Native Plant Seed Bank

Prepared for the Galiano Conservancy Association
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Index

Summary

This project builds off existing work from past and present volunteers of the Galiano Conservancy Association (hereafter, the GCA). The vision for this project was first acknowledged in 2011 when the supply of native and locally sourced plants outgrew the demand from restoration projects on Galiano Island. The nursery and GCA involvement are now oriented towards the propagation of plants as a source of revenue to support Conservancy projects. In addition, in-kind donations of plants can help support meaningful educational and cultural projects across the island.

Our team recognized the need to revitalize the nursery on three fronts: 1) collection, scheduling and inventory systems 2) public engagement, and 3) revenue generation. Each section was intended to replace or amend current systems and not to reinvent them. The workforce at the nursery has limited hours, as such, we hope our recommendations will increase efficiencies to free up time for exploring other aspects of the GCA vision. Our recommendations may be summarized in this way: a targeted selection of species - coupled with clear and consistent systems for indexing, documentation, and storage - can greatly improve quality and quantity of desirable nursery stock and prevent waste of time and resources; meaningful social engagement through annual workshops, social media, and a contributor system can increase community involvement in the nursery and bolster the GCA seed bank; and strategic planning can help create a successful social enterprise that is scalable according to demand and available resources.

In addition to these recommendations, we have contributed many of the practical resources necessitated by our plan. These include a complete Native Plant Nursery Index for informing and tracking seed collections, a list of desirable species not yet located, a template for seed storage and labelling envelopes, diagrams illustrating nursery workflow, an updated version of the Propagation Manual, and over 30 species worth of seed collections in a dedicated storage space. These resources are collected in the Appendices, compiled on the GCA google drive, and stored in the GCA office. We hope that our efforts aid in the ongoing efforts to provide high quality native plants, environmental education, and employment to the people of Galiano island.

Introduction

There is now consensus among scientists worldwide that the rapid expansion of the human population has precipitated a biodiversity crisis, and that local and global loss of species can have unanticipated detrimental effects on ecosystem structure, function, and stability (Cardinale *et al.*, 2012). Clear declines in global diversity, particularly amongst certain groups, are signaling the arrival of the sixth mass extinction episode in our planet's history (Wake & Vredenberg, 2008); however, at the local level, species diversity may be decreasing, neutral, or even increasing due to anthropogenic introduction of species into novel environments (Smart *et al.*, 2006). Islands, in particular, have been shown to be at once particularly vulnerable to biodiversity loss (Ricketts *et al.*, 2005) and ambiguous with regards to the antiquity ("nativeness") of many species (Avery *et al.*, 2013), making them critical microcosms for the study and practice of conservation in an era of climate change (Courchamp *et al.*, 2014).

Galiano Island, located on the west side of the Strait of Georgia in the Salish Sea of south-western British Columbia, is located within the globally unique and endangered Coastal Douglas Fir (CDF) biogeoclimatic zone (Flynn, 1999). While few critically endangered species are present on Galiano, the combined effects of development, unprecedented deer pressure on vegetation, and climate change have both immediate and long-term effects on local biodiversity - examples include the projected regional decline of Western Redcedar (*Thuja plicata*) (Hebda, 1994), low diversity and abundance of songbirds (Arcese *et al.*, 2014), and simplified vegetation communities lacking in culturally significant plants (Martin *et al.*, 2011). Restoration is an essential tool for maintaining island biodiversity in the face of these and other challenges, and the establishment of a native plant nursery is integral to ensuring the availability of species for local restoration projects and troubleshooting issues in restoration practice (Serrill, 2006). In addition, nurseries can educate, generate revenue, and inspire.

The GCA's native plant nursery is an integral part of the organization's restoration, education, and agriculture projects. It has a strong history of and holds great potential for volunteer engagement, the recovery of culturally significant species, and the maintenance of threatened plants and plant communities. Currently, the nursery is in a transitional state due to staff turnover, an impending move, and a shift in production focus. This transitional time has created a continuity gap, and as a result the current inventory system and volunteer involvement are insufficient to maintain a diverse, up-to-date, accessible, and useful library of propagative materials for current and future nursery purposes. Few seeds have been collected for the coming year, and current stock is lacking in diversity, quality, and quantity. We view this transition as an opportunity to clearly articulate nursery goals, design an effective nursery plan, and build capacity to meet the needs of the future.

Background

The GCA was formed in 1989 by members of Clear Cut Alternatives and the Galiano Forest and Land Use Council to purchase island lands for conservation purposes (Moore, 2016). In 2000, the establishment of a native plant nursery on donated land signified the adoption of ecological restoration as a central activity for the GCA. In many ways, the purchase of the Learning Centre in 2013 and the creation of a Food Forest in 2015 are also harbingers of the next phase of the GCA: the embrace of a collaborative, holistic land and "resource" management framework that emphasizes sustainable use, regenerative design, and rewilding. The allocation of a significant area within the Learning Centre property for agricultural use allows for the establishment of a permanent nursery location, as well as the propagation of a wider range of both native and non-native species.

Meanwhile, lack of predation has allowed deer to put unprecedented pressure on island ecosystems, dramatically altering the structure and composition of local plant communities and leading to scarcity of culturally important species (Martin *et al.*, 2011). Until contentious management decisions are made to limit the deer population, steps must be taken to preserve extant populations. If native plants are made available, protected gardens and restoration sites can serve as reservoirs for important native species (Lowry, 1999). With the initiation of participatory biogeographic Biodiversity Galiano Island project on iNaturalist (http://www.inaturalist.org/projects/biodiversity-galiano-island) in January, it is now easier to locate elusive species, track changes in distribution, and identify conservation priorities. Other projects, such as Salish Harvest (http://www.salishharvest.com/) and the Food Program (http://www.galianofoodprogram.ca/) further demonstrate the importance of acknowledging the knowledge and efforts of both First Nations (Turner & Lepofsky, 2013) and Eurasian settlers in intentionally shaping our present ecosystems when designing restoration and food security projects.

With this context, we believe the GCA can strategically situate the nursery at the intersection where restoration, conservation, agriculture, and culture meet, forging new partnerships and taking advantage of new resources while remaining grounded in local history. This is in line with the GCA's mission to "preserve, protect and enhance the quality of the human and natural environment" by means of land and marine conservation, stewardship and restoration, and environmental education and public awareness.

Goals and Objectives

Given the limited time and resources that can be devoted to the nursery at this point, we have focused on practical objectives that support current nursery needs, as well as the creation of systems that are scalable over time. We've articulated three broad goals within which these objectives may be situated: to make native plants available to the Galiano community, to educate and involve the public in native plant identification and collection, and to generate revenue from plant and seeds sales to support GCA programs (see Table 1). Check marks indicate which objectives we have already completed; these contributions are housed in the appendices.

It is our hope that these resources and recommendations can aid and orient current and future nursery managers and volunteers as the nursery grows and evolves over time. The frameworks included here can be expanded to include non-native species from the food forest when these become propagable. Design considerations for each goal and objective set are discussed in the next section.

