Native Species Garden Restoration Project

Ecological Restoration: ES 341

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In the end, we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught."

-Baba Dioum, 1937
George Jay Elementary School

Motto: “Learning to Care…. Caring to Learn”

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- LifeCycles
- George Jay Elementary School
- Frank Hobbs Elementary
- Fiona Chambers
- Jan Verwey
- Nancy Turner
- Heike Lettrari

Further thanks to sunlight that dances across waters, breezes that carry floral scent and salty ocean air, to the towering, lush green forests that hold the stories of our world, ants who carry 50 times their body weight, and to the Earth, that keeps on spinning everyday, reminding us with its beauty and complexities, how lucky we are to be alive. To the Earth, for all it teaches us, in hearts and minds, this project is dedicated.
Section 2: Introduction

2.1 Introduction

Restoration, defined by the Society for Ecological Restoration, is “the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed” (SER, 2004). An ecosystem, by definition consists of biotic factors, the abiotic/physical environment that sustains it and their interactions (SER, 2004). Sometimes an ecosystem can rehabilitate and regenerate on its own without aid from human restoration; however, in the case of land use change (habitat loss), climate change, introduced species, overexploitation and nitrogen deposition (use of chemical fertilizers) restoration is needed (Tillmans, 2013). After restoration, some ecosystems can function and maintain themselves, but there are instances where human management and monitoring is needed for longer periods of time. In some instances, the job of a restorationist is never done, because the end goal is never reached; the environment is always changing. Fortunately, “people develop a ferocious commitment to place via restoration and learn a great deal more about ecological processes than they would from less interactive pursuits” (Higgs, 2006). Restoration can help connect people to the land, community and even themselves on a deep and fulfilling level.

The project presented in this document is a native community plant garden at George Jay elementary school, located in Fernwood, Victoria, BC. There is a push within the education system to implement more experiential learning and time outside because there is a fear that children are too removed from nature, which implies disconnect from the earth (Monbiot, 2012). This project aims to tackle restoration of the site, but also attempts to better connect elementary school children to their environment. This is very important considering these children will be the ones protecting nature in the future. This plan also includes the garden consisting of only native plants to Victoria, because it is important to get to know one’s surroundings and be able to understand the benefits and names of the plants on the West Coast. We sought out George Jay Elementary because they already had ideas floating around in regards to a environmental “play area.” The play area would involve a native plant garden (this document), a natural playground and a stage for performing and presentations. We are very fortunate to plan a project that will most likely happen in the future. This document demonstrates a figurative framework of a plan to create this garden, as well as some useful tools to create other restoration projects.

2.2 References


Tillmans, A. *Biodiversity and Ecosystem Functioning* [PDF document]. Retrieved from Lecture Notes Online Web site:
Section 3: Site Analysis

Knowing your site well is essential to strong restoration. A firm understanding of the current ecology, uses and surrounding environment are essential in every step of restoration. Furthermore, the histories of all these factors are equally important, as well as any connections to peoples of past, present, and future (Garry Oak Ecosystem Restoration, 2013). We highly recommend that you delve into the story that is your site, sharing and learning from this information with students and community members.

3.0.1 Figure: Front view. The green area before the fence is the plot that is proposed for the native plant garden

3.1: Abiotic Factors

The site is a plot on the property of George Jay Elementary School, at 1118 Princess Avenue, Victoria, BC. According to the School-Based Weather website, George Jay Elementary School’s longitude is 236.649, its latitude is 48.433 and its elevation is 35m (2013). This area of Fernwood (a municipality located in Victoria) is located in the biogeoclimatic zone of Coast Douglas-fir and in the Garry Oak Ecosystem. The Douglas-fir zone “enjoys the finest climate in Canada”, because it is “sheltered by the rainsshadow of the Vancouver Island and Olympic mountains and is warmed by air from the Pacific” (BC Ministry of Forests, 1999). Therefore, the temperature in this area is quite mild; it has wet winters and warm summers. The Victoria, B.C. Weather & Climate section of the Tourism Victoria website (2012) states that Victoria receives an average of 2,183 hours of
sunshine each year and is frost free for eight months of the year. The average annual rainfall is 66.5 centimetres, and the temperatures are warmest in July (21.8C) and coldest in January (6.5C).

The dominating tree in this area is Douglas-fir (BC Ministry of Forests, 1999), one of which currently grows on George Jay Elementary School’s restoration site. Within this biogeoclimatic zone is the Gary Oak Ecosystem, which is known for its ability to support high plant diversity (Fairbarns, 2013). This will be very useful for the project due to a need of an ecosystem that can support plants with differing qualities such as a drought resistant or the ability to withstand diverse weather conditions. The plot of the site is located on the north side of the school. The North side of the garden is Queens Road, the South side is facing the school, East side is facing a basketball court and a field and the West side is facing a concrete play area, followed by Cook Street. The plot being propositioned to be transformed into a native plant garden is located up against the fence along Queens road and its dimensions are 88x16 feet. The soil quality is assumed to be poor due to little vegetation in the area, and because the plot is covered by very shallow sand and gravel. The soil has also been greatly compacted from heavy use by humans. This implies that new soil would need to be imported into the site if a garden were to be planted in this location. The plot is mostly flat, with a slight downward slope going towards the fence. The classification of plant community we are attempting to be recreated is a Maritime Meadows. According to the Field Guide for Site Identification and Interpretation for the Vancouver Forest region document, a Maritime Meadow is a plant community where the soil is a maximum of 50cm, has a low elevation and is less than 3km from the coast.

3.2. Biotic Factors

The species present in the immediate plot are a Douglas-fir tree (*Pseudotsuga menziesii*), a non-native grass, and dandelions (*Taraxacum*). With the site restoration, this tree will remain in this spot, which will need to be taken into consideration when evaluating shade-coverage for plants. The grass sparsely covers about 70-75% of the plot, while the dandelions cover around 30%. Areas surrounding the plot include some other vegetation. To the West is a Garry Oak tree, (*Quercus garryana*) which should have no major effect on the garden. Against the school there is a small covering of moss (*Bryophyta*) growing. On the other side of the fence are a few small unknown exotic trees, which should not cause issues being so near the site, however, there is a small leaf litter cover of 5-10% of the native community garden plot. Across the street is a large Garry Oak along with a few other trees. There are also some small domestic shrubs outside the apartment buildings, which are evidently put there for aesthetic reasons. There was no detection of any invasive species besides dandelions, so there is little to no risk of invasive plants taking over. However, this could be due to efforts of site management, and the currently depleted soil which does not easily allow for vegetation growth. The communities adjacent to this site include Queens road on the North East west, which has apartment buildings with small gardens around them, Cook street with the Garry Oak on the West side, and a field full of grass on the Eastern side (3.2.1 Figure 1).
The threatened species present is the Garry Oak tree across the street, as well as the one to the West side of the site. They both appear to be quite large and in good condition, and the garden should not affect its ability to thrive in any way; on the contrary, it will contribute to the ecological integrity of the site.
3.3 History

A study of the history of George Jay Elementary and its grounds provides continuity to this project and is an useful insight for the creation of the native plant garden. Before European colonization, the southeastern coast of Vancouver Island was inhabited by the Songhees First Nations while the Swengwung controlled the waterfront along with the Fernwood area (Ellis & Lillard, 1989). The specific area of George Jay Elementary was a series of trails between the Songhees Village in Cadboro Bay and the establishment of what became Fort Victoria after colonization (Greater Victoria Harbour, 2009).

After European establishment, the Fernwood area developed and populated over a gradual time period of 10 years. The land survey laid out in boundaries by Joseph Despard Pemberton lead to a controlled approach to urban development (Ellis & Lillard, 1989). In 1853, a square-log Colonial school was built, but it was demolished in 1879 (Adams, & Muir, 2004). However, the population of Fernwood continued to increase until the area was in desperate need for a school. Then, in 1910, George Jay Elementary was opened. It was the first school in Victoria to be built with reinforcing steel (Ellis & Lillard, 1989). The school was named after George Jay, who was an important figure in the education world and was the chair of the school board in 1908 (Ellis & Lillard, 1989). Through its history, the school has had some interesting neighbours. In 1911, the teachers had to yell quite loudly in the classrooms so that the children could hear them over the barking of the dogs from the neighbouring dog pound (Ellis & Lillard, 1989). North of George Jay was a cattle slaughter compound, and cattle would sometimes escape and run down to the Elementary school. The children would stare at the men chasing the cattle around their school’s field (Ellis & Lillard, 1989). During World War II, the school decided to embark on a unique project to support the Red Cross. The children grew vegetables in gardens to sell, and all the proceeds were given to the Red Cross to help people oversees (Ellis & Lillard, 1989). This information depicts that there was good soil in the past that was able to support the growing plants.

