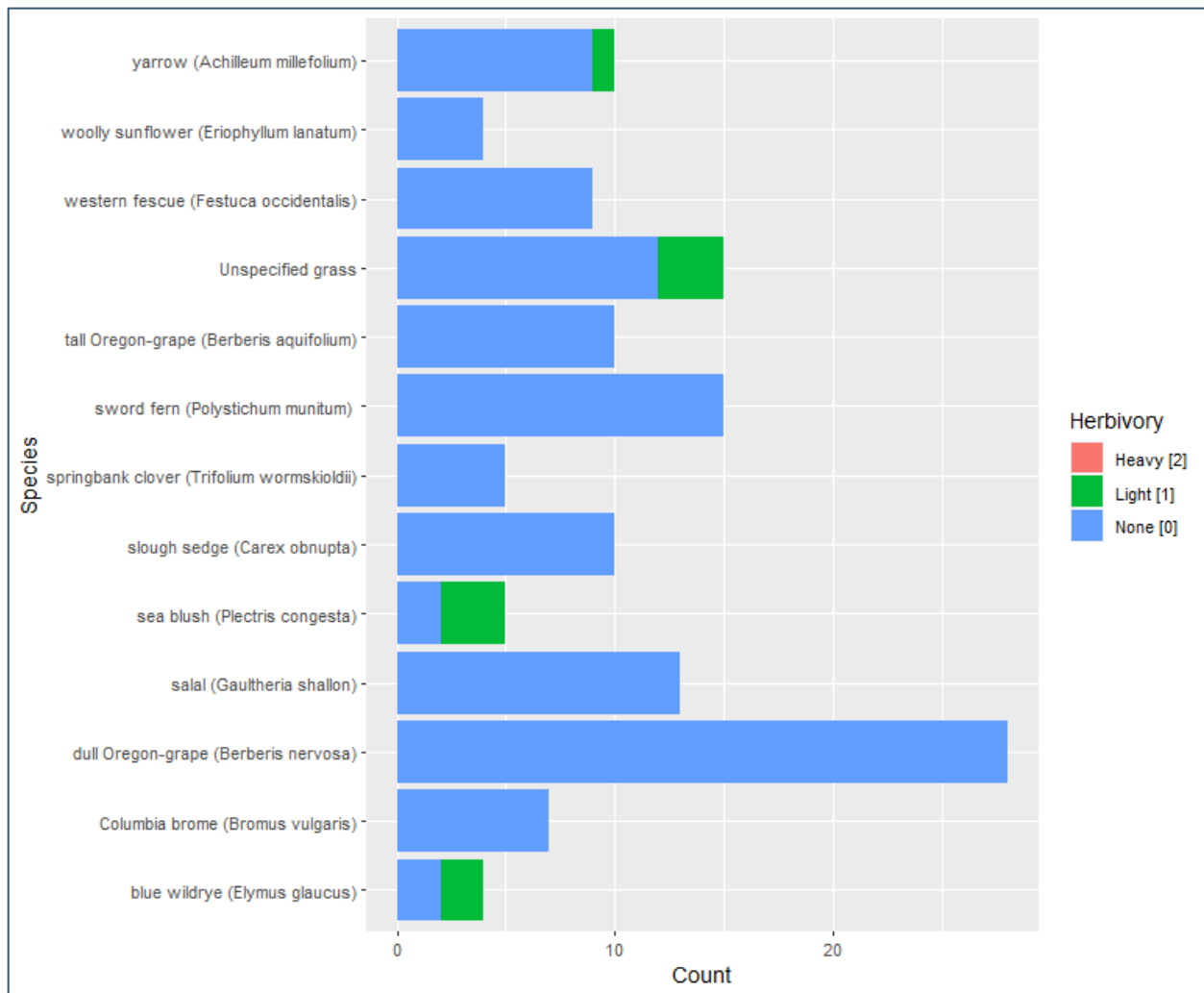


Figure 8 Plant herbivory data by species, only includes uncaged species in Zone 2 and 3. All of Zone 1 species are protected by deer fencing.

### Recommendations

See brief list of recommendations below (with recommended year of completion); detailed recommendations are provided in Table 3-5 below.

1. Prioritize monitoring of remaining 453 plantings to determine health and general success of species, specifically in all of Zone 1 subzones (2023); add flags to all species to aid in monitoring,
2. Planting of shrubs, forbs, and graminoid species in dense patches of high erosion areas of Zones 2 and 3 since there is potentially too much soil movement for germination of seeds to occur [2023/2024],
3. Seeding of various species across the site for a potential cost-effective solution in providing native species cover [2023/2024]; especially in previously restored areas,
4. Removal of exotic species prioritizing those in restored zones or those which would threaten the survival of plantings over removal in new areas (spurge-laurel [*Daphne laureola*], Scotch broom [*Cytisus scoparius*], Himalayan blackberry [*Rubus discolor*], English hawthorn [*Crataegus monogyna*] trees and stump resprouting, orchard-grass [*Dactylis glomerata*], as well as rhizomatous exotic grasses [2023 to ongoing]); Zone 1 is the priority due to the high density of native plantings and high density of exotic grasses,
5. Additional invasive species removal and native planting/seeding for areas of Zone 2 which have had minimal activity to date (2024),
6. Debris management including burn pile in Zone 2 (burn winter 2023/2023),
7. Restoration prescription development for Zone 4 (2024), and
8. Ongoing monitoring of all planted species and seeded areas (2023-2028).



**Table 3 Detailed Restoration, Maintenance, and Monitoring Recommendations for Zone 1**

<p><b>Maintenance Required</b></p>	<ol style="list-style-type: none"> <li>1. Ongoing removal of invasive species regeneration including Spurge-laurel (<i>Daphne laureola</i>), Scotch broom (<i>Cytisus scoparius</i>), English hawthorn (<i>Crataegus monogyna</i>), and some Himalayan blackberry (<i>Rubus discolor</i>) throughout Zone 1 subzones. These should be pulled as soon as possible to prevent fruiting/seeding.</li> </ol> <p><b>Maintenance Schedule: Complete removal activities twice per year prior to fruiting/seeding cycles.</b></p> <ol style="list-style-type: none"> <li>2. Management of resprouting English hawthorn (<i>Crataegus monogyna</i>) stumps in Zone 1 either by burning of stump (if permitted by the GIPRC) or stump grinding during dormant season to prevent disturbance to native plantings.</li> </ol> <p><b>Maintenance/Monitoring Schedule: Requires one-time completion and then ongoing monitoring for resprouting. Winter 2023/2023 may be an appropriate time for this.</b></p> <ol style="list-style-type: none"> <li>3. <b>High density of exotic grasses in Zone 1 which are threatening the potential success and establishment of native species, prioritize removal.</b></li> </ol> <p><b>Maintenance/Monitoring Schedule: Complete removal activities twice per year prior to fruiting/seeding cycle.</b></p>
<p><b>Recommended Restoration Activities</b></p>	<ol style="list-style-type: none"> <li>1. Recommend additional seeding to fill gaps in plantings and therefore contribution to competition of regenerating invasive species and competing with invasive grasses. Recommended seeds to trial include: previously seeded <i>Plectritis congesta</i>, <i>Clarkia amoena</i>, <i>Eriophyllum lanatum</i>; and new species <i>Collinsia parviflora</i>, <i>Claytonia perfoliata</i>, along with perennial grasses. Seeding annual forbs and perennial grasses and forbs may allow a good mix of competition against invasives by providing early winter growth with the annual forbs and late season cover with the perennial species. The annual forbs would hopefully also self-seed and spread easier across the site than perennial grasses and forbs. Seeding may be a more cost-effective way to cover a larger area.</li> <li>2. Replace dead plantings as required, upon monitoring results.</li> </ol> <p>Data by Brownlee, 2023, indicated <i>Eriophyllum lanatum</i> and <i>Grindelia stricta</i> both increased in cover when trialing invasive species management and native seeding/planting techniques; species <i>Achilleum millefolium</i>, <i>Prunella vulgaris</i>, and <i>Symphoricarpos albus</i> also had good percent cover, and therefore these species may also be good additions in higher quantities for the Project.</p>
<p><b>Monitoring Required</b></p>	<p><b>Monitoring Schedule: All plants in Zone 1f &amp; g as well as other Zone 1 subzones require an initial assessment, and then once per year for the next five years at which time conditions can be reassessed.</b></p>

Table 4 Detailed Restoration, Maintenance, and Monitoring Recommendations for Zone 2