Table 1: Proposed goals and associated objectives for the GCA native plant nursery

G1) To make native plants available to the Galiano Community

(O-1) Create online inventory of propagative materials that specifies plant locations, harvest times, and current stock

(O-2) Update propagation manual to include harvest and propagation schedule

(O-3) Establish a location and system for labeling and storing propagative materials

(O-4) Identify desirable species absent from the nursery and prioritize collection

G2) To educate and involve the public in native plant identification and collection

(O-5) Create materials (seed packets, mailing list) to engage potential contributors

(O-6) Run annual workshops in seed saving and vegetative propagation

(O-7) Notify contributors of desired species through website or newsletter

G3) To generate revenue from plant and seed sales to support conservancy programs

(O-8) Create revenue strategy to support nursery activities and GCA projects

(O-9) Create program scope for future diversion of funds or in-kind donations

(O-10) Create clear flowchart to link nursery activities from seed to sale

DESIGN CONSIDERATIONS

Plants

Selection of Plants

There are over 600 species of plant growing wild on Galiano island, according to historical and contemporary checklists (Biodiversity Galiano Island). Of these, over 300 are native species. Currently, the nursery contains 60 native species. We have identified an additional 90 species that are excellent candidates for nursery propagation and could be successfully marketed; many have been propagated by the GCA in the past. Selection was based on personal experience, usefulness of the species, attractiveness, and conservation potential. Of these, a handful have been singled out for inclusion in the native plant food forest project, and emphasis has been placed on the collection of these species. In addition to an overall inventory (Appendix A), a list of desirable species that do not yet have harvest locations documented has been generated to aid future forays (Appendix B).

Sourcing of Materials

The provenance of propagative materials for use in restoration and native plant gardening projects is a primary question involving many considerations (Herman *et al.*, 2014), and conflicting arguments about plant sourcing could be made from the same data (Schröder & Prasse, 2013). The importance of genetic fidelity versus genetic diversity is contested, and it may be practical to base decisions about sourcing plants based on the scale of site disturbance and the health of the surrounding landscapes (Lesica & Allendorf, 1999). It has even been proposed that the use of cultivars and/or non-native species is more practical in certain cases (Jones & Monaco, 2009). Nevertheless, it remains standard practice to select plant stock from local populations in order to confer local adaptations, and the insular nature of Galiano suggests the prioritization of propagule collection from plants on the island. We recommend that the GCA source propagules from island populations whenever possible, and have provided harvest locations for the majority of potential nursery species (see Appendix A). If desirable, useful, and/or potentially extirpated species are desired and cannot be located on the island, then arrangements should be made to import seed from nearby islands or seed companies.

Storage of Materials

Recently, several boxes of seeds dating all the way back to 2004 have been recovered from storage. A variety of containers were employed, labels were applied inconsistently, and

overall organization was lacking. This variability undoubtedly factored in these seeds not being sown in a timely manner. It is considered best practice to sow seeds immediately upon collection (P. Pringle, personal communication, August 10, 2016); however, this may not always be possible or practical. Therefore, we recommend careful and consistent labelling, filing, and storage of propagative materials. While cuttings and divisions must be planted right away and are *stored* in the nursery itself, seeds may be cleaned, placed in a labeled envelope, and stored for later use: we have created a template (Appendix C) and system for seed storage, and have followed this system for the 33 species that have been collected so far this year. In the future, scion wood collected for grafting will require careful labelling and refrigeration for several months.

Social Engagement

Due to carelessness, lack of awareness, and complex economic forces, we have lost many valuable seeds and species in BC and around the world. No invention of science can bring them back. Now is the time of need to call and reach out for "seed saving." The GCA is interested in restoration and protecting native plants. However, whose responsibility is it to save them, save the seeds: you, I, or the conservancy team? The answer is, "neither you, nor I, but We." All of us should try to save our valuable local seeds whatever way we can. We may not all be farmers, but not one of us can ignore the truth that we are all dependent on seeds. Therefore let us start seed hunting and create a seed bank! By following these simple strategies every member can contribute to saving the fundamental element for restoring our ecosystems, cultures, foods, and nature's beauty.

Audience Target

Community engagement is very important, as seed saving requires local knowledge and place connection. There are many knowledgeable amateur naturalists in the Galiano community, and many people already save seeds for their gardens. Instead of relying solely on staff to renew the seed bank year after year, targeted social engagement in the form of a *contributor* program could spread seed location, collection, and processing activities across the community. Members and past volunteers are excellent candidates; already this year, conversation with a member at the farmer's market has yielded seeds and starts of two desirable rare plants! It may be possible to create an active contributor system with efficient use of minimal resources.

When we develop a connection to a place it creates a sense of stewardship and passion to keep and protect it. It is everybody's responsibility; however, educating young people about the importance of seed saving is one way of encouraging more seed savers in the future. Young

people, ranging from primary age schoolchildren to teenagers, are always excited to learn and be part of practical activities in the community, and this creates a sense of responsibility and a mindset of the significance of seed saving. Therefore, creating a community garden or a nursery is as good as creating an education centre, as long as kids are brought out to explore and learn about native plants. This could be made part of school curriculum.

Techniques of engagement

The GCA should use multiple means of communication to reach out and snare potential contributors: members or volunteers who attend the annual seed saving or vegetative propagation workshops and in return occasionally collect seeds for the nursery. Communication channels include: tabling at community events, such as the farmer's market; posters and flyers; and a signup sheet to use towards an email list at every display or event, especially the farmer's market. An occasional newsletter could inform and engage contributors on the email list. Since effective communication is the key to draw people's attention and spread awareness, at every stand we must have someone knowledgeable to enlighten potential volunteers. This is also an effective method for introducing people to the idea of seed saving and educating them about some of the basic principles; for example, the difference between open-pollinated and hybrid seeds. The GCA already has many seeds arranged for display purposes, and free materials promoting seed saving.

Once engaged, contributors can attend an annual seed saving and/or vegetative propagation workshop put on by the GCA. The contributors will then be equipped to gather propagative materials at home or on the trail; afterwards, they can drop materials off at an appropriate place at the GCA office for processing. Collections can be encouraged and streamlined by distributing GCA seed envelopes to potential contributors (see Appendix C). Contributors may be kept appraised of the Conservancy's needs through online resources.

Cyber Communications

The GCA can create and update online resources with simple examples or demonstrations on seed harvesting; in addition, there should be a brief explanation on why the conservancy is calling for seed saving, and how this ties in with the mission and objectives. News or educational videos related to seed saving can be posted here. We have to constantly remind people how important seed saving is, as Jonathan Drori did in his TED talk (2009). The GCA can also attract and engage contributors through alliances with local web projects**,** such as Biodiversity Galiano Island and Salish Harvest. The Biodiversity Galiano Island project is a useful source of information regarding local plant biogeography, and there may be crossover potential for both contributors and resources between the Nursery and this project. Salish Harvest, meanwhile, can offer a great outlet for information about plants that are propagated in the Nursery.