3.3.1 Figure 1: Cooper, D. 2012, May 22. George Jay School, Princess Ave., Victoria - from Miss Fraser's Album. Taken between 1930 and 1940. Retrieved online from Kimberley Heritage Museum [blog post]
3.4 Human Impact

There is a path that goes from an opening in the fence, through the native garden area, which has come to be from use alone. Ideally, the path should be maintained, thereby increasing the accessibility of the garden, and allowing people that usually use this trail to continue passing through. The soil here has therefore likely been compacted further from trampling. This area is a school, so there is a lot of traffic; children also play on the gravel in this area. The anticipated use of humans after the restoration is to have the children engaging with the garden inside and outside of school. This means reading the signs that will be posted next to the plants, picking berries and going through the trail of the garden. There is also an expectation that the children will help manage and monitor the garden along with staff and community to make sure it is healthy and in good condition. This project focuses only on a native plant garden, however, the school would like the use the rest of the space in this area to create a “Nature playground”. Based on an interview with the principal, this would mean logs meant specifically for kids to play on, as well as a “Nature stage”.

3.5 Risks and Concerns

There are a number of factors to be taken into consideration in any restoration project. Invasive species and weeds are often the most obvious factors to consider, however it is important to take note of all areas of potential risk. These may include issues relating to past, current, or future use, neighbouring areas, restoration and monitoring costs, and a plethora of other considerations.

One of the major concerns to consider is encroachment of weeds. There is a fear that the dandelions and other weeds may start to spread among the garden, which could limit the native garden’s ability to flourish. In order to prevent this, monitoring and constant management need to be implemented in a way that evaluates the growth of weeds. A further consideration is the overpopulation of deer in Victoria. Even with plants that are “deer resistant,” deer may still eat the plants if there are no other plants in the area in their usual diet. Some solutions include planting yellow flowers, strongly scented plants, and creating barriers between the deer and the plant. This will need to be addressed through adaptive management as the garden grows and deer may or may not become an issue. Another factor to consider is the shade created from the Douglas-fir tree on the site, which limits sunlight available to nearby plants throughout the day. In order to not disturb the roots and growth of the tree, careful planting has to be implemented. To aid with the solution of sunlight, choosing plants that need little to no sunlight to put in areas with a lot of shade is beneficial. Soil excavation could also be a potential problem due to the risks of disturbing the Douglas fir tree, so when excavating, care should be taken to not get too close to the tree, or dig too deeply. The costs of excavation are also a concern. This is where a budget, along with grants and donations from organizations/the city are useful. The site is also quite dry, which needs to be taken into planning and management. This may be a simple result of over-compaction, lack of vegetation, and gravel, and the area will become healthier overtime as the garden and plants are established. However, if this is not the case, and in the meantime, extra care will be needed.
Possible solutions include having a close water source that is easily accessible and the creation of water barrels to catch the rain for the garden.

3.6 References


Section 4: Policy, Goals and Objectives

“We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.”—Aldo Leopold

(1949, as cited in The Garry Oak Ecosystems Recovery Team (GOERT), 2011)

In this section we provide background information on the importance of restoring this site (3.1). We then introduce our policy, followed by its four goals and their respective objectives.

4.1 Rational: Problem and solution

In the last century, the evidence from the natural sciences that shows how human impact has decreased biodiversity, altered natural process and threatened the integrity of our planet has been increasing (Kareiva & Marvier, 2011), making it clear that our relationship with the land and ocean is damaging Nature’s health.

To bring it home, the Garry Oak ecosystem and the challenges it faces are a good example of this unhealthy relationship. It is estimated that less than 5% of the area covered by these ecosystems before European colonization remains in a near natural state, and the remaining habitat is threatened by invasive species, degradation, fragmentation and the suppression of human stewardship (GOERT, 2011).

Before European settlement, “[t]he Kwakwaka’wakw, Coast Salish and other peoples looked after their lands and waters and "paid back" Nature for all her gifts in many ways. These range from very specific, focussed activities such as tending, sustaining and promoting the growth and productivity of their resources to managing and caring for particular localities and habitats, to adopting all-encompassing attitudes of respect and conservation that directed, and continue to direct, people's actions and behaviour." (Turner, 2005, p. 148). They used fires to limit the growth of unfavourable bushes, they weeded and pruned shrubs, they dispersed seeds and harvested only what they needed. They respected the land and loved it. Indeed, this ecosystem is suffering from the lack of healthy human involvement.

However, Nature is not the only one suffering from this lack of proper stewardship. More recently, the social sciences have also addressed environmental problems and found that our society’s relationship to the land is also detrimental for us. Economic studies on ecosystem services which we used to take for granted, have revealed how valuable Nature’s services are to us (Kareiva & Marvier, 2011) and how costly it is to lose them. But monetary value is not the only thing environmental degradation is causing.

Psychological research has revealed we have grown distant from the local environment and the younger generations are suffering from it the most. In 2008, Louv published a book titled
Last Child in the Woods: Saving children from nature deficit disorder, in which he summarized the increasing body of literature that addressed the lack of connection and interaction between children and the natural world. Today’s youth is used to learning about Nature through screens and windows, but the amount of time they spend engaging with Nature and directly experiencing it in an unstructured way is very limited (Driessnack, 2009), and this is highly detrimental. Research has shown that direct exposure to Nature increases cognitive abilities and attention spans, and fosters the creative thought process, problem-solving skills and self-discipline. It has also been found to reduce stress and depression (Driessnack, 2009). In short, direct exposure to Nature is essential for children’s physical and emotional health, as well as their cognitive ability.

Combining the research from the natural and social sciences leaves us with the conclusion that the relationship between Nature and humans that modern society has developed is unhealthy and needs to be addressed. And it is being addressed. There is currently a movement on Vancouver Island and surrounding islands to restore Garry Oak ecosystems and to reconnect people with their local natural environment (GOERT, 2011). These movements have shown that engaging communities in restoration projects not only helps ensure the long term success of the project, but also increases the awareness and appreciation of the local natural environment, fostering a sense of place, a long term meaningful connection to the natural world around them, and giving communities a “remarkable sense of accomplishment” (GOERT, 2011, p: 1.8). In addition, there is a movement in British Columbia for “greening schools” and including hands on environmental education into the curriculum (GOERT, 2011).

Since its edification, George Jay Elementary School has had very limited textured and diverse natural areas (see section 3.3). Today, large portions of the property are covered with gravel and concrete, and a grass field that has less than five trees. The children are therefore in desperate need of a textured and biodiverse space in which to engage and experience Nature. Last year, with the aid of LifeCyles, the school was able to implement raised garden beds to act as a food garden, and a place to explore non-grass plants. Katie Liébault, who is working on this project has seen the students’ excitement and joy first-hand when they engage with the plant diversity in this food garden. They also love searching for worms. The teachers have also been very receptive to the food garden and incorporate themes such as pollination, indoor seeding and “where does our food come from” into their classroom teaching. Given the success of this garden and in line with the above mentioned movements, George Jay Elementary School is seeking to create an outdoor classroom in its grounds to provide even more direct experiences with Nature’s processes and diversity.

To help address both, the biological and human aspects of our society’s land stewardship problems, our project aims to create a native plant garden as a complement to the outdoor classroom that the school is planning. We hope the school (you) will find it useful.
4.2 Policy

A well-designed native plant garden that has safe and interesting plants that engage the five senses can increase the ecological integrity of the site, and provide children with a space to interact with Nature, and educators with an in-site resource to teach about the local natural environment, and foster healthy stewardship.

However, there is much more to our project than just the finalized garden. The planning and decision making, the implementation, monitoring and evaluation stages of the garden are also very important, and require the involvement of all the people in your school community. Experience from restoration has shown us that including the community in projects from the very first stages, including the decision making process and planning, ensures the project actually meets the specific needs of the community, favours understanding of the natural system, fosters deeper engagement in the following stages, and generates a sense of ownership and belonging (Shandas & Messer, 2008). The implementation of the plan, in other words, the creation of the garden itself, is the first hands-on stage, and therefore provides a wonderful opportunity for experiencing Nature. Furthermore, volunteers that engage in labour intensive stages of restoration are known to feel a sense of accomplishment and more importantly, establish a connection to the restored site and a sense of place. In the words of Eric Higgs (2003) “[the] space is made meaningful to us through our experience of it...” (p. 148) and becomes a place, a place where we belong to. Therefore, it is imperative that the children be involved in the implementation process. For the same reason it also very important that the children be part of the monitoring and evaluation stage. In addition, seeing the garden change and develop will further increase their sense of accomplishment.

The policy of this project is therefore to **increase and maintain locally focussed ecological integrity while creating engaging educational opportunities for children in all steps of the project, with the aim of fostering a healthy relationship to Nature.**

4.3 Goals:

In line with the above stated policy, our project has four main goals and an additional goal for the future. Each goal has several objectives which are discussed further below.

1. Increase and maintain soil quality.
2. Create a plant garden that functions as an ecological community of native species.
3. Create a natural space that can be used as an engaging educational resource.
4. Create a space that connects children with nature and fosters stewardship.