<p><b>Maintenance Required</b></p>	<ol style="list-style-type: none"> <li>1. Removal of five English hawthorn (<i>Crataegus monogyna</i>) trees, to prevent any new growth from fruit/seed dispersal. Trees were flagged in April 2023. Stumps should be grinded prior to any additional planting or seeding. Large amount of fruit observed on these trees in 2022.</li> </ol> <p>Maintenance/Monitoring Schedule: Requires one-time completion and then ongoing monitoring for resprouting.</p> <ol style="list-style-type: none"> <li>2. High density of regenerating Spurge-laurel (<i>Daphne laureola</i>) observed during April 2023 monitoring, especially on side adjacent to property with Spurge-laurel infestation. Removal required.</li> </ol> <p>Maintenance/Monitoring Schedule: Complete removal activities once per year prior to fruiting/seeding cycles.</p> <ol style="list-style-type: none"> <li>3. Potential caging of shrubs if herbivory deemed to be affecting survival of non-caged species.</li> </ol>
<p><b>Recommended Restoration Activities</b></p>	<ol style="list-style-type: none"> <li>1. High density planting required along the southwest edge of Zone 2 as this is a high erosion area and very susceptible to daphne intrusion from neighboring seed bank. Would try planting in patches rather than individual spacing to act as a barrier of soil movement, then seeding areas around these plantings, as it would be more likely to germinate as the plantings will stabilize the soil.</li> <li>2. Additional invasive species removal of daphne and blackberry in isolated locations on rocky outcrops to eliminate seed source.</li> <li>3. Consider spreading of burlap or leaf mulch (using newspaper and leaf litter on site) on top and toe of Zone 2 where exotic herbaceous species are present (areas not planted in 2022). Once removed immediate follow up with seed. Ensure blackberry roots have been removed prior to laying of burlap. Will have to be after the Zone 2 burn pile is complete. May also consider some mowing activities prior to leaf mulch/burlap.</li> <li>4. Seeding/testing of new annual forbs on rocky outcrops to prevent erosion or intrusion of daphne/blackberry regeneration.</li> </ol> <p>Recommended seed species to experiment with include Miner's lettuce (<i>Claytonia perfoliata</i>), Siberian Miner's lettuce (<i>Claytonia sibirica</i>), small-flowered blue-eyed Mary (<i>Collinsia parviflora</i>), sea blush (<i>Plectritis congesta</i>), California brome (<i>Bromus carinatus</i>), California oatgrass (<i>Danthonia californica</i>), blue wildrye (<i>Elymus glaucus</i>), and Junegrass (<i>Koeleria macrantha</i>).</p> <p>Try seeding Entire-leaved Gumweed (<i>Grindelia stricta</i>) based on success of increasing cover from 2021 to 2022 by (Brownlee, 2023), adding another perennial forb (in addition to woolly sunflower [<i>Eriophyllum lanatum</i>]) may assist with competition of invasive species throughout the growing season. It may also be attractive to pollinators as it blooms over a long period of time and late into the season (<i>Grindelia stricta</i> Entire-leaved Gumweed, n.d.)</p>



	<p>Would recommend also trying to seed <i>Collinsia parviflora</i> which can grow in full sun to partial shade, this plant could be a good option for the rocky outcrops of Zone 2. It is an annual forb so will re-seed itself hopefully contributing to growing cover of native species on the site from year to year. This site was observed in large amounts at Bellhouse Provincial Park on Galiano Island which is a southeast facing park (<i>Collinsia parviflora</i> Small-flowered Blue-eyed Mary, n.d.). It has higher germination at lower temperatures so late fall or early spring sowing is best (<i>Collinsia parviflora</i>, 2003).</p> <p>Seeding <i>Claytonia perfoliata</i> could also occur in Zone 2. This could be a good species for the toe slope of Zone 2 that is moister during the winter months. This species grows from full sun meadows to shady forest understory and will set seed from year to year on bare soil. Deer may graze on it (<i>Claytonia perfoliata</i> Miner's Lettuce, n.d.) (<i>Propagation Guidelines: Miner's Lettuce, n.d.</i>). <i>Claytonia perfoliata</i> was recommended to be planted during restoration of Bellhouse Provincial Park (Scholz, 2006).</p>
	<ol style="list-style-type: none"> <li>1. Monitor tall-Oregon grape (<i>Berberis aquifolium</i>) and all planted trees for health based on April 2023 monitoring data.</li> <li>2. Additionally completing once per year monitoring of all plantings.</li> </ol> <p><b>Monitoring Schedule: Complete monitoring once per year for five years and then reassess conditions.</b></p>

Table 5 Detailed Restoration, Maintenance, and Monitoring Recommendations for Zone 3

<b>Maintenance Required</b>	<ol style="list-style-type: none"> <li>1. Removal of four English hawthorn (<i>Crataegus monogyna</i>) trees, to prevent any new growth from fruit/seed dispersal. Trees were flagged in April 2023. Stumps should be grinded prior to any additional planting or seeding.</li> </ol> <p><b>Maintenance Schedule: Requires one-time completion and then ongoing monitoring for resprouting.</b></p> <ol style="list-style-type: none"> <li>2. High density of regenerating Spurge-laurel (<i>Daphne laureola</i>) observed during April 2023 monitoring, especially on side adjacent to property with Spurge-laurel infestation. Removal required.</li> </ol> <p><b>Maintenance/Monitoring Schedule: Complete removal activities once per year prior to fruiting/seeding cycles.</b></p>
<b>Recommended Restoration Activities</b>	<ol style="list-style-type: none"> <li>1. High density planting of eroding slopes, soil movement too high for seeds to germinate. Recommend dense patches rather than individually spaced plants.</li> <li>2. More shrubs should be planted potentially try common snowberry due to success elsewhere on Project but would require caging to provide a higher shrub cover layer.</li> <li>3. Consider planting trailing blackberry along steps for public interest.</li> <li>4. Seeding across zone especially steep bare ground areas susceptible to erosion and daphne regeneration.</li> </ol>

	<p>5. Removal of English holly (<i>Ilex aquifolium</i>) trees.</p> <p>Try seeding some <i>Claytonia perfoliata</i> to stabilize the steep slopes where daphne has been removed. This species grows from full sun meadows to shady forest understory and will set seed from year to year on bare soil. Deer may graze on it (<i>Claytonia perfoliata</i> Miner's Lettuce, n.d.) (<i>Propagation Guidelines: Miner's Lettuce, n.d.</i>). <i>Claytonia perfoliata</i> was recommended to be planted during restoration of Bellhouse Provincial Park (Scholz, 2006).</p>
<b>Monitoring Required</b>	<ol style="list-style-type: none"> <li>1. Monitor salal (<i>Gaultheria shallon</i>), sword fern (<i>Polystichum munitum</i>), and dull-Oregon grape (<i>Berberis nervosa</i>) for health based on April 2023 monitoring data.</li> <li>2. Additionally completing once per year monitoring of all plantings.</li> </ol> <p><b>Monitoring Schedule: Complete monitoring on all plantings once per year for five years and then reassess conditions.</b></p>

### Conclusions

The efforts of countless volunteer hours and those that have been involved in a variety of capacities has allowed the Shore Access 17 accessing Georgeson Bay to be completely transformed. Ongoing management, maintenance, and monitoring are vital parts of successful restoration and will be required to ensure the Project continues to progress back to dominant cover of native vegetation.

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## *Appendix A Management Prescriptions*