Institutional Contribution

Universities, especially, the School of Environmental Studies, should make seed saving an important topic of study. Not only seed saving is a great tool of restoration, but, as Jonathan Drori states, "So if all human life, all life depends on plants, doesn't it make sense that perhaps we should try to save them? I think it does*"* (2009). Seed saving is much more than just protecting native plants, it is about the wellbeing of all creatures. Therefore, institutional attention is needed.

An example: Eric Higgs uses problem based learning (PBL) in restoration classes. He introduces different issues to discuss, question, analyse and explore potential solutions. It is a great way to learn about existing issues, and very eye-opening; to learn, for example, about hyper deer abundance in the Gulf Islands and the declining populations of bees on Vancouver Island. Therefore, we strongly believe PBL would be an effective method to bring attention to students about seed saving and gather profound thoughts on different strategies to keep up with seed saving.

Systems

In order to maintain an effective workflow, all employees and volunteers should refer to the flowchart seen in Figure 1. By following this flowchart, the nursery can ensure there is enough plants for future projects and revenue generation.

The first step begins with education: workshops on how to identify and collect native seeds or propagules. This step is outlined in the social engagement strategy. For the purpose of this flowchart, contributors will be able to donate seeds and information they gathered directly to nursery staff.

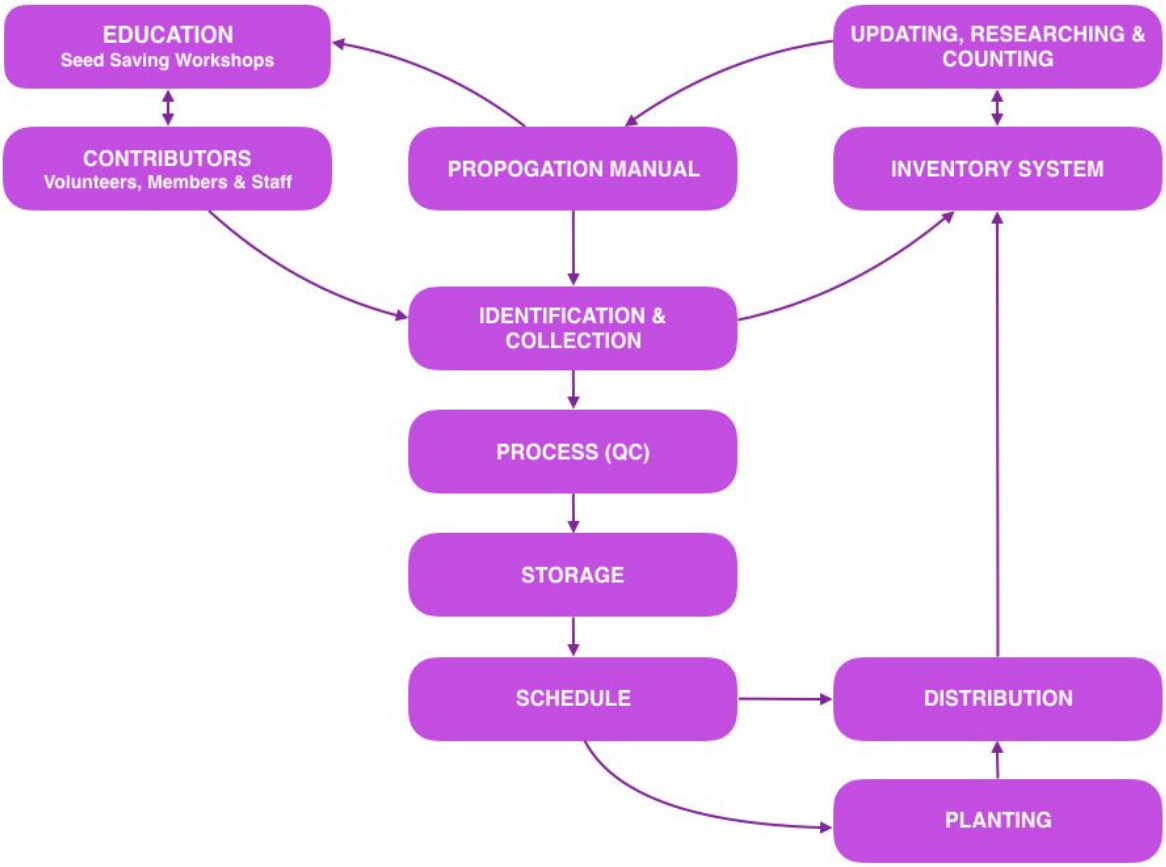

Figure 1: Micro Flowchart - Nursery seed cycle workflow, illustrating the relationships between the inventory (Native Plant Species Index, in Appendix A), the Propagation Manual (Appendix D), social engagement strategies, collection, and distribution

When a contributor brings in their seed or plant propagules to add to the nursery, nursery staff will process the samples through the quality control process. Contributions should be double checked against nursery reference materials to ensure the right plant has been identified. Contaminated seeds or invasive seeds that have been accidentally collected should be destroyed or disposed of properly.

Once seeds or propagules have gone through the quality control process, they can be counted for inventory, and then properly stored for future use. By adding new specimens to the inventory system, volunteers can update the propagation manual and maps. This information then gets fed back into the system for education; and the cycle repeats itself. The planting section and schedule can be seen in further detail in the propagation manual (Appendix D) which is populated by the nursery lead. Lastly, the distribution of plants and seeds will be further discussed in the revenue generation section.

The second macro flow-chart seen below in Figure 2 provides a snapshot into possible nursery streams and workflows in their entirety. Main headings are identified as Plant Locations,