Future Implied Goal: Encourage the “greening” of schools, particularly your school, with the hopes that more areas, such as the larger area in George Jay Elementary school may also be tuned into gardens.
4.4 Objectives:

Goal 1: Increase and maintain soil quality by,

a. Installing a rain barrel with capacity of at least 55 gallons before the garden is made.
b. Removing 100% of the gravel and bring organic, nutritious local soil in to cover a space of 88ft X 16ft, 1ft deep no earlier than two weeks before planting.
c. Protect the soil against compaction during the first 5 years of the project.
d. Maintaining one or more small areas free of plants for digging test holes to test the chemical, physical and biological characteristics of the soil.
e. Maintaining a healthy soil (as defined by the targets below) during the first 5 years of the project.
   i. The soil is slightly acidic, with a pH between 5.5 and 6.5, which is representative of BC’s soils and will facilitate nutrient availability from organic soils (Ministry of Agriculture, 2001).
   ii. The new soil has retained its initial scorings for nitrogen, phosphorus and potassium.
   iii. The soil is loamy, and does therefore contain approximately equal amounts of sand, silt and clay.
   iv. Several bugs (more than 3 species), including earthworms can be found in a sample of soil dug from a test hole.

Goal 2: Create a plant garden that functions as an ecological community of native species by,

f. Planting and maintain at least 10 species of native plants according to their requirements and companionship no longer than two weeks after the creation of the bed.
g. Planting and maintain at least 15 species of native plants according to their requirements and companionship within the first school term of the project.
h. Ensuring both female and male plants of each plant species are present every time a new species is planted, whenever the species is not hermaphrodite.
i. Installing a mason bee nest within the first three months of the project.
j. Having at least one species of plant that attracts butterflies and one that attracts birds.
k. Limit weeds and invasive plants to less than 10% of area covered.

Goal 3: Create a natural space that can be used as an engaging educational resource by

l. Having plants and objects that are a good representative of different natural features and stages and that engage all the senses, as follows:
   i. Plant and maintain at least one early spring sprouting plant within the first school term of the project.
   ii. Plant and maintain at least one plant known for its fall colours within first school term of the project.
   iii. Plant and maintain at least three species of ferns within the first school term of the project.
iv. Plant and maintain at least three species with edible fruits or berries within the first school term of the project.

v. Plant and maintain at least one tall bush, one short bush and one ground cover plant species within first school term of the project.

vi. Plant and maintain at least one evergreen and one deciduous plant species within the first school term of the project.

vii. Plant at least 3 species that were highly significant to the first nation people of Vancouver Island within the first school term of the project.

viii. Have at least 4 different types/shapes of leaves within the first school term of the project.

ix. Have at least 4 different types/shapes of flowers within the first school term of the project.

x. Include a rotting log in the garden within the first year.

xi. Include a pile of rocks and boulders within the first year.

m. Creating and installing signs that have at least the name and one use or characteristic for each of the plant species planted

n. Conducting a workshop or survey to include teachers and students in the decision making process or the garden, especially for choosing plants before the implementation of the project.

o. Having all children from the school participate in all phases of the restoration project, including the removal of the gravel, digging, planting and monitoring

p. Having children paint signs, bordering rocks, fences and any other materials needed.

q. Having teachers willingly and happily (not by mandate) use the plant garden for class activities and lessons to support the curriculum at least twice per term for each grade or class (this is independent of life cycles visits).

Goal 4: Create a space that connects children with nature and fosters stewardship. This will be noticed by:

r. Parents and teachers reporting through surveys that they have noticed some increase in curiosity for and knowledge of the local natural world, and its uses a year of the project.

s. Children spending time interacting in the garden by their own accord.

t. Children showing excitement about the development of the garden and take pride in their own contributions to it, such as the rocks and signs they painted, and the plants they planted.

u. Children, teachers, staff and parents following the reports and notices made on a board, through the school newsletter, and word of mouth.

For a detailed description on how to reach these goals and their objectives, and how to determine if they have been accomplished, please see sections 5, 6 and 7 of this document (the Plan, Implementation and Management, and Monitoring and Evaluation respectively).
References


Section 5: The Plan

The following describes the plan for the Native Species Garden Restoration Project at George Jay Elementary School. In general, here we lay out how the goals will be reached through the use of objectives. We include a list of who will be involved (5.1), what materials (5.2) and equipment (5.3) will be required, and how much it will cost (5.5).

5.1 Groups Involved:

Despite popular belief, restoration does not include only an ecosystem, but rather the people and community members of the surrounding area as well. In efforts to reach project goals, and to further the integrity and success of the restoration process, it is necessary to collaborate with numerous groups throughout all stages of restoration. This means including not only organizations that can directly help through funding or donations, but also community members who are simply interested in the project, who may need your help to reconnect with Nature. It is essential to involve all stakeholders in the planning, implementation, monitoring, and celebration of restoration in efforts to ensure mutually beneficial results, and better the surrounding community. People everywhere have knowledge to share, ideas and passions to pass on; every additional person is an asset to the Native Species Garden.

In addition, local businesses are often happy to get involved in local projects, and are likely a good resource for plants, donated materials, and equipment. Organizations such as nurseries are also great resources for further information and knowledge.

5.1.1 Groups and Organizations: The following is a list of groups and people that we recommend you to include in this project. When appropriate, a short description of the organization is provided. For contact information of each group, please refer to Appendix ______

George Jay Elementary School

- Principal: Leslie Lee
- Students, Kindergarten – Grade 5
- Parent Advisory Council (PAC)
- Faculties Management
- Teachers and Staff Members
- Parents of Students

Victoria School Board District #61

Lifecycles:

LifeCycles is a non-profit organization dedicated to cultivating awareness and initiating action on food, health, and urban sustainability in Greater Victoria. Our
programs bring together community members from diverse backgrounds to create and promote personal, shared and community gardens, deliver intergenerational educational programs and redistribute backyard fruit to vulnerable populations. Through these projects we build community skills development, leadership and empowerment. (Life Cycles Project, n.d, Home, para. 1)

Evergreen

Evergreen’s work focuses on empowering Canadians to make a difference in their own communities. Ready access to the best resources is a big part of that mandate. That’s why we offer a wide range of helpful and informative materials at little or no cost. We cover everything from getting people together in your community or school to planning and design, planting a garden, to managing your volunteers. (Evergreen, n.d. Resources: Overview, para. 1-2)

Habitat Acquisition Trust (HAT)

HAT helps people understand and care for natural environments in the Capital region. We are a non-profit, local land trust. Hat works to protect ecosystems and habitats permanently. We do this in three ways: land acquisition through purchase or donation; conservation covenants; and, education and stewardship. HAT works in partnership with governments and other non-profit organizations to achieve our goals. We also work with communities, schools, and individual landowners to enhance habitat protection on private land - making everyone part of the solution! (HAT, n.d. About HAT, para. 1-3)

Sierra Club BC

Sierra Club BC is a non-profit environmental organization whose mission is to protect and conserve British Columbia’s wilderness, species and ecosystems, within the urgent context of global warming impacts. We advocate the responsible use of B.C.’s natural resources while promoting a modern, equitable economy that sustains our planet in every way. One of our greatest strengths, rooted in our more than 40 year history, is our ability to engage and mobilize people in constructive action to protect ecosystems and wild spaces. At the heart of our organization are more than 16,000 supporters from diverse communities across the province. (Sierra Club BC, n.c. About Us, para. 1-2)

The University of Victoria

- Department of Environmental Studies
- Ecological Restoration (ES 341) Students

5.1.2: Plant Nurseries: The following is a list of nurseries you should contact when obtaining plants. Some might be happy to offer their expertise and services and even donate some plants. For contact information, please see Appendix A.1

Marigold’s Nurseries
GardenWorks
Lochside Nursery
Swan Lake Christmas Hill Nature Sanctuary
Russell Nursery  
Nature’s Garden Seed Co.  
Down to Earth Gardens & Nursery  
Elk Lake Garden Centre  
Art Knapp Plantland Victoria Garden Centre  
Le Coteau Farms Nursery & Garden Centre  
Metchosin Farm  
Fiona Hamersley Chambers

5.1.3 Retailers: The retailer shops below are a good potential source for equipment and tools. For contact information, please see Appendix A.2

Canadian Tire  
Home Depot  
Lee Valley Tools  
Rona Home & Garden

5.1.4: Soil Removal & Delivery. Below we provide a two of companies that can be contacted for the removal of and delivery of soil. However, recommend other options be explored. For contact information, please refer to Appendix A.3

Michell Excavating Ltd  
J.S. Bobcat & Excavating

5.2: Materials

In order to keep costs as low as possible, and to foster parent and community involvement, which is essential to the successful restoration of this area, we recommend getting as many of the materials needed donated. This may mean getting plants donated directly from a local nursery, propagating clippings from children’s gardens, or sustainably and respectfully taking them from the wild. The same can be applied to other materials, such as wood to build bat boxes, or decomposing logs. This can be accomplished by speaking directly with students, parents, community members, and staff, putting an announcement in the school newsletter and website, going to local nurseries, and posting on garden’s bulletin board once it has been established. Local non-profit environmental organizations such as Lifecycles and HAT are also strong resources. Refer to chapter 10 of Restoring British Columbia’s Garry Oak Ecosystems published by the Gary Oak Ecological Restoration Team for detailed instructions on species propagation, and how to plant them. The materials that cannot be borrowed or donated can be purchased from your local garden nursery or retailer (refer sections 5.1.2, 5.1.3 and Appendix A).
5.2.1. Plants: The following plants have been chosen for their biological and cultural characteristics. This particular combination of plants will satisfy all the objectives in section 4.4. For a list these characteristics and detailed information on each plant, please refer to Appendix A.4