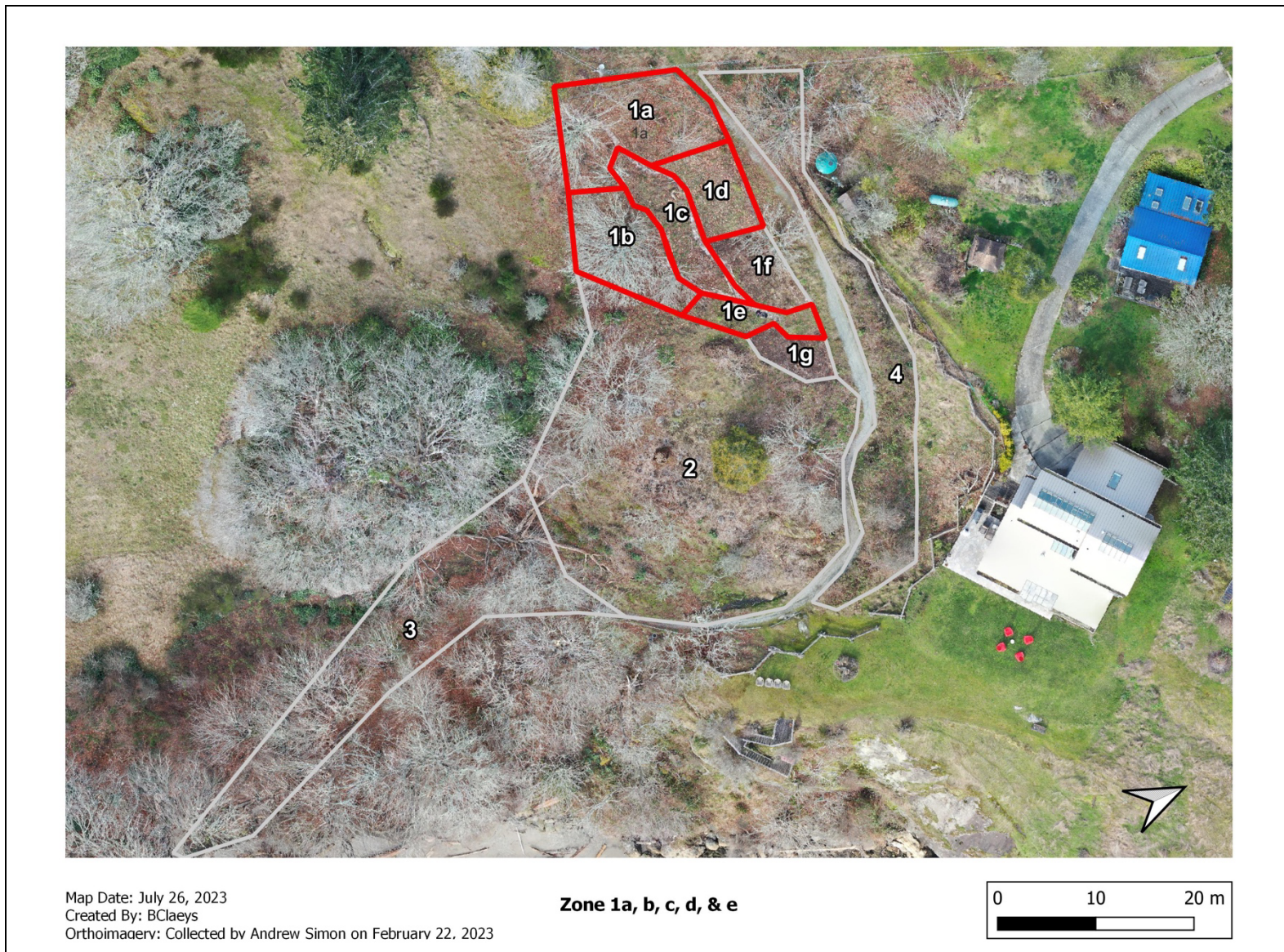


Brittany Claeys

ER390

Georgeson Bay Pollinator Restoration and Management Plan 2023

Table A 1 Management Prescription for Zone 1a, b, c, d, & e







Zone 1 photo taken on October 9, 2021



Zone 1 photo taken on April 13, 2023



Zone 1a photo taken on November 27, 2022



Zone 1a photo taken on November 27, 2022



<b>Description</b>	<p>Zone 1: encompasses a semi-forested area at the crest of the slope descending southeast to Georgeson Bay. The soil moisture regime is moderately wet, and the soil nutrient regime relatively rich, supporting an ecological community that would, over the course of ecological succession, climax with an overstory Douglas-fir, bigleaf maple, and western redcedar (<i>Boyd, Carrothers, Claeys, &amp; Simon, 2021</i>).</p> <p>Zone 1a: primarily covered by big-leaf maple and large cover of exotic grasses          Zone 1b: primarily covered by big-leaf maple and exotic grasses          Zone 1c: some cover of big-leaf maple, high cover of exotic grasses          Zone 1d: more open with some cover but also received good light          Zone 1e: primarily open with limited to no cover by the big-leaf maple overstory, English hawthorn and Himalayan blackberry</p>
<b>Terrestrial Ecosystem Mapping</b>	CwBg – Foamflower (RF) site series, young forest structural stage with a broadleaf canopy (5B) [RF5B] ( <i>Boyd, Restoration of Habitat for Native Plants &amp; Pollinators on Southern Galiano Island, BC, 2022</i> )
<b>Area</b>	1a: 142 square meters (m <sup>2</sup> ) 1b: 98 m <sup>2</sup> 1c: 71 m <sup>2</sup> 1d: 58 m <sup>2</sup> 1e: 36 m <sup>2</sup>
<b>Management Concerns (Past/Present)</b>	Past: Spurge-laurel, Himalayan blackberry, English hawthorn, scotch broom, exotic grasses Present: Invasive grasses, primarily Orchard-grass and rhizomatous exotic grasses in addition to the regrowth of Scotch broom and spurge-laurel seedlings, as well as persistent English hawthorn and Himalayan blackberry shoots.
<b>Management Goals</b>	Removal of invasive species, re-establishment of native species.
<b>Activities Completed</b>	<ul style="list-style-type: none"> <li>• Removal of Scotch broom, spurge-laurel, Himalayan blackberry, and English hawthorn</li> <li>• Burlap to suppress exotic grasses in Zone 1d</li> <li>• Fencing of Zone 1 to prevent deer herbivory</li> <li>• Planting of native species</li> <li>• Ongoing exotic grass removal</li> <li>• Monitoring</li> </ul>
<b>Species Planted</b>	osoberry ( <i>Oemleria cerasiformis</i> ), tall Oregon-grape ( <i>Berberis aquifolium</i> ), red flowering currant ( <i>Ribes sanguineum</i> ), mock orange ( <i>Philadelphus lewisii</i> ), red-osier dogwood ( <i>Cornus sericea</i> ), thimbleberry ( <i>Rubus parviflorus</i> ), western trumpet honeysuckle ( <i>Lonicera ciliosa</i> ), black hawthorn ( <i>Crataegus douglasii</i> ), dull Oregon-grape ( <i>Berberis nervosa</i> ), baldhip rose ( <i>Rosa gymnocarpa</i> ), salal ( <i>Gaultheria shallon</i> ), common snowberry ( <i>Symphoricarpos albus</i> ), blackcap raspberry ( <i>Rubus leucodermis</i> ), trailing blackberry ( <i>Rubus ursinus</i> ), oceanspray ( <i>Holodiscus discolor</i> ), pacific crabapple ( <i>Malus fusca</i> ), Lemmon's needlegrass ( <i>Achnatherum lemmonii</i> ), red columbine ( <i>Aquilegia formosa</i> ), California brome ( <i>Bromus carinatus</i> ), Columbia brome ( <i>Bromus vulgaris</i> ), long-stolonated sedge ( <i>Carex inops</i> ), slender-foot-sedge ( <i>Carex leptopoda</i> ), Siberian miner's

	<p>lettuce (<i>Claytonia sibirica</i>), California oatgrass (<i>Danthonia californica</i>), blue wildrye (<i>Elymus glaucus</i>), Western fescue (<i>Festuca occidentalis</i>), June grass (<i>Koeleria macrantha</i>), pacific woodrush (<i>Luzula comosa</i> var. <i>laxa</i>), prairie woodrush (<i>Luzula subsessilis</i>), mountain sweet cicely (<i>Osmorhiza berteroi</i>), sea blush (<i>Plectritis congesta</i>), self-heal (<i>Prunella vulgaris</i>), yerba buena (<i>Clinopodium douglasii</i>), woodland strawberry (<i>Fragaria vesca</i>), spring gold (<i>Lomatium utriculatum</i>), false lily-of-the-valley (<i>Maianthemum dilitatum</i>), blue-eyed grass (<i>Sisyrinchium idahoense</i>), sword fern (<i>Polystichum munitum</i>), Alaska oniongrass (<i>Melica subulata</i>), Great camas (<i>Camassia lechtlinii</i>)</p>
<b>Species Seeded</b>	<p>Farewell-to-spring (<i>Clarkia amoena</i>), woolly sunflower (<i>Eriophyllum lanatum</i>), California oatgrass (<i>Danthonia californica</i>), blue wildrye (<i>Elymus glaucus</i>), sea blush (<i>Plectritis congesta</i>)</p> <p>Seeded in a few isolated patches, in proximity to Zone 1f &amp; g.</p>