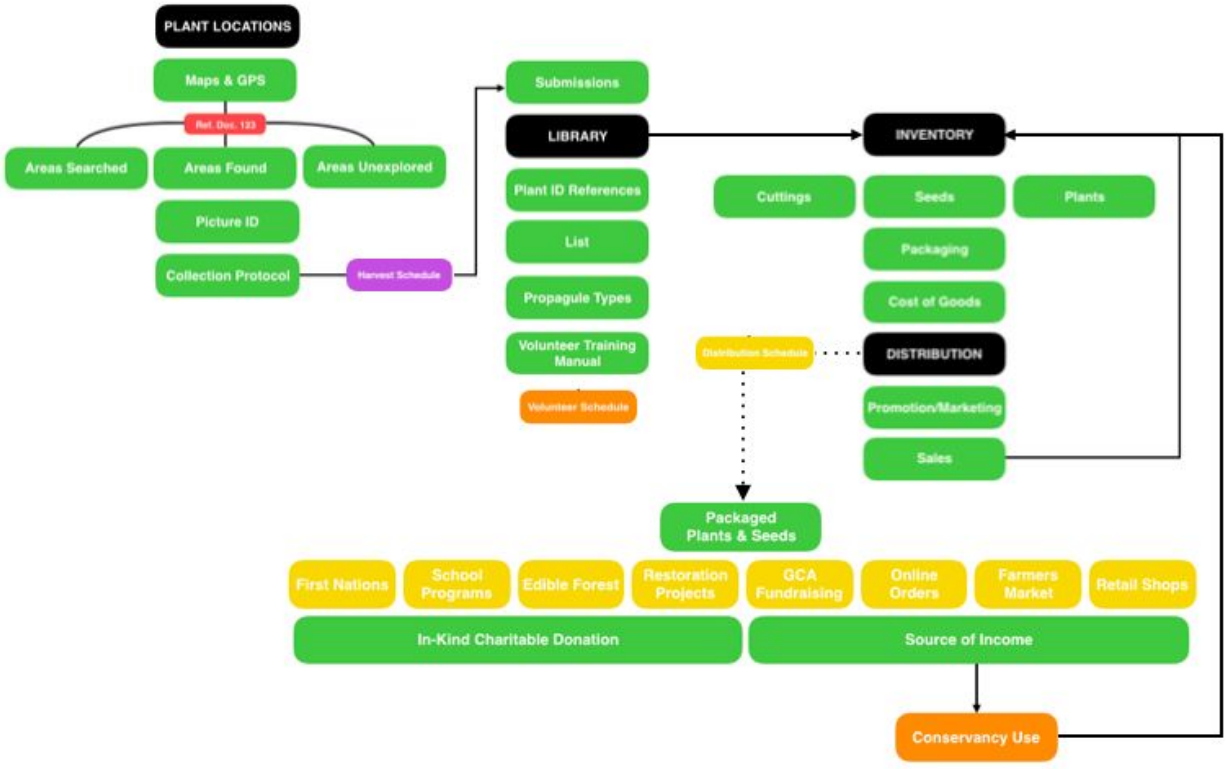

Figure 2: Macro flowchart - nursery functionality and distribution cycle, from seed to sale

Seed Library, Inventory, and Distribution. This macro view is an excellent tool for new recruits to the GCA in learning how the Nursery functions. In addition, people/volunteers can be assigned to each duty for proper work distribution.

Maps & GPS

In order to maintain consistency and accuracy for seed and propagule collections, contributors must use at least one of the two location strategies. The first and most accurate would be for participants to have a GPS on them to take a reading with. If this is not possible, nursery staff could use google earth in conjunction with the contributors to find approximate coordinates of the location. The second method would be for contributors to write down in detail the exact location they found the plant in. Whichever method, location information should be written down on the storage package (Appendix C) and recorded in the index (Appendix A).

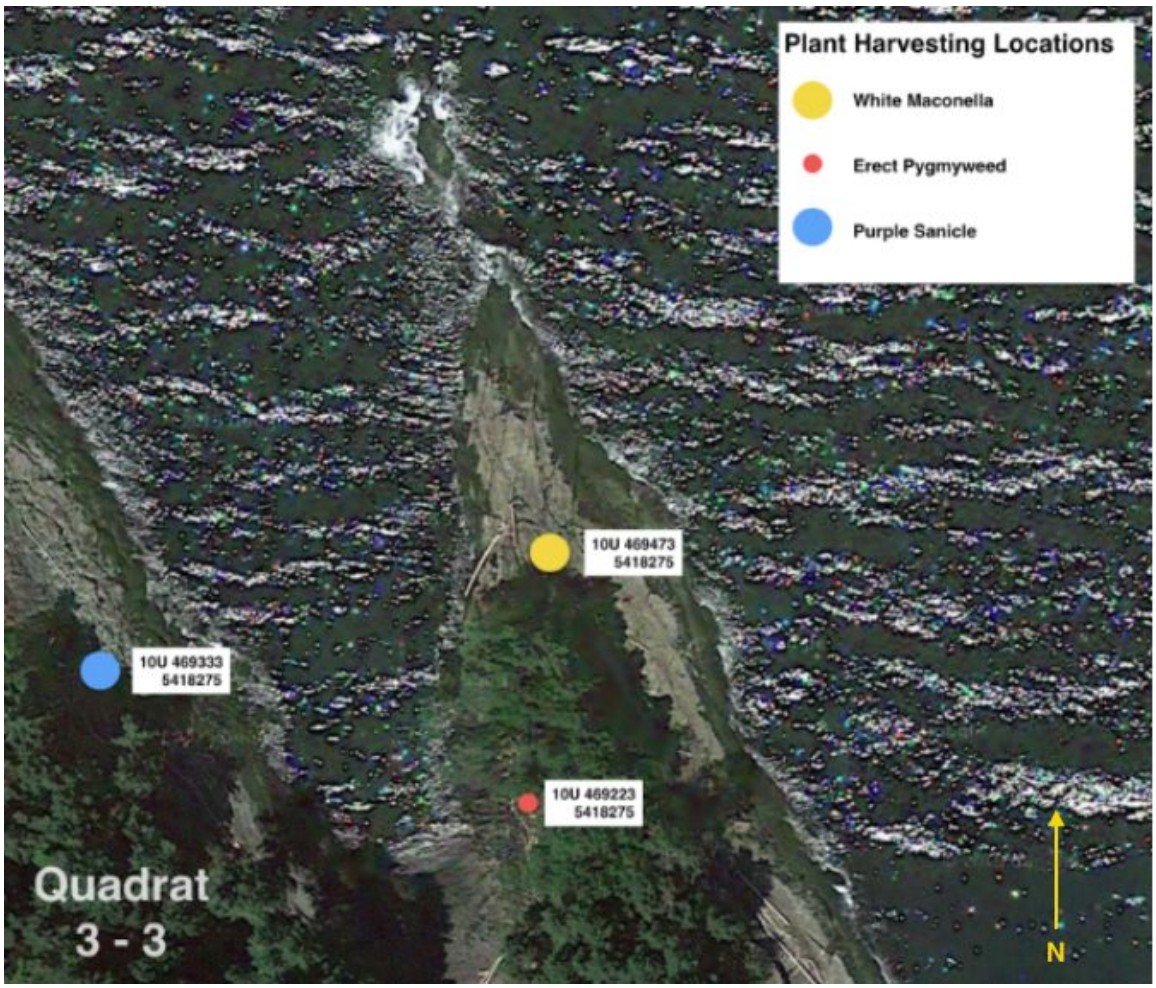

Figure 3: Example of GPS mapping for locating plant populations for harvest

Once this information has been collected and reviewed by the nursery staff, the data can then be inputted onto a master map (Figure 3) for all the best locations to harvest plants. Nursery staff can create a secondary spreadsheet for secondary or tertiary locations not visually seen on the map. With this information at hand, the system schedule for inventory, training and collection is made easier.

Program Scope

The top priority for this project is to collect enough seeds and cuttings to sustain the requirements and projects of the nursery. Once these requirements have been adhered to, all extra plants or seeds can be sold to the public to recover costs.

Packaging Design

Front Back

Figure 4: Proposed design for packaging of seeds for sale

Packaging options include a simple kraft paper pouch with the GCA logo and plant information. The front of the package refers buyers to the fact that the seeds are local, and are harvested by

local volunteers (Figure 4). Aside from where the plant is found, there is a call to action in the form of visiting the website on how to care for the plant itself. While at the website there are other opportunities for involvement such as volunteering or donating.

Retail Locations

The Nursery already has established a retail location on Galiano at the local hardware store. In the future the nursery could sell plants and excess seeds at other locations as well.