- Salmonberry (*Rubus spectabilis*)
- Red Huckleberry (*Vaccinium paryifolium*)
- Salal (*Gaultheria shallon*)
- Oceanspray (*Holindiscus discolor*)
- Tall Oregon Grape (*Mahonia aquifolium*)
- Wooly Sunflower (*Eriophyllum lanatum*)
- Red Columbine (*Aquilegia Formosa*)
- Pacific Bleeding Heart (*Dicentra Formosa*)
- Indian-Plum (*Oemleria cerasiformis*)
- Coastal Strawberry (*Fragaria chiloensis*)
- Licorice Fern (*Polypodium glycyrrhiza*)
- Deer Fern (*Blechnum spicant*)
- Maidenhair Fern (*Adiantum pedatum*)
- Sword Fern (*Polystichum munitum*)
- Red-Flowering Currant (*Ribes sanguineum*)

Please note that these plants were chosen from a long list of native plants available in British Columbia. They were chosen in particular for their uses, educational opportunities, colours and shapes, varieties, and match for the landscape. However, there are many other plants that would be desirable for planting the Native Species Garden. If you would like to include other, or more plants, talk to a local nursery (refer to section 5.1.2), or look to one of the many useful online resources, such as the Native Plant Table provided by HAT (2009) or the Garry Oak Ecosystems Recovery Team’s online restoration handbook (2011) (see section 5.6 for complete reference).

5.2.2: Water Barrel. The following materials will be necessary to build a rain barrel.

- Barrel
- Mesh Screen
- ½” Plastic Faucet
- Teflon Tape
- Steel Washer
- O-Ring
- Plastic Elbow
- Cable Tie
- Plastic Drain Cover
- Plug
- Paddle Bits
5.2.3: Mason Bee Hive: The following materials will be necessary to build a mason bee hive.

- Drill with a bit of 5/16th of an inch
- Scrap lumber (Do not use treated wood)
- Plywood
- Nails
- Chicken wire (optional)
- A side of a building, fence post or trees to place the bee house

5.2.4: Bat Box: The following materials will be necessary to build a bat box:

- Plank of rough-sawn untreated wood 120cm x 20cm x 2 cm
- 19cm x 4cm long nails and hammer
- 1 x metal eyelet with a 1cm diameter
- Pencil
- Wood saw
- Ruler

* This was obtained from the article How to make a bat box (n.d.)

Note: Please refer to section 5.4 for the budgets for plants, water barrel, mason bee hive, and bat box.

5.2.6. Additional Materials: The following items will also be needed for the completion of the objectives described in section 4.4.

Decomposing Log(s)

A decomposing log is primarily needed to plant licorice ferns in, however decomposing logs make for great miniature ecosystems and learning opportunities. Depending on size and availability, having a few extra log pieces will be an excellent addition to the native garden. The log can be found on the beach. Please be sure to contact your local city representatives for permission. Areas such as Gonzales Beach have driftwood cleanups at the end of April (City of Victoria, 2012). Alternatively, a parent or staff member may have one available on their property. If not, Craigslist is often a good resource for finding materials such as these.

Cedar Rounds
These can be either collected off the beach (as with the decomposing log), or likely, a parent or staff member has some (or a fallen tree that could be converted into cedar rounds) on their property. If not, Craigslist is often a good source for finding materials such as these.

Soil

To fill a space the size of the garden, it will be necessary to have soil delivered (and the current soil taken away) to the site. Two separate companies can do this, however it is most economical to work out a deal with one, to both remove and deliver the soil.

In this project’s case, it is recommended an announcement is put out to parents, staff, and friends of George Jay Elementary School, to see if any connections to excavating companies can be found to obtain a better deal.

Multiply the length by the width of the plot (in feet), and divide by 27, to get the amount of topsoil needed. This will give you the yardage at a foot deep. Thirty percent should be added to this total in order to account for compaction (Michell Excavating Ltd., n.d.). For this garden, at a size of 88 by 16 feet, 67.79 yards will be needed in total.

Removal of the soil can be worked out with the company that brings new soil, however in efforts to save money, as well as help out your community, an attempt can be made at offering the removed soil to people. Although the current gravelly soil is not good for growing plants, it can still be used in other ways, such as for filling potholes or other areas that need fill. Rural settings often are grateful for this kind of material, so putting an announcement out in the school newsletter and website, and perhaps even in the local newspaper is recommended. Craigslist may also be a good way to reach those looking for fill. Otherwise removed soils are generally dumped in a landfill, or area of forest, which undesirable and should be avoided. Finding community members who want the old soil is a win-win solution for everyone.

To have soil removed and delivered, a company will charge for the time it takes to drive to and from the site, time spent at the site, as well as the soil itself. An approximate quote for this is about $2000. This cost can be brought down through the previously mentioned efforts.

It is important to note that there is currently a fully grown Douglas-fir tree situated in the middle to left (refer to figure 1 for a site map) of the site. Special care will need to be taken in digging/excavation of this area in efforts to protect this healthy and long-lived tree.

This will be the most costly factor of building the native garden, however it is utterly important to the project; quality soil is the foundation of your garden, and will translate to long-living, healthy plants. Low quality soil will have the nutrients quickly washed out, weeds will take over, and/or your plants will suffer in the long-term.

For potential soil removal and delivery companies, see page section 5.1.4.
Bulletin Board

This can likely be found already located in the school.

5.3 Equipment:

As mentioned earlier, we also recommend collecting as much of your equipment and tools as possible from within your community; ask to borrow (or have donated) from staff and faculty, students, parents, nurseries, non-profit environmental organizations, and local community members. In addition, it is likely that facilities management already has much of the necessary equipment. As previously stated, this works to keep our costs as low as possible, and to create the parent and community involvement that is essential to successful restoration of this area. Borrowed tools often come with working hands, and each hand that works the soil is one step closer to achieving a community strongly connected with its land and environment. The more people are involved in the native garden, the more sharing of ideas and knowledge can transfer, and friendships across generations and species can flourish.

The tools and equipment that cannot be borrowed or donated can be purchased from your local garden nursery or retailer (refer to Appendix ______).

General Equipment and Tools:

- Round-Mouth Shovel (We recommend purchasing at least one round-mouth shovel for the school, in the case of future additions to the garden.)
- Garden Rake
- Spading Fork
- Hoe
- Pruners (We recommend purchasing these (or having donated), so the school can use them year-round.)
- Wheelbarrow
- Gloves, adult and children (We recommend purchasing these (or having donated), so the school can use them year-round.

Note: Wearing gloves while gardening teaches children (and adults) that getting your hands dirty is bad, unhealthy, and – yucky! In fact, it is just the opposite, and this kind of thinking is what separates us from the land and environment, and discourages connection. Therefore, while we do recognize the need for gloves in some situations (for instance when it is cold outside in the winter), we do not want them to become a necessity to working in the garden.

- Watering Hose (We recommend purchasing this (or having it donated), so the school has year-round use.)
- Hammer
- Screw Driver

Note: See section 5.4 for Equipment and Tools Budget.
5.4 Budget

Although an approximate budget has been included, the budget for this project can vary greatly depending on donations and community involvement. As mentioned in both the materials, and equipment and tools sections (5.2 and 5.3), we hope that most will be donated, brought from student, staff, and community member’s yards, collected, or borrowed. A great deal of equipment will already be on hand with facilities management.

It is also recommended that students fundraise in the fall to help with the remaining costs of the Native Species Garden to be implemented in the spring. Furthermore, grants, donations, and help with resources are often supplied through non-profit organizations such as LifeCycles, Evergreen, and HAT (see Groups Involved section 5.1)

It may also be an idea for students to sell products made from the garden once it has been established. Jams, jellies, pies, flowers, baskets, art, – the possibilities are endless! This could help to finance the maintenance of the garden.

The budget has been split into sections, including the basic garden costs, which are essential to establishing the Native Species Garden, and then the water barrel, mason bee box, and bat box, projects within the restoration plan. Afterwards, a complete overview budget of all the projects together is presented, to depict total cost of the restoration.

Lastly, it is important to note that in drawing up the budget, all plants, and most materials and equipment were included in the cost, with the exception of some that were guaranteed to be available to the school. This means that the overall cost will likely be lower than here projected; however, going into any project it is always better to over-estimate costs.