Zone 1g November 25, 2022



Zone 1g April 14, 2023



Zone 1f November 25, 2022



Zone 1f, e, g November 27, 2022

<b>Description</b>	<p>Zone 1: encompasses a semi-forested area at the crest of the slope descending southeast to Georgeson Bay. The soil moisture regime is moderately wet, and the soil nutrient regime relatively rich, supporting an ecological community that would, over the course of ecological succession, climax with an overstory Douglas-fir, bigleaf maple, and western redcedar (Boyd, Carrothers, Claeys, &amp; Simon, 2021).</p> <p>Zone 1f/g: Identified as herbaceous pollinator community, removal of English hawthorn transformed into an open meadow with limited or no overstory cover.</p>
<b>Terrestrial Ecosystem Mapping</b>	CwBg – Foamflower (RF) site series, young forest structural stage with a broadleaf canopy (5B) [RF5B] (Boyd, <i>Restoration of Habitat for Native Plants &amp; Pollinators on Southern Galiano Island, BC</i> , 2022)
<b>Area</b>	<p>1f: 50 m<sup>2</sup></p> <p>1g: 31 m<sup>2</sup></p>
<b>Management Concerns Past/Present</b>	<p>Past: Himalayan blackberry, English Hawthorn, invasive grasses</p> <p>Present: English hawthorn and Himalayan blackberry resprouting, exotic grasses</p>
<b>Management Goals</b>	Establish a herbaceous meadow to attract a diversity of pollinators through extended seasons, as well as be the focal point of the Project and to honor Indigenous culture through art and signage
<b>Activities Completed</b>	<ul style="list-style-type: none"> <li>• English hawthorn and Himalayan blackberry removal</li> <li>• Deer fence install</li> <li>• Laying of burlap to smother exotic grasses</li> <li>• Planting of herbaceous species and seeding</li> </ul>
<b>Species Planted</b>	red columbine ( <i>Aquilegia formosa</i> ), Great camas ( <i>Camassia leichtlinii</i> ), farewell-to-spring ( <i>Clarkia amoena</i> ), woolly sunflower ( <i>Eriophyllum lanatum</i> ), white fawn lily ( <i>Erythronium oregonum</i> ), chocolate lily ( <i>Fritillaria affinis</i> ), Oregon gumweed ( <i>Grindelia stricta</i> ), small-flowered alumroot ( <i>Heuchera micrantha</i> ), barestem desert parsley ( <i>Lomatium nudicaule</i> ), Yampah ( <i>Perideridia montana</i> ), sea blush ( <i>Plectritis congesta</i> ), broad-leaved shootingstar ( <i>Primula hendersonii</i> ), pretty shootingstar ( <i>Primula pulchellum</i> ), blue-eyed grass ( <i>Sisyrinchium idahoense</i> )
<b>Species Seeded</b>	<p>Farewell-to-spring (<i>Clarkia amoena</i>), woolly sunflower (<i>Eriophyllum lanatum</i>), California oatgrass (<i>Danthonia californica</i>), blue wildrye (<i>Elymus glaucus</i>), sea blush (<i>Plectritis congesta</i>)</p> <p>Seeded in patches between plantings where gaps were observed, to assist with outcompeting exotic grasses.</p>









Zone 2 photo taken on October 9, 2021



Zone 2 photo taken on April 13, 2023



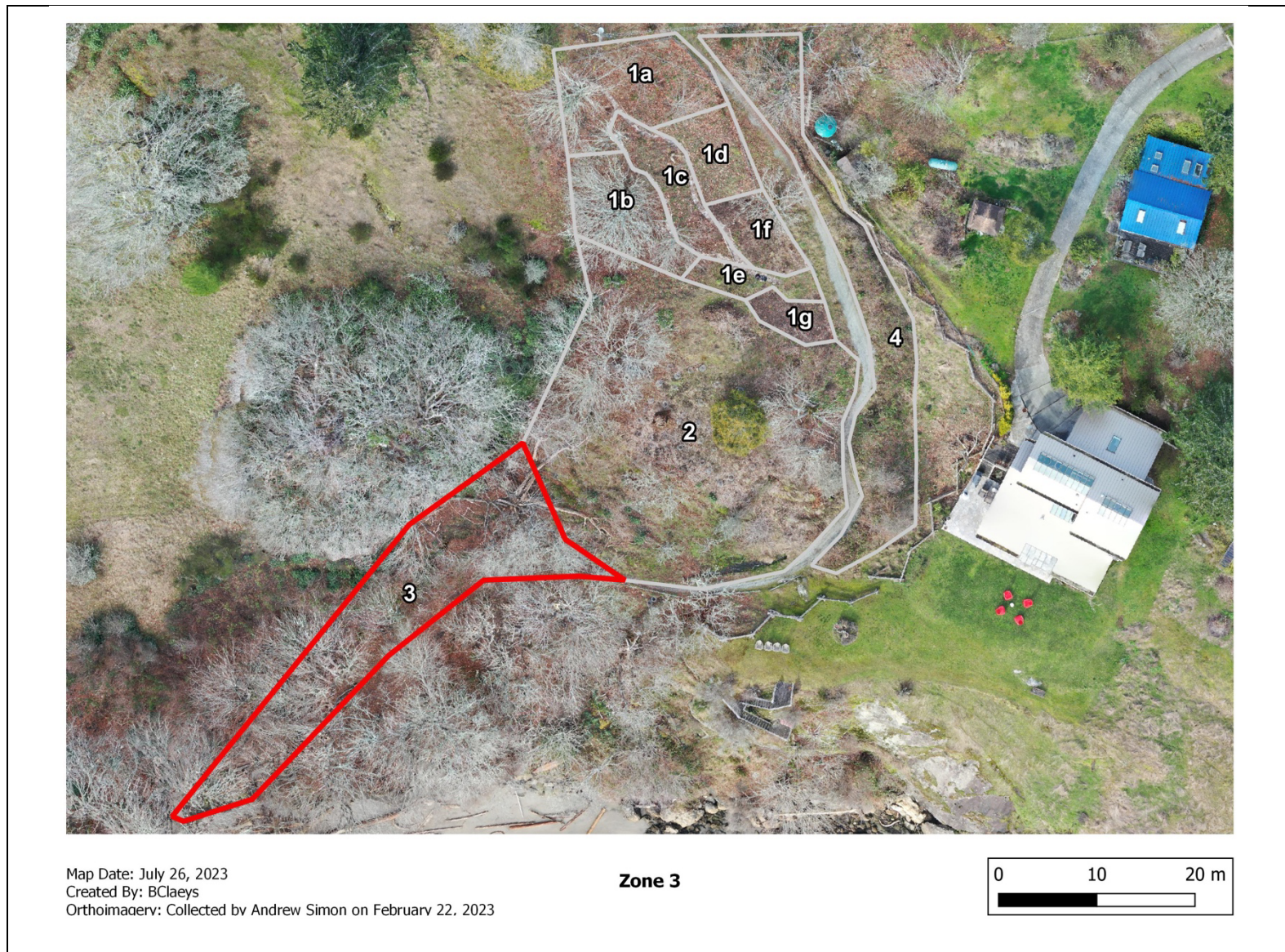
Zone 2 photo taken on April 13, 2023



Zone 2 photo taken on April 13, 2023



<b>Description</b>	Zone 2 primarily encompasses a steep slope with exposed bedrock and thin soils. Except for a large swath of Himalayan blackberry at the top of this outcrop, the area is relatively sparsely vegetated, with thin soils resulting in limited tree cover and open exposure. Fencing this area is not possible due to thin soils. The top aspect of this zone is overrun by exotic grasses and has been used as the “burning zone” for the Project. The toe of the slope also is overrun by exotic grasses and tends to be a bit moister especially in the winter as a drainage culvert passes through. There are also English hawthorn trees present within this zone (Boyd, Carrothers, Claeys, & Simon, 2021).
<b>Terrestrial Ecosystem Mapping</b>	CwBg – Foamflower (RF) site series, graminoid-dominated structural stage (2b) with very shallow soils and a warm aspect (vw) [RFvw2b] (Boyd, Restoration of Habitat for Native Plants & Pollinators on Southern Galiano Island, BC, 2022)
<b>Area</b>	831 m <sup>2</sup>
<b>Management Concerns Past/Present</b>	Past: Himalayan blackberry, spurge-laurel, shallow soils, steep slopes, exotic grasses, English hawthorn Present: A few isolated patches of Himalayan blackberry and spurge-laurel remaining, regeneration of spurge-laurel on margins of adjacent property, exotic grasses at toe and top aspects of slope, bare exposed soil which may be vulnerable to influx of exotic species.
<b>Management Goals</b>	Removal of invasive species, re-establishment of native species.
<b>Activities Completed</b>	<ul style="list-style-type: none"> <li>• Invasive species removal, primarily spurge-laurel and Himalayan blackberry, some orchard-grass</li> <li>• Planting of native trees, shrubs, forbs, and grasses, as well as seeding</li> <li>• Caging of trees and non-deer-resistant shrubs</li> <li>• Monitoring</li> </ul>
<b>Species Planted</b>	hairy manzanita ( <i>Arctostaphylos columbiana</i> ), arbutus ( <i>Arbutus menziesii</i> ), Garry oak ( <i>Quercus garryana</i> ), tall Oregon-grape ( <i>Berberis aquifolium</i> ), Scouler’s willow ( <i>Salix scouleriana</i> ), oceanspray ( <i>Holodiscus discolor</i> ), common snowberry ( <i>Symphoricarpos albus</i> ), yarrow ( <i>Achilleum millefolium</i> ), woolly sunflower ( <i>Eriophyllum lanatum</i> ), Lemmon’s needlegrass ( <i>Achnatherum lemmonii</i> ), Roemer’s fescue ( <i>Festuca roemerii</i> ), blue wildrye ( <i>Elymus glaucus</i> ), sea blush ( <i>Plectritis congesta</i> ), salmonberry ( <i>Rubus spectabilis</i> ), slough sedge ( <i>Carex obnupta</i> ), springbank clover ( <i>Trifolium wormskioldii</i> )
<b>Species Seeded</b>	Farewell-to-spring ( <i>Clarkia amoena</i> ), woolly sunflower ( <i>Eriophyllum lanatum</i> ), California oatgrass ( <i>Danthonia californica</i> ), blue wildrye ( <i>Elymus glaucus</i> ), sea blush ( <i>Plectritis congesta</i> )  Since there was bare ground from removal of Himalayan blackberry ( <i>Rubus discolor</i> ) on the rocky slope, it was a good opportunity to provide extra cover through seeding to prevent or minimize any other exotic species from establishing.