Farmer's Markets

The market is a source of revenue opportunities as well as an opportunity to generate awareness. Volunteers can directly engage members of the community to volunteer or donate to the cause through purchasing seeds/plants. If the nursery has the the means in its workforce, sales could be expanded to other markets in the Gulf Islands.

Online Shopping

Revenue can be generated through online shopping at the GCA website. In addition to sweaters and mugs, seed packets may also be made available. Seeds that are locally harvested can be sold for a greater margin since there is a charitable cause associated with their purchase.

GCA Fundraising

Events put on by the GCA are a great opportunity for raising funds and awareness. Seeds and plants can be auctioned off for exorbitant prices, especially in the case of rare plants.

Charitable Donations

In-kind donations of seeds or plants can be made to other events on the Gulf Islands; this further spreads awareness of the GCA cause. Donations should be made to the local First Nations to acknowledge the importance their presence carries in the community. Donating to school programs may also be viable for creating projects in association with the GCA or even to recruit volunteers.

GCA Projects

Lastly, the nursery can also work along-side other GCA projects, such as the Edible Forest project or other ecological restoration projects off site.

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Appendices

Appendix A: Native Plant Species Index for Nursery and Propagule Collection

The list below is an abbreviated version of the completed Native Species Index that we have compiled for nursery purposes - the complete list has been included on the GCA google drive. Seeds that have already been collected have a "Yes" in the seed column, whereas seeds that haven't yet been collected have a "No" in this column; priority should be given to species with "Need" in the seed column. Locations of species populations are noted when known. If a plant is known to occur on Galiano, but has no documented harvest locations, then "Need location" is written in the locations column; if the plant is thought to occur on Galiano, but no populations are documented, "Unknown" is written in the locations column; if the plant is thought to no longer occur on Galiano, "Off Island" is written in the locations column. Propagule types and harvest times are also included, and current nursery stock is noted.

Nursery	Seed	Name	Locations	Propagule Type	Harvest Time
Yes	No	*Abies grandis* Grand Fir	Widespread.	Seed	Aug-Oct
Yes	No	*Acer glabrum* Douglas Maple	Sturdies Bay Road (near bench).	Seed	Sep-Oct
Yes	No	*Acer macrophyllum* Big Leaf Maple	Widespread. Learning Centre (Cove).	Seed	Sep-Oct
Yes	Yes	*Achillea millefolium* Yarrow	Widespread. Learning Centre (Cove).	Seed, Division	Aug-Oct
No	Yes	*Achlys triphylla* Vanilla Leaf	Widespread. Learning Centre (Roadside). Vanilla Leaf Land.	Seed	July-Aug
No	No	*Achnatherum lemmonii* Lemmon's Needlegrass	Need location.	Seed, Division	June
No	No	*Actaea rubra* Red Baneberry	Unknown.	Seed	July-Sep

No	Yes	*Allium acuminatum* Hooker's Onion	Bodega Ridge. Bluffs Park. Mt Sutil. Tapovan Peace Park.	Seed	July-Aug
No	No	*Allium amplectens* Slimleaf Onion	Unknown.	Seed	June-July
Yes	Yes	*Allium cernuum* Nodding Onion	Nursery. Mt Suil.	Seed, Division	July-Sep
Yes	No	*Alnus rubra* Red Alder	Widespread.	Seed	Aug-Sep
Yes	No	*Amelanchier alnifolia* Saskatoon Berry	Learning Centre (Cove). Montague Prov. Park. Bellhouse Park. Burrill Road.	Seed	June-July
No	Need	*Anaphalis margaritacea* Pearly Everlasting	Learning Centre (NPFF). Laughlin Lake.	Seed	Sep-Oct
No	X	*Angelica genuflexa* Kneeling Angelica	Off island?	Seed	June-Aug
Yes	Yes	*Aquilegia formosa* Red Columbine	Need location. Nursery.	Seed	May-Sep
Yes	Need	*Arbutus menziesii* Arbutus	Widespread. Learning Centre (Cove).	Seed	Aug-Nov
No	Yes	*Arctostaphylos columbiana* Hairy Manzanita	Bodega Ridge.	Seed, Cutting	July-Aug
No	Need	*Arctostaphylos uva-ursi* Bearberry	Dionisio Prov. Park. Not enough to propagate - need to import stock.	Seed, Cutting	Aug-Oct
No	Yes	*Artemisia suksdorfii* Coastal Sagewort	Matthew's Beach.	Seed, Division	Sep-Oct
Yes	No	*Athyrium filix-femina* Lady Fern	Widespread.	Division, Spore	n/a
No	No	*Barbarea orthoceras* American Yellowrocket	Unknown.	Seed	July-Aug
Yes	Yes	*Berberis aquifolium* Tall Oregon Grape	Learning Centre (Cove). Bellhouse Park. Bodega Ridge.	Seed	July-Aug

Yes	No	*Berberis nervosa* Dull Oregon Grape	Widespread. Learning Centre (Cove). Learning Centre (NPFF)	Seed	July-Aug
No	No	*Betula papyrifera* Paper Birch	Unknown.	Seed	Sep-Oct
No	No	*Blechnum spicant* Deer Fern	Widespread. Laughlin Lake.	Division, Spore	n/a
No	Yes	*Brodiaea coronaria* Crown Brodiaea	Bellhouse Park. Learning Centre (SW Corner). Retreat Island.	Seed	July-Aug
No	Yes	*Bromus carinatus* California Brome	Widespread. Learning Centre (Cove).	Seed	June-July
No	Yes	*Camassia leichtlinii* Great Camas	Bellhouse Park.	Seed	June-Aug
No	Yes	*Camassia quamash* Common Camas	Bellhouse Park. Learning Centre (SW Corner).	Seed	June-Aug
No	Need	*Campanula rotundifolia* Bellflower	Unknown.	Seed	Aug-Oct
No	Need	*Ceanothus sanguineus* Redstem Ceanothus	Unknown.	Seed, Cutting	July-Sep
No	No	*Cerastium arvense* Field Chickweed	Learning Centre (SW Corner).	Seed	May-July
No	No	*Clarkia amoena* Farewell-to-Spring	Unknown.	Seed	July-Aug
No	Need	*Claytonia parviflora* Streambank Spring Beauty	Widespread.	Seed	June-Aug
No	Need	*Claytonia perfoliata* Miner's Lettuce	Widespread. Greig Creek. Bellhouse Park. Learning Centre (Bluffs). Bluffs Park.	Seed	May-June
No	Need	*Claytonia sibirica* Siberian Miner's Lettuce	Widespread.	Seed	June-Aug
Yes	No	*Clinopodium douglasii* Yerba Buena	Widespread. Learning Centre (FF).	Seed, Layering	Sporadic
No	No	*Collinsia grandiflora* Giant Blue-eyed Mary	Unknown.	Seed	May-June