Sections 5.4.1 through 5.4.6 are in the following pages
## 5.4.1 Table: Basic Costs

### Basic Costs for Building George Jay Elementary School's Native Species Garden

<table>
<thead>
<tr>
<th>Plants:</th>
<th>Price:</th>
<th>Quantity:</th>
<th>Additional Materials:</th>
<th>Price:</th>
<th>Quantity:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonberry (2 gal)</td>
<td>16.50</td>
<td>1</td>
<td>* Collected from community (see section 5.2 )</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td><em>Rubus spectabilis</em></td>
<td></td>
<td></td>
<td>Dekomposing Log*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Huckleberry (2 gal)</td>
<td>16.50</td>
<td>1</td>
<td>Cedar Rounds*</td>
<td>N/A</td>
<td>3 to 5</td>
</tr>
<tr>
<td><em>Vaccinium parvifolium</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salal (1 gal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Gaultheria shallon</em></td>
<td>9.98</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oceanspray (2 gal)</td>
<td>16.50</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Hodiscus discolor</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tall Oregon Grape (2 gal)</td>
<td>16.50</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Mahonia aquifolium</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wooly Sunflower (1 gal)</td>
<td>9.98</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Eriophyllum lanatum</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Columbine (1 gal)</td>
<td>9.98</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Aquilegia formosa</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Bleeding Heart (1 gal)</td>
<td>14.50</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Dickentra formosa</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indian-Plum (2 gal)</td>
<td>16.50</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Oemleria cerasiformis</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coastal Strawberry (flat)</td>
<td>2.49</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td><em>Fragaria chiloensis</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Licorice Fern (1gal)</td>
<td>9.98</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Polypodium glycyrrhiza</em></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Deer Fern (1 gal)</td>
<td>9.98</td>
<td>8</td>
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<td></td>
<td></td>
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<tr>
<td><em>Blechnum spicant</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maidenhair Fern (1 gal)</td>
<td>9.98</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Adiantum pedatum</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sword Fern (1 gal)</td>
<td>9.98</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Polystichum munitum</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Flowering Currant (1 gal)</td>
<td>9.98</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ribes sanguineum</em></td>
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<tr>
<td><strong>Approximate Plants Total:</strong></td>
<td>466.87</td>
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<tr>
<td><strong>Approximate Services Total:</strong></td>
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</tr>
<tr>
<td><strong>Tools &amp; Equipment:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round-Mouth Shovel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jobmate Roundpoint Shovel</td>
<td>12.99</td>
<td>2</td>
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<td></td>
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<tr>
<td>Garden Rake</td>
<td></td>
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<tr>
<td>Home Basics Leaf Rake</td>
<td>14.99</td>
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<tr>
<td>Spading Fork</td>
<td></td>
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<tr>
<td>Botanica 4 Tine Spading Fork</td>
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<tr>
<td>Hoe</td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>Home Basics Garden Hoe</td>
<td>18.99</td>
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<td>Basic By-Pass Pruners</td>
<td>5.99</td>
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<tr>
<td>Wheelbarrow</td>
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</tr>
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<td>Jobmate Steel Tray Wheelbarrow</td>
<td>49.99</td>
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<tr>
<td>Gloves</td>
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<tr>
<td>Rugged Work Gloves</td>
<td>3.99</td>
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<tr>
<td>Kid's Gardening Gloves</td>
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<tr>
<td>Watering Hose</td>
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<tr>
<td>Jobmate Light-Duty Hose, 50ft</td>
<td>13.99</td>
<td>1</td>
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</tr>
<tr>
<td>Hammer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel 8-oz Claw Hammer</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Screw Driver</td>
<td></td>
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<tr>
<td><strong>Approximate General Total:</strong></td>
<td>207.81</td>
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</tr>
<tr>
<td><strong>Total Basic Costs:</strong></td>
<td>2,674.68</td>
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</tr>
</tbody>
</table>
### 5.4.2 Table: Rain Barrel Project Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Description</th>
<th>Price</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrel</td>
<td>Plastic 55 gallon food grade drum</td>
<td>20.00</td>
<td>1</td>
</tr>
<tr>
<td>Mesh Screen</td>
<td>Insect screening (roll)</td>
<td>5.99</td>
<td>1</td>
</tr>
<tr>
<td>½” Plastic Faucet</td>
<td>Acetal sink faucet (PVC)</td>
<td>3.49</td>
<td>1</td>
</tr>
<tr>
<td>Teflon Tape</td>
<td>PTFE thread seal tape w/ Teflon</td>
<td>0.79</td>
<td>1</td>
</tr>
<tr>
<td>Steel Washer</td>
<td>½” Flat Steel Washer</td>
<td>0.29</td>
<td>1</td>
</tr>
<tr>
<td>O-Ring</td>
<td>#12 O-rings</td>
<td>1.97</td>
<td>1</td>
</tr>
<tr>
<td>Plastic Elbow</td>
<td>PVC schedule 50-90° elbow</td>
<td>0.23</td>
<td>1</td>
</tr>
<tr>
<td>Cable Tie</td>
<td>24” Zip Tie 10/bag (HVAC)</td>
<td>4.96</td>
<td>1</td>
</tr>
<tr>
<td>Plastic Drain Cover</td>
<td>6” round grate</td>
<td>3.99</td>
<td>1</td>
</tr>
<tr>
<td>Plug</td>
<td>#1 or #2 rubber stopper</td>
<td>0.50</td>
<td>1</td>
</tr>
<tr>
<td>Tools</td>
<td>Paddle Bits</td>
<td>9.99</td>
<td>1</td>
</tr>
<tr>
<td>Downspout Flex Elbow</td>
<td>Plastic extension for downspout</td>
<td>2.00 – 8.00</td>
<td>Optional</td>
</tr>
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**Total:** 52.20
### 5.4.3 Table: Mason Bee Hive Project Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Description</th>
<th>Price</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drill</td>
<td>Drill w/ 5/16&lt;sup&gt;th&lt;/sup&gt; in. bit</td>
<td>Borrow</td>
<td>1</td>
</tr>
<tr>
<td>Scrap Lumber</td>
<td>Do not use treated wood; 4x4 in. with a volume deep enough for 31/2” holes</td>
<td>8.00</td>
<td>1</td>
</tr>
<tr>
<td>Plywood</td>
<td>Large enough to cover the box (this is your roof)</td>
<td>3.00</td>
<td>1</td>
</tr>
<tr>
<td>Nails</td>
<td>Any average size nail will work</td>
<td>4.00 / pound (shared with other projects)</td>
<td>½ dozen</td>
</tr>
<tr>
<td>Chicken Wire</td>
<td>Optional</td>
<td>$25.00 / roll; best to have a small piece donated</td>
<td>1</td>
</tr>
<tr>
<td>Tree to place the bee box</td>
<td>Fence post or building side will work as well</td>
<td>N/A</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total Cost of Mason Bee Hive Project:** 15.00
5.4.4 Bat Box Project Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Description</th>
<th>Price</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Plank</td>
<td>Rough-sawn, untreated plank; 120 cm x 20 cm x 2 cm</td>
<td>8.00</td>
<td>1</td>
</tr>
<tr>
<td>Nails</td>
<td>4 cm long</td>
<td>N/A</td>
<td>19</td>
</tr>
<tr>
<td>Metal Eyelet</td>
<td>1 cm diameter</td>
<td>0.50</td>
<td>1</td>
</tr>
<tr>
<td>Pencil</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Wood Saw</td>
<td>Any wood saw</td>
<td>N/A</td>
<td>1</td>
</tr>
<tr>
<td>Ruler</td>
<td>N/A</td>
<td>N/A</td>
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**Total Cost of Bat Box Project:** 8.50

5.4.5 Table: Final Costs of Restoration

<table>
<thead>
<tr>
<th>Budget Category</th>
<th>Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Basic Costs</td>
<td>2,674.68</td>
</tr>
<tr>
<td>Total Cost of Rain Barrel Project</td>
<td>52.20</td>
</tr>
<tr>
<td>Total Cost of Mason Bee Hive Project</td>
<td>15.00</td>
</tr>
<tr>
<td>Total Cost of Bat Box Project</td>
<td>8.50</td>
</tr>
</tbody>
</table>

**Total Cost of Restoration:** 2,750.38
5.5 References


Section 6: Implementation and Management

6.1. Who will be involved?

The main goal of the Native Species Garden project is to not only to restore a valuable ecosystem on George Jay Elementary School grounds, but to also encourage students and teachers to engage with nature throughout the entire process. The idea is to give children the opportunity to learn through discovery in this 'hands-on' project. There are many ways in which teachers will be able use their classes to help implement the native garden. In science classes, children could help dig up and plant, in art classes the children could paint small signs about the different species that will be staked into the ground throughout the garden. Our goal for the children is giving them a sense of connection with garden, with a sense of accomplishment and self-confidence. It is important that the young students connect with nature and build a vital relationship with it in order to take care of the Native Species Garden.

Aside from the students and teachers of George Bay Elementary, we recognize that other help from the school and local community is necessary. This is a great opportunity for community groups to partner with the School District #61 that specializes in implementing gardens and community projects. Below are various references that have already been stated above. Please see section 5.1. : Groups Involved, for contact information.