Zone 3 photo taken on October 9, 2021



Zone 3 photo taken on April 13, 2023



Zone 3 photo taken on October 9, 2021



Zone 3 photo taken on April 13, 2023

<b>Description</b>	Zone 3 covers a shaded forested community in a moisture-receiving toe slope position. The canopy is composed primarily of big-leaf maple; the understory is sparse, including sword fern among other native species. Although spurge-laurel is a problem in this area, this community is relatively ecologically intact as compared to the previous described communities (Boyd, Carrothers, Claeys, & Simon, 2021).
<b>Terrestrial Ecosystem Mapping</b>	CwFd – Kindbergia (RK) site series at a young forest structural stage with a single-storied, broadleaf canopy (5sB) [RK5sB] (Boyd, <i>Restoration of Habitat for Native Plants &amp; Pollinators on Southern Galiano Island, BC, 2022</i> )
<b>Area</b>	377 m <sup>2</sup>
<b>Management Concerns</b>	Past: Spurge-laurel Present: Erosion of steep slopes and bare ground, regenerating spurge-laurel, spurge-laurel seed bank on adjacent southeast property
<b>Management Goals</b>	Removal of invasive species, re-establishment of native species.
<b>Activities Completed</b>	<ul style="list-style-type: none"> <li>○ Spurge-laurel removal</li> <li>○ Planting of shrubs, graminoids, and ferns</li> <li>○ Seeding steep erosional areas</li> </ul>
<b>Species Planted</b>	dull Oregon-grape ( <i>Berberis nervosa</i> ), salal ( <i>Gaultheria shallon</i> ), sword fern ( <i>Polystichum munitum</i> ), Western fescue ( <i>Festuca occidentalis</i> ), Columbia brome ( <i>Bromus vulgaris</i> )
<b>Species Seeded</b>	sea blush ( <i>Plectritis congesta</i> ) seeded in high erosion areas of Zone 3 slopes



## *Appendix B Comprehensive Plant List*

Table B 1 Comprehensive Plant List 2021- Zone 1

Zone	Plants	Sratum	No. SFN	No. GCA	Total
1	osoberry ( <i>Oemleria cerasiformis</i> )	Shrub	0	5	5
1	tall Oregon-grape ( <i>Berberis aquifolium</i> )	Shrub	0	16	16
1	red flowering currant ( <i>Ribes sanguineum</i> )	Shrub	5	3	8
1	mock orange ( <i>Philadelphus lewisii</i> )	Shrub	16	0	16
1	red-osier dogwood ( <i>Cornus sericea</i> )	Shrub	0	10	10
1	thimbleberry ( <i>Rubus parviflorus</i> )	Shrub	0	10	10
1	western trumpet honeysuckle ( <i>Lonicera ciliosa</i> )	Shrub	0	5	5
1	black hawthorn ( <i>Crataegus douglasii</i> )	Shrub	0	5	5
1	dull Oregon-grape ( <i>Berberis nervosa</i> )	Shrub	6	3	9
1	baldhip rose ( <i>Rosa gymnocarpa</i> )	Shrub	0	10	10
1	salal ( <i>Gaultheria shallon</i> )	Shrub	16	2	18
1	snowberry ( <i>Symphoricarpos albus</i> )	Shrub	18	0	18
1	blackcap raspberry ( <i>Rubus leucodermis</i> )	Shrub	0	10	10
1	trailing blackberry ( <i>Rubus ursinus</i> )	Shrub	18	10	28
1	oceanspray ( <i>Holodiscus discolor</i> )	Shrub	0	20	20
1	pacific crabapple ( <i>Malus fusca</i> )	Tree	0	6	6
	<b>TOTAL SHRUBS/TREES</b>		79	115	194
1	Lemmon's needleglass ( <i>Achnatherum lemmonii</i> )	Graminoid	5	0	5
1	red columbine ( <i>Aquilegia formosa</i> )	Forb	0	20	20
1	California brome ( <i>Bromus carinatus</i> )	Graminoid	18	0	18
1	Columbia brome ( <i>Bromus vulgaris</i> )	Graminoid	10	0	10
1	long-stoloned sedge ( <i>Carex inops</i> )	Graminoid	5	0	5
1	slender-foot sedge ( <i>Carex leptopoda</i> )	Graminoid	4	0	4
1	Siberian miner's lettuce ( <i>Claytonia sibirica</i> )	Annual Forb	6	0	6
1	California oatgrass ( <i>Danthonia californica</i> )	Graminoid	18	0	18
1	blue wildrye ( <i>Elymus glaucus</i> )	Graminoid	18	0	18
1	western fescue ( <i>Festuca occidentalis</i> )	Graminoid	6	0	6
1	Junegrass ( <i>Koeleria macrantha</i> )	Graminoid	6	0	6
1	pacific woodrush ( <i>Luzula comosa</i> var. <i>laxa</i> )	Graminoid	4	0	4
1	prairie woodrush ( <i>Luzula subsessilis</i> )	Graminoid	4	0	4

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1	mountain sweet cicely ( <i>Osmorhiza berteroi</i> )	Forb	5	0	5
1	sea blush ( <i>Plectritis congesta</i> )	Annual Forb	9	0	9
1	self-heal ( <i>Prunella vulgaris</i> )	Forb	3	0	3
1	yerba buena ( <i>Clinopodium douglasii</i> )	Forb	0	5	5
1	woodland strawberry ( <i>Fragaria vesca</i> )	Forb	0	10	10
1	spring gold ( <i>Lomatium utriculatum</i> )	Forb	0	10	10
1	false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	Forb	0	10	10
1	blue-eyed grass ( <i>Sisyrinchium idahoense</i> )	Forb	0	10	10
1	sword fern ( <i>Polystichum munitum</i> )	Fern	6	0	6
1	Alaska oniongrass ( <i>Melica subulata</i> )	Graminoid	3	0	3
1	great camas ( <i>Camassia leichtlinii</i> )	Forb	0	10	10
<b>TOTAL HERBACEOUS</b>			130	75	205
<b>TOTAL PLANTS</b>			209	190	<b>399</b>

Table B 2 Comprehensive Plant List 2022 – Zone 1

Zone	Plants	Stratum	No. SFN	No. GCA	No. MIC	Total
1f/1g	Red columbine ( <i>Aquilegia formosa</i> )	Forb		18		18
1f/1g	Great camas ( <i>Camassia leichtlinii</i> )	Forb		16		16
1f/1g	Farewell-to-Spring ( <i>Clarkia amoena</i> )	Annual		12		12
		Forb				
1f/1g	Woolly sunflower ( <i>Eriophyllum lanatum</i> )	Forb		18		18
1f/1g	White fawn lily ( <i>Erythronium oregonum</i> )	Forb		16		16
1f/1g	Chocolate lily ( <i>Fritillaria affinis</i> )	Forb		16		16
1f/1g	Oregon gumweed ( <i>Grindelia stricta</i> )	Forb	3			3
1f/1g	Small-flowered alumroot ( <i>Heuchera micrantha</i> )	Forb			15	15
1f/1g	Barestem desert parsley ( <i>Lomatium nudicaule</i> )	Forb		12		12
1f/1g	Yampah ( <i>Perideridia montana</i> )	Forb	12			12
1f/1g	Sea blush ( <i>Plectritis congesta</i> )	Annual	2			2
		Forb				
1f/1g	Broad-leaved shootingstar ( <i>Primula hendersonii</i> )	Forb	12			12
1f/1g	Pretty shootingstar ( <i>Primula pulchellum</i> )	Forb		10		10
1f/1g	Blue-eyed grass ( <i>Sisyrinchium idahoense</i> )	Forb	12			12
1	Black hawthorn	Tree				12
	<b>TOTAL</b>		41	118	15	<b>186</b>
1f/1g	Seed - <i>Clarkia amoena</i> , <i>Eriophyllum lanatum</i>	Seed	SFN			
1f/1g	Seed - <i>Danthonia californica</i> , <i>Elymus glaucus</i>	Seed	SFN			
1	Seed - <i>Plectritis congesta</i>	Seed	SFN			