No	No	*Collinsia parviflora* Small Blue-eyed Mary	Widespread.	Seed	May-June
No	No	*Cornus canadensis* Bunchberry	Unknown.	Seed	July-Sep
No	Need	*Cornus nuttallii* Pacific Dogwood	Cook Road near Ecological Reserve. Ken Millard's Property.	Seed	Aug-Sep
Yes	No	*Cornus stolonifera* Red-osier Dogwood	Unknown.	Seed, Cutting	July-Aug
Yes	No	*Crataegus douglasii* Black Hawthorne	Dionisio Prov. Park. Old nursery site.	Seed	July-Aug
No	No	*Danthonia californica* California Oatgrass	Need location.	Seed, Division	June-July
No	Yes	*Delphinium menziesii* Menzies' Larkspur	Learning Centre (SW Corner).	Seed	June-July
No	Need	*Dodecatheon hendersonii* Broadleaf Shooting Star	Unknown.	Seed	June-Aug
No	Need	*Dodecatheon pulchellum* Pretty Shooting Star	Unknown.	Seed	June-Aug
No	No	*Elymus glaucus* Blue Wild Rye	Widespread. Learning Centre (Cove). Mt Sutil.	Seed	July-Sep
No	Need	*Epilobium angustifolium* Fireweed	Laughlin lake. Retreat Cove Road.	Seed	Aug-Sep
No	Yes	*Epilobium densiflorum* Dense-flower Primrose	Learning Centre (Garden).	Seed	Aug-Sep
No	Yes	*Eriophyllum lanatum* Wooly Sunflower	Bodega Ridge. Bluffs Park. Mt Sutil. Learning Centre (Cove).	Seed	July-Aug
No	Yes	*Erythranthe guttatus* Seep Monkeyflower	Learning Centre (SW Corner). Dionisio Prov. Park.	Seed	May-July
No	Need	*Erythronium oregonum* Oregon Fawn Lily	Bellhouse Park. Dionisio Prov. Park. Bluffs Park.	Seed	July-Aug
Yes	No	*Festuca roemeri* Roemer's Fescue	Nursery. Mt Sutil. Bodega Ridge.	Seed, Division	July-Sep
Yes	No	*Fragaria vesca* Woodland Strawberry	Widespread.	Seed, Layering	May-June

No	Yes	*Fritillaria affinis* Chocolate Lily	Need location.	Seed	July-Aug
Yes	Yes	*Gaultheria shallon* Salal	Widespread. Learning Centre (NPFF).	Seed	June-Sep
Yes	No	*Grindelia spp.* Gumweed	Widespread. Learning Centre (Cove).	Seed	Sep-Nov
No	No	*Heracleum maximum* Cow Parsnip	Off island?	Seed	May-July
Yes	No	*Heuchera micrantha* Crevice Alum Root	Need location.	Seed	May-July
Yes	No	*Holodiscus discolor* Oceanspray	Widespread. Learning Centre (Cove).	Seed	Aug-Sep
No	No	*Hordeum brachyantherum* Meadow Barley	Need location.	Seed	June-July
No	No	*Juncus bolanderi* Bolander's Rush	Learning Centre (NPFF).	Seed, Division	July-Sep
No	No	*Juncus effusus* Common Rush	Widespread. Learning Centre (NPFF).	Seed, Division	July-Sep
No	No	*Juncus ensifolius* Daggerleaf Rush	Need location.	Seed, Division	July-Sep
No	No	*Juniperus communis* Common Juniper	Unknown.	Seed, Cutting	Aug-Sep
No	Yes	*Juniperus maritima* Puget Sound Juniper	Montague Prov. Park. Dionisio Prov. Park.	Seed, Cutting	Aug-Sep
No	No	*Kalmia microphylla* Western Bog-laurel	Ecological Reserve.	Seed	July-Oct
No	No	*Koeleria macrantha* Junegrass	Mt Sutil.	Seed	July-Sep
Yes	Yes	*Lilium columbianum* Tiger Lily	Porlier Pass Road (near nursery).	Seed	Aug-Nov
Yes	No	*Linnaea borealis* Twinflower	Learning Centre (Roadside). DL 57. Thera. Porlier Pass Road.	Seed, Layering	July-Aug
No	No	*Lithophragma parviflora* Small Woodland Star	Bluffs Park.	Seed	June-Aug

No	No	*Lomatium dissectum* Fernleaf Desert Parsley	Unknown.	Seed	July-Aug
No	No	*Lomatium grayi* Gray's Lovage	Unknown.	Seed	July-Aug
Yes	Need	*Lomatium nudicaule* Indian Consumption Plant	Off island?	Seed	June-July
No	Yes	*Lomatium utriculatum* Spring Gold	Learning Centre (SW Corner). Bluffs Park.	Seed	June-July
Yes	No	*Lonicera ciliosa* Orange Honeysuckle	Need location.	Seed	Aug-Sep
Yes	No	*Lonicera hispidula* Hairy Honeysuckle	Widespread. Learning Centre (Cove).	Seed	Aug-Sep
No	No	*Lysichiton americanus* Skunk Cabbage	Learning Centre. Laughling Lake. Polier Pass Road.	Seed	July-Aug
No	No	*Maianthemum dilatatum* False Lily-of-the-Valley	Unknown. Nursery.	Seed, Division	Aug-Oct
No	No	*Maianthemum racemosa* False Solomon's Seal	Unknown.	Seed	July-Sep
No	Need	*Malus fusca* Oregon Crabapple	Whaler Bay. Bluffs Road, near Coastal Access 15.	Seed	July-Sep
No	No	*Melica subulata* Alaska Oniongrass	Need location.	Seed	June-July
No	No	*Myosotis laxa* Small Forget-me-Not	Laughlin Lake.	Seed	July-Sep
Yes	No	*Oemleria cerasiformis* Indian Plum	Retreat Cove. Bodega Ridge.	Seed, Cutting	May-July
No	No	*Olsynium douglasii* Satin-flower	Off island?	Seed	June-Aug
No	Need	*Opuntia fragilis* Brittle Prickly Pear	Secret Beach. Matthew's Point Beach.	Seed, Pad?	Sporadic
No	Yes	*Osmorhiza berteroi* Mountain Sweet Cicely	Widespread. Bodega Ridge.	Seed	June-Aug
Yes	No	*Paxistima myrsinites* Falsebox	Bellhouse Park. Mt Sutil. Bluffs Park. Learning Centre (Bluffs).	Seed, Cutting	June-Sep