Life Cycles is a non-profit, community development organization that initiates education of local food and urban sustainability through hands-on gardening in school grounds (Life Cycles Project, n.d.). While a native garden is different than a vegetable garden, Life Cycles would be an excellent group to also get involved, as they would have plenty of information on local resources available.

Habitat Acquisition Trust (HAT) can also aid in the process of implementing the George Bay Elementary Native Garden. HAT is non-profit, local land trust that partners with governments and other non-profit organization to work with communities, including schools to enhance habitat protection on private land (HAT, 2009). Frank Hobbs Elementary connected with the HAT Green Spots Program to help implement their native garden. They also offer workshops and training for teachers so they can use the garden as part of their classroom. It’s very important that teachers are taught how to care for a garden so they can also teach their students correctly.

Fiona Chamber, an Environmental Studies professor of Ethnobotany at University of Victoria an owner of Metchosin Farms has expressed interest in teaching workshops with the teachers and student of George Jay Elementary.

6.2. How will the garden be implemented?

Our project must work from the ground up, starting with the soil. Currently, the ground where the native garden is to be grown is unable to support the nutrients and stability that plants need. Therefore, local, rich soil will have to be brought in. However, before any excavation takes place, the soil must be tested to find out how much acidity and nutrients are in the soil, which will determine the amount of soil must be brought in. Please refer to the Monitoring section to learn how to carry out a soil test. The soil could be improved in quality by adding nutrients and raw materials. Items such as dry seaweed, barley pellets, steer manure, bone
meal, and eggshells can greatly boost the soil's quality to support plants (Jan's phone call). The collection of many of these can be made to involve students, such as by going on a field trip to the beach to collect (and learn about) seaweeds, or having students bring in old eggshells. It is important to note that seaweeds must be dried before adding it to the garden, so as to not put too much salt in the soil. While native plants do grow freely in our ecosystem, they are very selective where they grow so the ideal habitat must be made for them to flourish.

Once soil is in place, plants need to be implemented immediately, so as to protect the soil from being blown away in the wind, or having the nutrients washed away in the rain. Plants will be donated from local communities, home gardens, and bought from local nurseries. A great way that local communities and students can be involved is through the donation of plants. Since a native garden is made up of plants that are local to Victoria, there is a very good chance that Salal or Ocean Spray could be growing in the backyards of some student’s homes. Plants and cuttings must be taken only from private land such as homeowner’s yards as it is illegal to take from public parks and beaches (GOERT, 2011).

Depending on the season, seeds or sprouted plants will be planted into the garden. In the fall, seeds are naturally dispersed and remain dormant over the wet winter. In the spring, these seeds have developed stable roots that will allow the plant to continue to flourish and grow, even through the hot summer. Alternatively, the garden can be planted in the spring; however, there are two very important conditions that must be followed through for spring planting. First, the plants must already have sprouted within a pot. The seeds cannot develop fast enough to secure their roots in time for the dry summer weather. Second, if the garden is planted in the spring, it must be watered throughout the first summer or else the plants will likely die from the weather because have not matured enough. The best option would be to use the fall to prepare the garden and the spring to plant. The full time frame of this method is instructed below.

6.3. Time Frame

As this restoration project involves an elementary school, the time frame is organized around the school year, beginning in September. The fall and winter months are an important time to begin to organize support and interest for the native garden that will be planted the following spring. From the beginning of the restoration, the students of George Jay are involved with the design of their native garden. In September, students will help choose what kind of plants they would like in their garden by a sign or board the hallway of pictures and names of potential plants. A sign within the school, dedicated to the garden can provide information and a way that students can see how their garden is progressing through updates.

By February of 2014, all plants, supplies and groups that will be involved must be in order for work to begin in March. First, gravel will have to be removed and filled with new soil brought in. This is also the time where extra nutrients such as dried seaweed or eggshells could be added. After the soil is in place, in March, planting must begin immediately as the soil cannot be left barren, which will decrease the quality. Please see the “Create A Plan” section on how and when to plant.
### 6.3.1. Short-term Time Frame

| Fall, 2013 | - Connect with community organizations for information and funding  
|           | - Test soil quality  
|           | - Choose the types of plants that will be planted in the spring  
|           | - Roughly design the garden  
|           | - Develop and work up a budget  |

| February, 2014 | - Gather all supplies and materials for building the garden  
|                | - Remove gravel and fill with new soil  
|                | - Have all plants chosen and determined where to plant them  
|                | - Install rain barrel(s)  |

| March 2014 | - Plant all native plants within the garden  
|           | - Establish pathways throughout the garden  
|           | - Install bat box and mason bee hive  
|           | - Water the garden thoroughly and often  |

Note: The long-term time frame is continued under the management section for logical reasons.

By implementing a native garden, the goal is to not only create a garden, but an ecological community. For example, through selecting plants that are welcoming for butterflies such as the red huckleberry, Coastal strawberry, and Indian plum, these encourage butterflies into the garden, promoting sustainable biodiversity. Two other projects that should also be included within the garden are building mason bee hives and bat boxes. Mason bees are excellent pollinators, and important for the garden to develop and grow. Bats should also be encouraged into the garden because they are efficient pollinators and manage pests such as mosquitoes (www.bats.org.uk). Furthermore, they would provide another opportunity for environmental education.

### 6.4. How to Build

Finally, an easy and effective way to water the garden is implementing a rain barrel to catch the rain runoff from the roof of the school. Below are ways to build a bat box, a mason bee hive and a rain barrel. All the materials can be found in the 5.2.2. - 5.2.4. sections.

#### 6.4.1 How to build a rain barrel – for material list, please refer to section 5.2.2.

The rain barrel needs to be made/implemented during the fall, but especially before planting because the garden will need lots of water when first planted and throughout the summer.

Step 1 Cut an opening in the top of the barrel the size of the drain cover.
Step 2 Drill one hole at the bottom to drain the barrel. Put the plug in the bottom hole.

Step 3 Drill a hole for the faucet, approximately 6 inches from the bottom.

Step 4 Attach assembled faucet. Place the large steel washer over the faucet threads. Slide an o-ring over the faucet threads. Wrap the faucet threads with Teflon tape. Place the faucet into the hole in the barrel and screw a plastic elbow onto the assembly from the inside of the barrel.

Step 5 Cut a piece of mesh screen slightly larger than the drain cover. Secure the mesh screen to the drain cover with the zip tie. Insert the drain cover into the opening on top of the barrel.

Step 6 Cut the downspout to just above the rain barrel. Attach the downspout flex elbow to the downspout.

Step 7 Slide the rain barrel under the spout lining up the mesh screen opening with the spout. Spray water on the roof and check to make sure the rain barrel and mesh opening are in the right location.

Step 8 Optional: paint your rain barrel using Krylon Fusion paint.

Step 9 Use water collected with rain barrel for gardening purposes.

6.4.1 Figure 1: A rain barrel. Source: http://www.esf.edu/ere/endreny/GIcalculator/RainBarrelIntro.html

6.4.2. How to build a mason beehive - for material list, please refer to section 5.2.3.

Step 1 Find a medium sized block of lumber that is not made of treated wood.
Step 2 Use a drill with a preferably 5/16th of an inch drill bit to make a hole about 3 to 5 inches deep but not all the way through the wood block.

Step 3 Cover the holes with chicken wire to help keep birds away from the bee house.

Step 4 Attach a small slanted roof of plywood onto top of the house to keep moisture out.

Step 5 Securely place the bee house on the south side of buildings or tree.

Helpful Considerations:
- Drill on a very slight angle upwards to moisture will not build up in the holes.
- Hang at least four feet or higher to prevent raccoon or rodents getting to the bees.
- Create 30 or 40 holes because mason bees like to nest together, but not too many or else they can’t keep track of their hole.

6.4.2 Figure 1: A Mason Bee House. How To Raise and Manage Orchard Mason Bees for the Home Garden.

6.4.3. How to build a bat box - For material list, please refer to section 5.24

Step 1 Using a pencil, divide and cut the plank into the following sized pieces: 40cm x 15cm (back), 23cm x 20cm (roof) and 23cm x 15cm (front). Finally cut a piece 20cm x 34cm and cut it diagonally to create two triangles for the sides of the bat box.

Step 2 Place the backboard on a flat surface and cut ridges into it, 2mm deep every 0.5cm, to make a 'ladder' for the bats to climb up.

Step 3 Take one of the side triangles and measure 12.5cm from the acute angle along the longest length. Draw a horizontal line across the triangle at this point and cut off the smallest part. Repeat with the other side.
Step 4 Nail the two side panels to the front panel of the bat box. Sit the roof on top and push up the backboard to check for a tight fit. Nail on the backboard. Nail on the roof and an eyelet for hanging and hang above ground on a tree, post or house wall.

6.4.3 Figure 1: A bat box. How to Make A Bat Box. Source: http://www.gardenersworld.com/how-to/projects/wildlife-gardening/how-to-make-a-bat-box/25.html

6.5. Management

After planting is finished, management is required for future care and stability of plants. Our goal is for the students to be constantly engaged with the garden, even after the initial implementation is finished. Within the Native Species Garden, management is any positive impact or action is carried out onto the garden. This can be from watering and pruning to painting rocks, eating berries, and creating signs about various plants.