Table B 3 Comprehensive Plant List 2022 – Zone 2

Zone	Plants	Stratum	No. SFN	No. GCA	Total
2	hairy manzanita / Columbian manzanita (Arctostaphylos columbiana)	Tree		3	3
2	arbutus (Arbutus menziesii)	Tree	3		3
2	Garry oak (Quercus garryana)	Tree	2		2
2	tall Oregon-grape (Berberis aquifolium)	Shrub		25	25
2	Scouler's willow (Salix scouleriana)	Shrub		2	2
2	oceanspray (Holodiscus discolor)	Shrub	3		3
2	common snowberry (Symphoricarpos albus)	Shrub	10		10
2	yarrow (Achilleum millefolium)	Forb	10		10
2	woolly sunflower (Eriophyllum lanatum)	Forb	10		10
2	Lemmon's needlegrass (Achnatherum lemmonii)	Graminoid	5		5
2	Roemer's fescue (Festuca roemerii)	Graminoid		10	10
2	blue wildrye (Elymus glaucus)	Graminoid	5		5
2	sea blush (Plectritis congesta)	Annual Forb	5		5
2	Seed - Clarkia amoena, Eriophyllum lanatum	Seed	SFN		
2	Seed - Danthonia californica, Elymus glaucus	Seed	SFN		
2	Seed - Plectritis congesta	Seed	SFN		
2	salmonberry (Rubus spectabilis)	Shrub	2		2
2	slough sedge (Carex obnupta)	Graminoid	10		10
2	springbank clover (Trifolium wormskioldii)	Forb	5		5
<b>TOTAL PLANTS</b>			<b>70</b>	<b>40</b>	<b>110</b>



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**Table B 4 Comprehensive Plant List 2022 – Zone 3**

<b>Zone</b>	<b>Plants</b>	<b>Stratum</b>	<b>No. SFN</b>	<b>No. GCA</b>	<b>No. MIC</b>	<b>Total</b>
3	dull Oregon-grape ( <i>Berberis nervosa</i> )	Shrub	20		8	28
3	salal ( <i>Gaultheria shallon</i> )	Shrub	15			15
3	sword fern ( <i>Polystichum munitum</i> )	Fern	15			15
3	Western fescue ( <i>Festuca occidentalis</i> )	Graminoid	10			10
3	Columbia brome ( <i>Bromus vulgaris</i> )	Graminoid	10			10
3	Seed - <i>Plectritis congesta</i>	Seed	SFN			
<b>TOTAL PLANTS</b>			<b>70</b>	<b>0</b>	<b>8</b>	<b>78</b>

## *Appendix C 2023 Monitoring Data*

Name	Zone	Health (0-2 scale)	Herbivory (0-2 scale)	Notes	timestamp	BC comments
arbutus (Arbutus menziesii)	2	1	n/a	Caged	2023-04-11 11:51:12	
arbutus (Arbutus menziesii)	2	1	n/a	Caged	2023-04-11 12:00:16	
arbutus (Arbutus menziesii)	2	1	n/a	Caged	2023-04-11 12:51:01	
blackcap raspberry (Rubus leucodermis)	1	2	n/a		2023-04-13 14:26:46	
blackcap raspberry (Rubus leucodermis)	1	2	n/a		2023-04-13 14:28:38	
blackcap raspberry (Rubus leucodermis)	1	1	n/a		2023-04-13 14:32:57	
blue-eyed grass (Sisyrinchium idahoense)	1	2	n/a		2023-04-13 13:16:37	
blue-eyed grass (Sisyrinchium idahoense)	1	2	n/a		2023-04-13 13:34:25	
blue-eyed grass (Sisyrinchium idahoense)	1	2	n/a		2023-04-14 12:09:28	
blue-eyed grass (Sisyrinchium idahoense)	1	2	n/a		2023-04-14 12:15:32	
blue-eyed grass (Sisyrinchium idahoense)	1	2	n/a		2023-04-14 12:19:55	
blue wildrye (Elymus glaucus)	2	1	1	Not caged	2023-04-11 14:46:40	
blue wildrye (Elymus glaucus)	2	2	0	Not caged	2023-04-11 14:48:52	
blue wildrye (Elymus glaucus)	2	2	0	Not caged	2023-04-11 15:13:15	
blue wildrye (Elymus glaucus)	2	2	1	Not caged	2023-04-11 15:10:28	
blue wildrye (Elymus glaucus)	2	n/a	n/a		2023-04-11 14:50:37	
California brome (Bromus carinatus)	1	2	n/a		2023-04-13 13:52:07	
great camas (Camassia leichtlinii)	1	2	n/a		2023-04-13 13:57:10	
great camas (Camassia leichtlinii)	1	2	n/a		2023-04-14 11:58:27	
great camas (Camassia leichtlinii)	1	2	n/a		2023-04-14 11:58:53	
great camas (Camassia leichtlinii)	1	2	n/a		2023-04-14 12:16:16	
great camas (Camassia leichtlinii)	1	2	n/a		2023-04-14 12:16:41	

great camas (Camassia leichtlinii)	1	2	n/a		2023-04-14 12:17:09	
great camas (Camassia leichtlinii)	1	2	n/a		2023-04-14 12:17:35	
Columbia brome (Bromus vulgaris)	3	2	0	Not caged	2023-04-12 13:08:12	
Columbia brome (Bromus vulgaris)	3	1	0	Not caged	2023-04-12 14:04:34	
Columbia brome (Bromus vulgaris)	3	2	0	Not caged	2023-04-12 14:24:20	
Columbia brome (Bromus vulgaris)	3	2	0	Not caged	2023-04-12 14:25:38	
Columbia brome (Bromus vulgaris)	3	0	n/a	Not caged Looks dead	2023-04-12 14:44:08	
Columbia brome (Bromus vulgaris)	3	1	0	Not caged	2023-04-12 14:47:47	
Columbia brome (Bromus vulgaris)	3	2	0	Not caged	2023-04-12 15:02:12	
Columbia brome (Bromus vulgaris)	3	2	0	Not caged	2023-04-12 15:03:44	
common snowberry (Symphoricarpos albus)	2	2	n/a	Caged	2023-04-11 11:36:17	
common snowberry (Symphoricarpos albus)	2	2	n/a	Caged	2023-04-11 11:53:11	
common snowberry (Symphoricarpos albus)	2	2	n/a	Caged	2023-04-11 11:54:58	
common snowberry (Symphoricarpos albus)	2	1	n/a	Caged	2023-04-11 11:56:01	
common snowberry (Symphoricarpos albus)	2	2	n/a	Caged	2023-04-11 11:57:45	
common snowberry (Symphoricarpos albus)	2	2	n/a	Caged	2023-04-11 12:12:02	
common snowberry (Symphoricarpos albus)	2	2	n/a	Caged	2023-04-11 12:26:07	



common snowberry ( <i>Symphoricarpos albus</i> )	2	2	n/a	Caged	2023-04-11 12:38:08	
common snowberry ( <i>Symphoricarpos albus</i> )	2	2	n/a	Caged	2023-04-11 12:57:16	
common snowberry ( <i>Symphoricarpos albus</i> )	2	2	n/a	Caged	2023-04-11 13:40:05	
common snowberry ( <i>Symphoricarpos albus</i> )	2	2	n/a	Caged	2023-04-11 13:53:54	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 11:38:10	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 11:39:40	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 11:56:56	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 12:01:44	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 12:04:05	
yarrow ( <i>Achilleum millefolium</i> )	2	1	1	Not caged	2023-04-11 12:32:34	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 12:40:04	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 12:55:55	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 14:05:09	
yarrow ( <i>Achilleum millefolium</i> )	2	2	0	Not caged	2023-04-11 14:45:39	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0, but maybe some by insects??	2023-04-12 12:49:09	