No	No	*Perideridia gairdneri* Gairdner's Yampah	Off island?	Seed	July-Aug
Yes	No	*Petasites frigidus palmatus* Coltsfoot	Need location. Nursery.	Seed, Division	May-Aug
No	No	*Phacelia tanacetifolia* Scorpionweed	Unknown.	Seed	?
Yes	Yes	*Philadelphus lewisii* Mock Orange	Learning Centre (Cove). Old nursery site.	Seed, Cutting	July-Aug
Yes	Yes	*Physocarpus capitatus* Pacific Ninebark	Learning Centre (Cove). Old nursery site.	Seed	July-Aug
No	No	*Pinus contorta* Shore Pine	GCA Office? Learning Centre (Cove)? Sticks-Allison?	Seed	June-Oct
No	No	*Pinus monticola* Western White Pine	Ecological Reserve.	Seed	June-Oct
No	Yes	*Plectritis congesta* Sea Blush	Nursery.	Seed	April-June
No	No	*Poa secunda* Sandberg's Bluegrass	Need location.	Seed	June-July
No	No	*Polypodium glycyrrhiza* Licorice Fern	Bellhouse Park.	Division, Spore	n/a
Yes	No	*Polystichum munitum* Western Sword Fern	Widespread.	Division, Spore	n/a
No	No	*Populus tremuloides* Trembling Aspen	Learning Centre (Bluffs).	Seed, Cutting	May-Aug
No	No	*Populus trichocarpa* Black Cottonwood	DL 67. Porlier Pass Road. Burril Road.	Seed, Cutting	May-Aug
No	Need	*Potentilla anserina* Pacific Silverweed	Montague Prov. Park. Learning Centre (Cove).	Seed, Layering	July-Sep
No	Yes	*Prunella vulgaris* Self-heal	Widespread. Learning Centre (Roadside).	Seed, Division	Aug-Oct
No	No	*Prunus emarginata* Bitter Cherry	Widespread. Learning Centre (Cove). DL 67.	Seed	July-Sep
Yes	Yes	*Pseudotsuga menziesii* Douglas-fir	Widespread.	Seed	July-Sep

Yes	No	*Pteridium aquilinum* Bracken Fern	Widespread.	Division, Spore	n/a
Yes	No	*Quercus garryana* Garry Oak	Bellhouse Park. Mt Sutil. Bluffs Park. Ken Millard's Property.	Seed	Aug-Sep
No	No	*Ranunculus occidentalis* Western Buttercup	Unknown.	Seed	May-July
No	No	*Rhamnus purshiana* Cascara Sagrada	Bluffs Road, near Coastal Access 15.	Seed	July-Sep
No	No	*Rhododendron groenlandicum* Labrador Tea	Ecological Reserve.	Seed, Cutting	July-Sep
No	No	*Ribes bracteosum* Stink Currant	Unknown.	Seed	July-Aug
No	Yes	*Ribes divaricatum* Woodland Gooseberry	Montague Prov. Park. Learning Centre (Cove).	Seed, Cutting	July-Aug
No	No	*Ribes lobbii* Fuschia-flowered Gooseberry	Unknown.	Seed	July-Aug
Yes	No	*Ribes sanguineum* Red-flowering Currant	Need location.	Seed	June-July
Yes	No	*Rosa gymnocarpa* Baldhip Rose	Widespread.	Seed	Aug-Oct
Yes	No	*Rosa nutkana* Nootka Rose	Widespread. Learning Centre (Cove). Parker Island.	Seed, Division	Aug-Oct
Yes	Yes	*Rubus leucodermis* Blackcap Raspberry	Widespread. Learning Centre (NPFF).	Seed	July-Aug
Yes	No	*Rubus parviflorus* Thimbleberry	Learning Centre (Roadside).	Seed	July-Aug
Yes	No	*Rubus spectabilis* Salmonberry	Widespread. Learning Centre (Roadside).	Seed	May-June
No	Yes	*Rubus ursinus* Trailing Blackberry	Widespread. Learning Centre (NPFF).	Seed, Layering	June-July
Yes	No	*Salix lucida ssp. lasiandra* Pacific Willow	Coastal Access 15.	Seed, Cutting	Summer

Yes	No	*Salix scouleriana* Scouler's Willow	Widespread. Learning Centre (Cove). Bellhouse Park.	Seed, Cutting	Summer
No	No	*Salix sitchensis* Sitka Willow	Pebble Beach/Cable Bay.	Seed, Cutting	May-June
Yes	No	*Sambucus racemosa* Red Elderberry	Learning Centre (Cove). Porlier Pass Road.	Seed, Cutting	May-June
No	No	*Sanicula bipinnatifida* Purple Sanicle	Unknown.	Seed	July-Aug
No	No	*Sanicula crassicaulis* Pacific Sanicle	Widespread. Bellhouse Park.	Seed	May-July
No	No	*Sedum lanceolatum* Lanceleaf Stonecrop	Unknown.	Seed, Division	July-Aug
Yes	No	*Sedum spathulifolium* Broadleaf Stonecrop	Widespread. Learning Centre (Cove). Nursery.	Seed, Division	July-Aug
Yes	Need	*Shepherdia canadensis* Buffaloberry	Montague Prov. Park. Nursery.	Seed, Cutting	July-August
Yes	No	*Sisyrinchium idahoense* Blue-eyed Grass	Need location.	Seed	July-Sep
No	No	*Solidago canadensis* Canada Goldenrod	Matthew's Beach.	Seed	Sep-Nov
No	No	*Sorbus sitchensis* Sitka Mountain Ash	Unknown.	Seed	July-Aug
Yes	No	*Spiraea douglasii* Hardhack	Widspread. Laughlin Lake.	Seed, Cutting	Sep-Oct
No	No	*Stachys cooleyae* Cooley's Hedge Nettle	Laughlin Lake.	Seed, Division	Aug-Sep
Yes	No	*Symphoricarpos albus* Snowberry	Widespread. Learning Centre (Cove).	Seed	Sep-Oct
No	No	*Symphyotrichum subspicatum* Douglas Aster	Unknown.	Seed, Division	Sep-Nov
Yes	No	*Taxus brevifolia* Pacific Yew	Montague Prov. Park. Parking Lot for Manzanita Complex. Learning Centre (NPFF).	Seed, Cutting	Aug-Oct

Yes	Yes	*Tellima grandiflora* Fringecups	Widespread. Nursery.	Seed, Division	May-Aug
Yes	No	*Thuja plicata* Western Redcedar	Widespread. Vanilla Leaf Land trail.	Seed	Sep-Oct
No	No	*Tiarella trifoliata* Three-leaf Foamflower	Widespread. Learning Centre (Roadside).	Seed	Aug-Oct
No	No	*Toxicodendron diversilobum* Poison Oak	Unknown.	Seed	Sep-Oct
No	Yes	*Toxicoscordion venenosum* Death Camas	Bodega Ridge. Learning Centre (Bluffs). Bluffs Park. Mt Sutil.	Seed	June-Aug
No	No	*Trientalis latifolia* Western Starflower	Widespread. Learning Centre.	Seed	May-July
No	No	*Trifolium wormskjoldii* Springbank Clover	Unknown.	Seed, Division	July-Sep
No	Yes	*Triteleia hyacinthina* Fool's Onion	Bellhouse Park.	Seed	June-July
Yes	No	*Tsuga heterophylla* Western Hemlock	Widespread. Vanilla Leaf Land trail.	Seed	Sep-Oct
Yes	No	*Vaccinium ovatum* Evergreen Huckleberry	Learning Centre (FF). Bellhouse Park. Cable Bay/Pebble Beach. Learning Centre (Cove).	Seed, Cutting	July-Oct
No	No	*Vaccinium oxycoccos* Bog Cranberry	Ecological Reserve.	Seed	Sep-Oct
Yes	Yes	*Vaccinium parvifolium* Red Huckleberry	Learning Center (sporadic). Cable Bay/Pebble Beach. Porlier Pass Road	Seed	June-July
Yes	No	*Viburnum edule* Highbush Cranberry	Off island?	Seed	July-Oct
No	Need	*Viola sempervirens* Evergreen Violet	Bluffs Park.	Seed	July-Aug