From April until June, weekly lunch hour groups of students could sign up to week, water and care for the garden. As George Jay Elementary already has student clubs that are run during lunch break, a Nature Club, dedicated to the Native Species Garden would be an excellent way that student could actively become involved during school hours. Jobs that will need to be managed include managing soil levels and quality, watering, weeding and pruning the plants in the garden.

There is no way to fail at managing the Native Species Garden – the whole project is a learning opportunity. A crucial goal of the project is to engage the students in a ‘hands-on’ experience, including the possible consequences of dealing with the life of plants. Even if a plant dies over the summer or herds of deer come through the garden, every situation is a very important learning experience for the young students.
### 6.5.1. Long-term Time Frame

<table>
<thead>
<tr>
<th>Time Frame</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| April – June 2014   | - Constant watering from the rain barrel  
|                     | - Set up summer care schedule  
|                     | - Engaged students will the garden through classes  
|                     | - Create signs for long the pathway                                               |
| Summer, 2014        | - Watering  
|                     | - Pruning bushes for developed growth  
|                     | - Observing any potential harm such as from deer or invasive plants               |
| Fall 2014           | - Continue to develop more programs and clubs dedicated to garden  
|                     | - Clean and maintain the rain barrel, mason been hive and bat box.               |
| 2015 and Future     | - Hold annual meetings where school around South Vancouver Island can come together and discuss how they implemented native gardens on their campuses  
|                     | - Constant engagement and involvement of students with the garden                |
|                     | - Host a garden party to celebrate!                                              |

Finally, to manage the garden also means to celebrate its success and life. Creating a garden requires a lot of energy, people and time and this effort should be recognized. A great opportunity could be a garden party where students, teachers, local organizations like Life Cycles or community members could come together. Here, students could showcase their paintings, poems, or experiments that they made in relation to the garden. It is vital the students are able to recognize their accomplishments and share their experience of the garden with others through the celebration of life and nature.

Below is the site design.
6.6 Design

This diagram illustrates the design we suggest for the site and the plants discussed in previous sections. The locations for each element were selected based on plant characteristics and aesthetics. However, you may choose to organize your garden differently.

6.6.1 Figure 1: Suggested Design of the Native Species Garden.

6.7 References


Section 7: Monitoring and Evaluation

7.1 Introduction

As defined by the Garry Oak Ecosystem Restoration Team (2011), monitoring is, “the act of making repeated measurements of a meaningful indicator” (page number goes here). Often left out in restoration projects, a strong monitoring plan is integral to successful restoration. Further, there is a commonly held misconception that monitoring occurs only at the end of a project; this idea is very mistaken, and monitoring should occur from the very start of your project. Monitoring ranges in forms from qualitative to quantitative, and specific to broad. Many often refer to western practices of numerical measuring and recording when thinking of monitoring, and while this is indeed an important component of it, more abstract forms of monitoring can be equally useful (Turner, 2000) (http://biophilosophy.ca/Teaching/4160materials/Turner.pdf). Indigenous peoples of the past, for instance, often did not actively carry out the western ideal of monitoring, yet still fully participated in long-term observances of plants. Simply visiting a plant or site each day is a form of monitoring. Noticing changes in colours of leaves, increases in the number of leaves eaten by insects, observing more butterflies in an area - these are all informative monitoring methods. Very often it was the act of being in a location repeatedly, that constituted monitoring: indigenous peoples would visit their local berry patch and as doing so, take notice that there were more berries one summer, or fewer bees another. From these observations, management would naturally occur as they helped to maintain their food source. Any change in an ecosystem will affect, and is affected by other parts of that ecosystem. Therefore, any observation made, whether strictly scientific or not, is beneficial to a restoration project.

The National Oceans and Atmospheric Administration () lays out four main types of project monitoring. These are:

1. Pre-implementation monitoring—Provides baseline information to compare with post-implementation data to determine whether the restoration is having the desired effect.
2. Implementation monitoring—Ensures the project is being implemented as planned and identifies needed modifications.
3. Effectiveness monitoring—Enables restoration practitioners to evaluate whether a specific project has met its objectives.
4. Validation monitoring—Allows restoration practitioners to determine whether long-term restoration goals are being achieved.
(http://www.habitat.noaa.gov/restoration/techniques/)

This project will include four parts that includes evaluation at each step with monitoring, instead of having evaluation as a separate section on its own as above in “3. Effectiveness monitoring.” Parts will be labelled as: Pre-implementation Monitoring and Evaluation, Implementation Monitoring and Evaluation and Post-Implementation Monitoring and Evaluation and Overall Success of Project Monitoring and Evaluation. This methodology ensures that reflection occurs as much as possible at each of the four parts mentioned above. This involvement at every stage of a restoration plan allows for adaptive management. It is only with monitoring and making observations of an area that any further decisions can effectively be made. As our world rapidly changes, ecosystems are continually shifting and emerging (Higgs, 2003), creating previously unknown environments. It is often a mistake of restorationists to believe that they fully understand an ecosystem or site; however, the truth is that no one does. It is therefore important...
to realize that every effort on a site is experimental and adaptive, and changes as positive or negative observations are made through monitoring. This is why monitoring is so essential. It gives important information on when our experiments are not benefiting the ecosystem, when we need to step back, and when we can lend a hand (GOERT SITE). It also tells when restoration efforts are being successful! Monitoring and evaluation should hold the hand of every other step in a project, always watching over and deciding where to move forward from there. It can be accomplished by anyone, at any age, at any time, in any form, and yet, when shared and explored, can lead to immeasurably stronger restoration projects.

Evaluation follows closely behind monitoring at every stage, as observations are contemplated and the question, “what does this mean?” is asked. As mentioned above, every change is the result of another factor, and therefore they must be evaluated as to what the cause has been, and what the following effects will be. Evaluation is therefore the analysis of monitoring, and the decision making that occurs in adaptive management. Furthermore, the Garry Oak Ecosystem Restoration Team notes that monitoring and evaluation is, “a critical step in the adaptive management process because it ensures that reliable information is gathered to address the knowledge gaps and uncertainties identified at the outset” (GOERT, 2011, p. 1.7). Equally essential, evaluation answers, “why?” and, “what now?”.

7.2 Rationale behind Monitoring and Evaluation Program and Methods

When discussing a monitoring and evaluation outing with students, it is important to exchange different ideas that explain for the changes in garden, or what different occurrences mean. Students can offer suggestions for what should happen next in management, according to these results. It is important to once again, acknowledge that students and teachers may not have an answer for one of their questions, or an exact understanding of why something has occured. This is an integral part of adaptive management, and learning occurs simultaneously with implementation. In adaptive management, there are no mistakes, only creative opportunities. Where knowledge has been gained, there is no such thing as a mistakes.

Furthermore, when evaluating your monitoring, two results can occur. First, your results are all positive, and the garden is completely flourishing! High five each other and move on! Wrong! While high fives should definitely be exchanged, it is now necessary to ask, why? People often stop at this point, accept that all is well, and move on. However, it is just as important to question the workings in your garden if there is success, as if there are problems. Discuss what has occurred in the garden with students. What life cycles are occurring that have helped the garden flourish? Why does the presence of many earthworms mean there is healthy soil? Where did the earthworms come from? Why were they not there before? What is it that has happened to make the garden become, or remain healthy? Who, or what, is to thank for this? There are just as many opportunities to learn and grow, regardless of the outcome. If, however, your answer is no, or aspects of the garden do not succeed as planned, do not worry! Remember what the infamous Ms. Frizzle from the Magic School Bus used to say, “Take chances, make mistakes and get messy!”

The purpose of this Native Species Garden is to learn about natural processes, get outside and have fun. Next, brainstorm potential causes as to why your garden may not be as healthy as it could be. Look into different management techniques, and do research by talking with local gardeners, community members, indigenous peoples, and anyone else with an interest! From there, recreate a plan and implement new strategies.
7.3 Where the Monitoring and Evaluation information will be kept and made available.

Any information collected should include a hard-copy version and a version stored on-line and/or on a computer. This ensures that information is not lost in case one version is lost. Information in a hard copy version could be sorted into categories such as (but is not limited to) Photographs, Monitoring and Evaluation Tables filled out, Surveys, Student work relating to Native Species Garden etc. Other forms might include; having a section in the Newsletter celebrating the Native Species Garden in some way (ex: Indian Plum is flourishing with spring flowers!); having a section on the website of George Jay Elementary School keeping people posted about any of the goals relating to the garden (example: Two classrooms so far this year have engaged with the Native Species Garden to teach their unit on seasons!); a bulletin board in the hall and/or classroom with artwork, poems, comments from students, parents and other participants pertaining to the Native Species Garden; a write up in a newspaper celebrating the implementation of the Native Species Garden. In summary, it is important to post information and reflections gathered to show that this information is not just being collected for the sake of collection, but collected to monitor and evaluate progress, challenges and learning which occurs.