dull Oregon-grape ( <i>Berberis nervosa</i> )	3	2	0	Not caged	2023-04-12 12:51:54	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 12:53:50	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 by deer but maybe some by insects	2023-04-12 12:55:54	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 but maybe some by insects	2023-04-12 12:57:26	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	2	0	Not caged  Health - 2 (old leaves not healthy but lots of new leaves emerging)	2023-04-12 12:59:38	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:13:58	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:15:55	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 13:17:15	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 13:19:01	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 but maybe some by insects	2023-04-12 13:30:20	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 maybe by insects	2023-04-12 13:34:34	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Almost dead but maybe new leaves emerging	2023-04-12 13:42:29	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 13:45:39	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 13:50:27	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:00:17	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:03:09	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:08:31	

dull Oregon-grape ( <i>Berberis nervosa</i> )	3	2	0	Not caged  Herbivory - 0 maybe by insects	2023-04-12 14:35:05	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:38:40	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:39:14	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:40:32	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:42:05	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:43:17	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:45:45	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:47:12	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 14:55:02	
dull Oregon-grape ( <i>Berberis nervosa</i> )	3	1	0	Not caged	2023-04-12 14:58:57	
dull Oregon-grape ( <i>Berberis nervosa</i> )	1	1	n/a	Being outcompeted by invasive grasses	2023-04-14 11:12:03	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-13 11:55:56	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-13 11:59:48	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-13 12:00:23	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-13 12:06:46	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-13 12:07:22	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-14 11:36:05	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-14 11:36:34	
false lily-of-the-valley ( <i>Maianthemum dilatatum</i> )	1	2	n/a		2023-04-14 11:37:01	
Garry oak ( <i>Quercus garryana</i> )	2	2	n/a	Caged  Leaves just starting to come out	2023-04-11 12:29:15	
Garry oak ( <i>Quercus garryana</i> )	2		n/a	Caged  Health - unknown  Can't tell if leaves will come out or not	2023-04-11 14:10:41	
Grass	2	2	0	Not caged	2023-04-11 12:12:51	
Grass	2	1	0	Not caged	2023-04-11 12:23:16	
Grass	2	1	1	Not caged  Herbivory - 1 (looks like maybe some)	2023-04-11 12:26:44	

Grass	2	2	0	Not caged	2023-04-11 12:28:20	
Grass	2	2	0	Not caged	2023-04-11 12:33:53	
Grass	2	2	0	Not caged	2023-04-11 12:39:01	
Grass	2	2	0	Not caged	2023-04-11 12:42:10	
Grass	2	2	0	Not caged	2023-04-11 13:42:23	
Grass	2	2	1	Not caged	2023-04-11 13:43:31	
Grass	2	2	1	Not caged	2023-04-11 13:44:20	
Grass	2	2	0	Not caged	2023-04-11 13:48:07	
Grass	2	2	0	Not caged	2023-04-11 13:48:57	
Grass	2	2	0	Not caged	2023-04-11 14:00:03	
Grass	2	2	0	Not caged	2023-04-11 14:06:13	
Grass	2	2	0	Not caged	2023-04-11 15:17:31	
hairy manzanita (Arctostaphylos columbiana)	2	1	n/a	Caged	2023-04-11 14:43:48	
hairy manzanita (Arctostaphylos columbiana)	2	1	n/a	Caged	2023-04-11 14:44:44	
hairy manzanita (Arctostaphylos columbiana)	2	1	n/a	Caged	2023-04-11 15:12:26	
Junegrass (Koeleria macrantha)	1	2	n/a		2023-04-13 14:31:11	
long-stoloned sedge (Carex inops)	1	2	n/a		2023-04-13 14:40:07	
long-stoloned sedge (Carex inops)	1	2	n/a		2023-04-13 14:42:32	
long-stoloned sedge (Carex inops)	1	2	n/a		2023-04-13 14:43:08	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 12:21:11	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 12:23:44	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 12:28:53	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 12:41:45	
mock orange (Philadelphus lewisii)	1	1	n/a	Some dead leaders	2023-04-13 14:59:30	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 15:00:57	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 15:13:58	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 15:16:59	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 15:20:02	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-13 15:24:57	
mock orange (Philadelphus lewisii)	1	2	n/a		2023-04-14 10:59:41	



mock orange ( <i>Philadelphus lewisii</i> )	1	2	n/a		2023-04-14 11:02:25	
mock orange ( <i>Philadelphus lewisii</i> )	1	2	n/a		2023-04-14 11:31:44	
mock orange ( <i>Philadelphus lewisii</i> )	1	2	n/a		2023-04-14 13:47:26	
mock orange ( <i>Philadelphus lewisii</i> )	1	2	n/a		2023-04-14 13:55:09	
oceanspray ( <i>Holodiscus discolor</i> )	2	2	n/a	Caged	2023-04-11 11:44:05	
oceanspray ( <i>Holodiscus discolor</i> )	2	1	n/a	Caged	2023-04-11 11:47:48	
oceanspray ( <i>Holodiscus discolor</i> )	2	2	n/a	Caged	2023-04-11 13:52:04	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 12:33:38	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 12:36:25	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 14:07:57	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 14:45:18	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 14:48:25	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 14:51:49	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 15:03:40	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 15:04:13	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 15:07:39	
oceanspray ( <i>Holodiscus discolor</i> )	1	1	n/a	Leader branches have no leaves	2023-04-13 15:22:01	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 15:26:10	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-13 15:28:55	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-14 11:27:57	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-14 11:29:56	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-14 11:34:38	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-14 11:44:15	
oceanspray ( <i>Holodiscus discolor</i> )	1	2	n/a		2023-04-14 11:55:40	
osoberry ( <i>Oemleria cerasiformis</i> )	1	2	n/a		2023-04-14 10:49:45	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 12:03:42	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 12:09:22	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 13:12:08	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:06:12	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:08:45	

red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:11:55	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:32:00	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:33:31	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:34:39	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-13 15:36:06	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-14 10:30:03	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-14 11:21:43	
red columbine ( <i>Aquilegia formosa</i> )	1	1	n/a	Overcrowding by invasive grass	2023-04-14 12:23:45	
red columbine ( <i>Aquilegia formosa</i> )	1	2	n/a		2023-04-14 13:48:32	
red flowering currant ( <i>Ribes sanguineum</i> )	1	2	n/a		2023-04-13 13:59:55	
red flowering currant ( <i>Ribes sanguineum</i> )	1	1	n/a	No leaves on leader branch	2023-04-14 10:34:53	
red flowering currant ( <i>Ribes sanguineum</i> )	1	1	n/a	No leaves on leader branches	2023-04-14 11:18:42	
red flowering currant ( <i>Ribes sanguineum</i> )	1	1	n/a	Yellow leaves	2023-04-14 11:53:07	
red flowering currant ( <i>Ribes sanguineum</i> )	1	2	n/a		2023-04-14 13:59:43	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:10:42	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:12:02	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged	2023-04-12 13:28:03	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged	2023-04-12 13:29:12	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:31:47	
salal ( <i>Gaultheria shallon</i> )	3	0	n/a	Dead salal	2023-04-12 13:36:14	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:37:35	
salal ( <i>Gaultheria shallon</i> )	3	2	0	Not caged	2023-04-12 13:38:41	
salal ( <i>Gaultheria shallon</i> )	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 13:41:02	
salal ( <i>Gaultheria shallon</i> )	3	0	n/a	Not caged  Health - 0	2023-04-12 13:44:15	

				Observed to be dead		
salal (Gaultheria shallon)	3	2	0	Not caged	2023-04-12 13:54:47	
salal (Gaultheria shallon)	3	2	0	Not caged	2023-04-12 13:55:39	
salal (Gaultheria shallon)	3	1	0	Not caged  Herbivory - 0 but maybe by insects	2023-04-12 14:05:41	
salal (Gaultheria shallon)	3	2	0	Not caged  Herbivory - 0 maybe a bit by insects	2023-04-12 14:27:45	
salal (Gaultheria shallon)	3	1	0	Not caged  Herbivory - 0 maybe some by insects	2023-04-12 14:37:12	
salal (Gaultheria shallon)	1	0	n/a	Dead	2023-04-13 15:12:36	No live Salal observed in Zone 1
salmonberry (Rubus spectabilis)	2	2	n/a	Caged	2023-04-04 21:34:16	
salmonberry (Rubus spectabilis)	2	1	n/a	Caged  Some branches without leaves  Soil has washed away a bit from base	2023-04-04 21:34:38	
Scouler's willow (Salix scouleriana)	2	2	n/a	Cage	2023-04-11 13:02:18	
Scouler's willow (Salix scouleriana)	2	2	n/a	Caged	2023-04-11 13:04:23	
sea blush (Plectritis congesta)	2	2	1	Not caged	2023-04-11 11:41:20	
sea blush (Plectritis congesta)	2	2	1	Not caged	2023-04-11 11:46:45	
sea blush (Plectritis congesta)	2	2	1	Not caged	2023-04-11 12:11:11	
sea blush (Plectritis congesta)	2	2	0	Not caged	2023-04-11 12:34:55	
sea blush (Plectritis congesta)	2	2	0	Not caged	2023-04-11 14:03:40	
self-heal (Prunella vulgaris)	1	2	n/a		2023-04-13 13:39:44	
self-heal (Prunella vulgaris)	1	2	n/a		2023-04-13 13:40:09	
self-heal (Prunella vulgaris)	1	2	n/a		2023-04-14 14:06:46	
slough sedge (Carex obnupta)	2	2	0	Not caged	2023-04-11 15:23:00	
slough sedge (Carex obnupta)	2	1	0	Not caged  Tips are brown	2023-04-11 15:23:56	
slough sedge (Carex obnupta)	2	1	0	Not caged  Tips brown	2023-04-11 15:24:50	
slough sedge (Carex obnupta)	2	2	0	Not caged	2023-04-11 15:26:03	