Appendix B - Dislocated Plant List

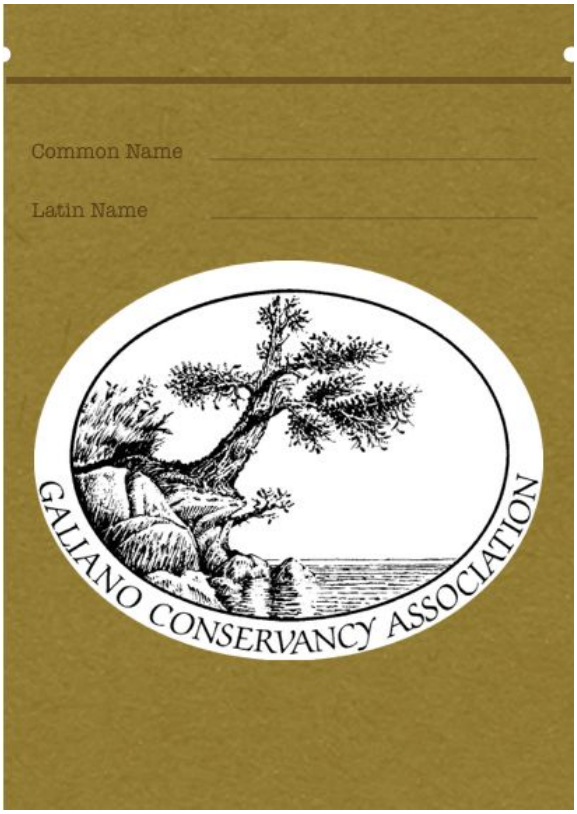
This list, compiled from the index, includes only plants that do not yet have documented harvest locations on Galiano island. This list could be shared online or through a newsletter with community contributors in order to target exploration and collection activities. If a plant is known to occur on Galiano, but has no documented harvest locations, then "Need location" is written in the status column; if the plant is thought to occur on Galiano, but no populations are documented, "Unknown" is written in the status column; if the plant is thought to no longer occur on Galiano, "Off Island" is written in the status column.

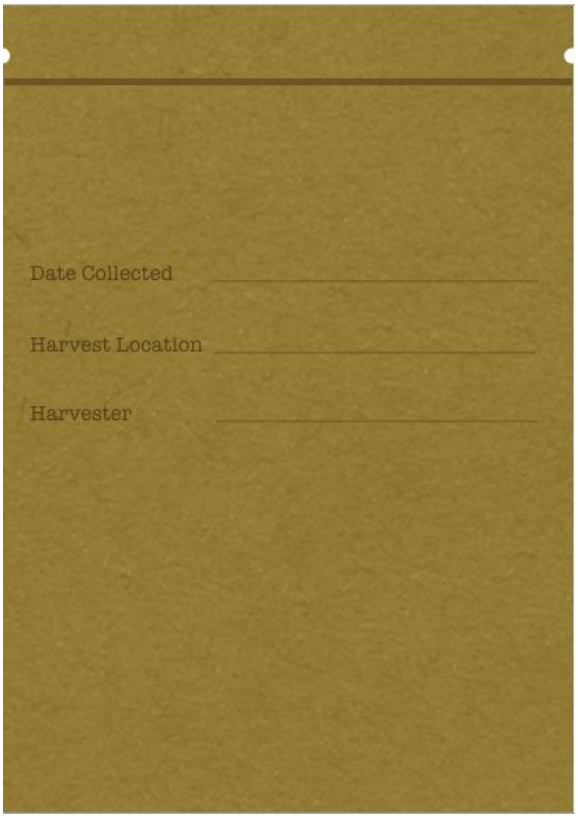
Species	Common Name	Status
Achnatherum lemmonii	Lemmon's Needlegrass	Need location.
Actaea rubra	Red Baneberry	Unknown.
Allium amplectens	Slimleaf Onion	Unknown.
Angelica genuflexa	Kneeling Angelica	Off island?
Aquilegia formosa	Red Columbine	Need location. Nursery.
Barbarea orthoceras	American Yellowrocket	Unknown.
Betula papyrifera	Paper Birch	Unknown.
Campanula rotundifolia	Bellflower	Unknown.
Ceanothus sanguineus	Redstem Ceanothus	Unknown.
Clarkia amoena	Farewell-to-Spring	Unknown.
Collinsia grandiflora	Giant Blue-eyed Mary	Unknown.
Cornus canadensis	Bunchberry	Unknown.
Cornus stolonifera	Red-osier Dogwood	Unknown.
Danthonia californica	California Oatgrass	Need location.
Dodecatheon hendersonii	Broadleaf Shooting Star	Unknown.
Dodecatheon pulchellum	Pretty Shooting Star	Unknown.
Fritillaria affinis	Chocolate Lily	Need location.
Heracleum maximum	Cow Parsnip	Off island?
Heuchera micrantha	Crevice Alum Root	Need location.
Hordeum brachyantherum	Meadow Barley	Need location.
Juncus ensifolius	Daggerleaf Rush	Need location.

Juniperus communis	Common Juniper	Unknown.
Lomatium dissectum	Fernleaf Desert Parsley	Unknown.
Lomatium grayi	Gray's Lovage	Unknown.
Lomatium nudicaule	Indian Consumption Plant	Off island?
Lonicera ciliosa	Orange Honeysuckle	Need location.
Maianthemum dilatatum	False Lily-of-the-Valley	Unknown. Nursery.
Maiantheum racemosa	False Solomon's Seal	Unknown.
Melica subulata	Alaska Oniongrass	Need location.
Olsynium douglasii	Satin-flower	Off island?
Perideridia gairdneri	Gairdner's Yampah	Off island?
Petasites frigidus palmatus	Coltsfoot	Need location. Nursery.
Phacelia tanacetifolia	Scorpionweed	Unknown.
Poa secunda	Sandberg's Bluegrass	Need location.
Ranunculus occidentalis	Western Buttercup	Unknown.
Ribes bracteosum	Stink Currant	Unknown.
Ribes lobbii	Fuschia-flowered Gooseberry	Unknown.
Ribes sanguineum	Red-flowering Currant	Need location.
Sanicula bipinnatifida	Purple Sanicle	Unknown.
Sedum lanceolatum	Lanceleaf Stonecrop	Unknown.
Sisyrinchium idahoense	Blue-eyed Grass	Need location.
Sorbus sitchensis	Sitka Mountain Ash	Unknown.
Symphyotrichum subspicatum	Douglas Aster	Unknown.
Toxicodendron diversilobum	Poison Oak	Unknown.
Trifolium wormskjoldii	Springbank Clover	Unknown.
Viburnum edule	Highbush Cranberry	Off island?

Appendix C - Collection and Storage Envelopes

Envelopes like these could be used by GCA staff to store and label collections. A small stack could also be given to contributors in order to motivate collections and streamline processing.





Appendix D: Updated Propagation Manual

This resource is too large to attach here and is included in the GCA google drive.