slough sedge ( <i>Carex obnupta</i> )	2	2	0	Not caged	2023-04-11 15:27:51	
slough sedge ( <i>Carex obnupta</i> )	2	2	0	Not caged	2023-04-11 15:29:15	
slough sedge ( <i>Carex obnupta</i> )	2	2	0	Not caged	2023-04-11 15:31:19	
slough sedge ( <i>Carex obnupta</i> )	2	2	0	Not caged	2023-04-12 12:39:19	
slough sedge ( <i>Carex obnupta</i> )	2	2	0	Not caged	2023-04-12 12:41:00	
slough sedge ( <i>Carex obnupta</i> )	2	2	0	Not caged	2023-04-12 12:42:21	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-13 11:58:21	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-13 13:42:19	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-13 15:15:20	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-13 15:22:51	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-13 15:27:44	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-13 15:30:09	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-14 13:50:59	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-14 13:51:31	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-14 13:52:10	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-14 13:53:16	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-14 14:01:15	
common snowberry ( <i>Symphoricarpos albus</i> )	1	2	n/a		2023-04-14 14:02:34	
springbank clover ( <i>Trifolium wormskioldii</i> )	2	2	0	Not caged	2023-04-11 15:32:46	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 13:17:15	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 13:21:04	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 13:25:28	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 13:30:48	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 13:37:26	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 13:37:55	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 14:06:33	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 14:12:13	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 14:18:43	
spring gold ( <i>Lomatium utriculatum</i> )	1	2	n/a		2023-04-13 14:19:11	
springbank clover ( <i>Trifolium wormskioldii</i> )	2	2	0	Not caged	2023-04-11 15:21:55	

springbank clover ( <i>Trifolium wormskioldii</i> )	2	2	0	Not caged	2023-04-11 15:27:03	
springbank clover ( <i>Trifolium wormskioldii</i> )	2	2	0	Not caged	2023-04-11 15:34:06	
springbank clover ( <i>Trifolium wormskioldii</i> )	2	2	0	Not caged	2023-04-12 12:41:36	
woodland strawberry ( <i>Fragaria vesca</i> )	1	2	n/a	4 plants observed	2023-04-13 11:50:50	
woodland strawberry ( <i>Fragaria vesca</i> )	1	2	n/a		2023-04-13 12:04:09	
woodland strawberry ( <i>Fragaria vesca</i> )	1	2	n/a		2023-04-14 10:27:05	
woodland strawberry ( <i>Fragaria vesca</i> )	1	2	n/a		2023-04-14 10:28:20	
woodland strawberry ( <i>Fragaria vesca</i> )	1	2	n/a		2023-04-14 12:29:54	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:01:25	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:22:58	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:23:37	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:32:56	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:49:07	
sword fern ( <i>Polystichum munitum</i> )	3	2	0	Not caged	2023-04-12 13:53:21	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:56:58	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 13:59:12	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:01:26	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:07:03	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:28:52	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:31:03	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:32:09	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:33:30	
sword fern ( <i>Polystichum munitum</i> )	3	1	0	Not caged	2023-04-12 14:36:14	
sword fern ( <i>Polystichum munitum</i> )	1	2	n/a		2023-04-14 11:15:46	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 11:28:00	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 11:31:10	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 11:34:47	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 11:45:39	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged  Plant uprooted but tried to replant under cage	2023-04-11 11:50:01	



tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 11:54:12	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 11:59:07	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 12:03:10	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a		2023-04-11 12:24:48	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 12:31:13	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 12:37:12	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 12:44:01	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 13:13:56	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 13:58:24	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 14:02:01	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 14:02:59	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 14:11:57	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 14:26:45	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	n/a	Caged	2023-04-11 14:41:56	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Uncaged	2023-04-11 14:42:40	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 14:48:02	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 15:14:18	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-11 15:18:55	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	2	1	0	Not caged	2023-04-13 11:11:26	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	1	2	n/a		2023-04-13 13:06:58	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	1	1	n/a		2023-04-13 14:01:49	
tall Oregon-grape ( <i>Berberis aquifolium</i> )	1	2	n/a		2023-04-14 11:49:52	
trailing blackberry ( <i>Rubus ursinus</i> )	1	2	n/a		2023-04-13 11:45:09	
trailing blackberry ( <i>Rubus ursinus</i> )	1	2	n/a		2023-04-13 11:47:48	
trailing blackberry ( <i>Rubus ursinus</i> )	1	2	n/a		2023-04-13 12:11:47	
trailing blackberry ( <i>Rubus ursinus</i> )	1	2	n/a		2023-04-13 12:26:48	
trailing blackberry ( <i>Rubus ursinus</i> )	1	2	n/a		2023-04-13 12:38:13	
trailing blackberry ( <i>Rubus ursinus</i> )	1	1	n/a		2023-04-14 10:45:59	
trailing blackberry ( <i>Rubus ursinus</i> )	1	1	n/a		2023-04-14 10:46:46	
trailing blackberry ( <i>Rubus ursinus</i> )	1	1	n/a		2023-04-14 11:26:27	

trailing blackberry ( <i>Rubus ursinus</i> )	1	2	n/a	x2 plants	2023-04-14 11:48:06	
Unknown	2	0	n/a	Not caged  Specimen likely dead  Maybe woolly sunflower	2023-04-11 12:53:21	Assumed health 0 as any species planted in Zone 2/3 should have been visible if were alive
Unknown	2	0	n/a	Not caged  No plant observed	2023-04-11 14:08:22	Assumed health 0 as any species planted in Zone 2/3 should have been visible if were alive
Unknown	3	0	n/a	No planting observed	2023-04-12 13:03:55	Assumed health 0 as any species planted in Zone 2/3 should have been visible if were alive
Unknown	3	0	n/a	No planting observed	2023-04-12 13:05:26	Assumed health 0 as any species planted in Zone 2/3 should have been visible if were alive
Unknown	3	0	n/a	No planting observed	2023-04-12 14:57:48	Assumed health 0 as any species planted in Zone 2/3 should have been visible if were alive
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 13:09:25	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 13:52:06	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 13:58:01	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 14:26:46	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 14:31:38	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 14:52:27	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 14:56:41	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 15:00:15	
western fescue ( <i>Festuca occidentalis</i> )	3	2	0	Not caged	2023-04-12 15:04:41	
western trumpet honeysuckle ( <i>Lonicera ciliosa</i> )	1	2	n/a		2023-04-14 12:01:10	
western trumpet honeysuckle ( <i>Lonicera ciliosa</i> )	1	2	n/a		2023-04-14 12:02:38	
western trumpet honeysuckle ( <i>Lonicera ciliosa</i> )	1	2	n/a		2023-04-14 12:05:05	
western trumpet honeysuckle ( <i>Lonicera ciliosa</i> )	1	2	n/a		2023-04-14 12:06:42	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	2	0	Not caged	2023-04-11 11:42:40	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	2	0	Not caged	2023-04-11 11:52:08	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	1	0	Not caged	2023-04-11 12:44:40	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	2	0	Not caged	2023-04-11 12:46:16	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	0	n/a	Not caged  Health - 0 (dead)	2023-04-11 12:47:53	Woolly sunflower didn't do well on Zone 2 slope, although cotyledons observed from seeding???
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	0	n/a	Not caged  Health - 0 (dead)	2023-04-11 12:48:58	

woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	0	n/a	Not caged  Health - 0 (dead)	2023-04-11 12:51:47	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	0	n/a	Not caged  Health - 0 (dead)	2023-04-11 12:54:58	
woolly sunflower ( <i>Eriophyllum lanatum</i> )	2	0	n/a	Not caged  Health - 0 (dead)  Presumed dead woolly sunflower	2023-04-11 13:54:57	