7.4 Who will do the Monitoring and Evaluation

As this Native Species Garden Design project is geared toward students, teachers, parents and community members, involvement in any stage of this project is not limited to only one of these groups. That being said, it is important to communicate who will be doing monitoring and evaluation to ensure it does in fact happen. Perhaps a group of people involved with George Jay Elementary School could be created in charge of making sure it does happen. For example: a Nature club at lunch time (See Plan Section)

7.5 Note on Monitoring and Evaluation Section

Given that the policy for this project seeks to “increase and maintain locally focused ecological integrity while creating engaging educational opportunities for children in all steps of the project, with the aim of fostering a healthy relationship to Nature” it is important that monitoring and evaluation program and methods are created with the stakeholders (students, teachers, parents, community members (human and ecological)) in mind. When working with a school and on their school’s site, for the process and result of restoration to be effective, engaging, efficient and educational, it is of utmost importance to have input from these stakeholders in all steps of the process including making decisions. Although efforts were made to do just, it proved to be difficult (see Section 9: Reflection). On that note a meeting will occur on March 28th, after this project is handed in, as members of our group will be meeting with a group of parents and teachers to share ideas, plan future courses of action – one of which will include improving the current Monitoring and Evaluation Section. Working with stakeholders more often and directly also ensures that suggestions given in the Design Project are realistic which would decrease time and energy spent on detailing plans that may be too grandiose for the project. All of the monitoring and evaluation techniques have been designed, chosen or adapted specifically for elementary students under the direction any of the individuals or group involved (see Sections 5.1 and 6.1). This Monitoring and Evaluation Program is based around our goals and objectives. The goals provide the backbone for
the program and the majority of the objectives were used as indications of success. However overall indicators that this project plan is successful would be if

- The four Goals are reached/ are strived to be reached and also that this process continue in perpetuity.
- This process leads to learning about restoration, natural processes and creating a connection to self, the community and Nature
- People are striving to reach the goals and are learning along the way.
- Monitoring and Evaluation occurs
- Adaptive management is implemented
- People’s curiosity in natural processes increases

7.6 Pre-implementation, Implementation, Post-implementation and Overall Project Monitoring and Evaluation

Listed here are types of monitoring and evaluation techniques that can be used which are geared for the different sections:

- Untreated control plot
- Soil Test
- D.3 Example of Monitoring and Evaluation one of the four goals
- Photo-point Monitoring

Details are or should be posted in Appendix B

7.6.1 How often will monitoring and evaluation happen?

The BC Grassland Ch. 6 suggests that monitoring and evaluation occur at first, third and fifth year then every five years. However, due to the nature of this project and our goals of the project, we suggest monitoring and evaluation to happen a certain number of times (detailed below) with the hopes that if people are compelled, for monitoring and evaluation to occur as much as possible. We suggest that Pre-implementation Monitoring and Evaluation occurs at least one time, for Implementation Monitoring and Evaluation to occur as any steps are implemented (such as soil brought in), for Post-implementation Monitoring and Evaluation to occur at least once per temperate season (Fall, Winter, Spring and Summer) and for Overall Project success to occur at least once per year at the end of the school year. plan suggest every month to show changes in the plants and seasons.

7.6.2 Pre-implementation Monitoring and Evaluation
It is important to conduct baseline monitoring and evaluation as the information collected serves as the base data that future monitoring and evaluation information will be compared with. Photo-point monitoring (once every temperate season) 4 cardinal directions from middle of site. 3 photos every 5 feet standing 5 feet from edge of boundary (standing within school ground). See Appendix for details of technique. These sets of photographs will act as what the following years will be compared with. 

Dig a deep pit.
The site analysis is also included in the baseline information. Students, parents, teachers etc. are encouraged to conduct a site analysis as well get involved in the site analysis.

Monitoring:

Conduct Photo-point monitoring, Diameter at Breast Height of Douglas-fir Tree, initial soil test (depth, pH, presence or absence of Nitrogen/Phosphorous/Potassium (N/P/K))

Conduct Photo-point monitoring.

Diameter at Breast Height of Douglas-fir tree.

Along with the site analysis in the beginning of this project, conduct one with groups such as students, teachers and stakeholders.

Evaluation Questions:

Has an untreated control plot at least two feet by two feet been created?

Were the Pre-implementation monitoring activities completed?

Why or why not?

Adaptive Management: Brainstorm ways to increase the possibility of these goals being reached, and/or develop a survey or other method to find out if these things are or are not occurring including a question of why people think this may be the case and suggestions they have. If this was not done during post-implementating of this Design Project, do so as soon as possible.

7.6.3 Implementation

Photo-point Monitoring and Monitoring Question, Evaluation Reflection, Adaptive Management

Monitoring: Were the steps pertaining to post-implementation of the Native Species Garden followed? (See Policy, Goals and Objectives Section and Planning Section)
Evaluation: Why or Why not? Comment on why stakeholders felt it was an appropriate step to follow. If not, comment why stakeholders felt it was not an appropriate step to follow.

Adaptive Management: Brainstorm ways to increase the possibility of these goals being reached, and/or develop a survey or other method to find out if these things are or are not occurring including a question of why people think this may be the case and suggestions they have.

7.6.4 Post-implementation

Photo-point monitoring, Ecological Map, Tables to fill out (Monitoring and Evaluation Questions), Adaptive Management

Conduct Photo-point monitoring, Diameter at Breast Height of Douglas-fir Tree, intial soil test (depth, pH, presence or absence of Nitrogen/Phosphorous/Potassium (N/P/K),

Monitoring Questions: Were the steps pertaining to post-implementation of the Native Species Garden followed? (See Policy, Goals and Objectives Section)

Evaluation Questions:

Why or Why not? Comment on why stakeholders felt it was an appropriate step to follow. If not, comment why stakeholders felt it was not an appropriate step to follow.

Adaptive Management: Brainstorm ways to increase the possibility of these goals being reached, and/or develop a survey or other method to find out if these things are or are not occurring including a question of why people think this may be the case and suggestions they have.

7.7 Overall Project

7.1 Survey or meeting to answer Monitoring and Evaluation Questions

Focusing on the goals mentioned earlier in this section:

- The four Goals are reached/ are strived to be reached and also that this process continue in perpetuity.
- This process leads to learning about restoration, natural processes and creating a connection to self, the community and Nature
- People are striving to reach the goals and are learning along the way.
- Monitoring and Evaluation occurs
- Adaptive management is implemented
- People’s curiosity in natural processes increases

Monitoring Question: Were these goals reached?
Evaluation Question: Why or Why not? Comment on why stakeholders felt it was an appropriate step to follow. If not, comment why stakeholders felt it was not an appropriate step to follow.

Adaptive Management: Brainstorm ways to increase the possibility of these goals being reached, and/or develop a survey or other method to find out if these things are or are not occurring including a question of why people think this may be the case and suggestions they have.

References

*due to time constraints we were not able to complete this reference section, we apologise for that.
Section 8. Recommendations

Due to time constraints, a list of recommendations has been included below for those who carry out the Native Species Garden to consider and delve into further. This includes additional ways to carry out implementation, as well as ways to incorporate the garden in learning afterwards.

- Stepping stones could be added in the garden. These could be simply cedar rounds, or they could be made as a student project in class, out of cobb. This is a great way to make natural stepping stones, that uses a mixture of sawdust, flour, and water. Students can further decorate the stepping stones by pressing found pebbles into it to make designs. This further links students to the garden, when they can see something tangible in the garden that they made with their own hands.

- If a boarder is needed in the garden to protect smaller plants while they are being established, it is encouraged that students gather small rocks which they can paint and decorate, to be laid out in the garden. We did not include this in our immediate plan, as we do not want to create a strong fence that states, this is the garden, this is not. There is often a preconceived notion of nature and not-nature, wild and not-wild, or them and us. Projects such as this strive to expel this notion, and remind people that we are our environment, we are part of nature. Therefore, we do not want to create a line in the sand that you cross over to enter the garden, where only then do you start interacting with nature. Rather we want our garden to spill over with a ragged edge, a simple extension of the environment around us. This being said, some plants may indeed need a marker of some sort to protect them. This can be decided through the adaptive management process.

- The Plant Profile Pictures can be cut out and used as flashcards (with names of plants written on the back) for students to learn the plants in their garden. The pictures could also be used to make a sort of ‘Native Plant Bingo’, which can be played in class or made accessible as a game during inside-days at lunch hour and recess. If students became proficient at the common names, the game and flashcards could move on to the Latin names.

- Learn the Latin names of plants in the garden! Although they may seem daunting at first, latin names tell a story about the plant, and actually help to remind of what kind of plant it is. Their translations usually tell a physical characteristic of the plant, a common use, or a famous myth relating to it.

- Teachers can engage students in the garden in many ways. Taking them out to it during science class as life cycles, ecosystems, animals, plants and other natural science topics are discussed would be a great way to engage students minds and captivate their imagination. When we can see an idea in multiple ways, such as by hearing about it, reading it, seeing pictures, and then touching, feeling, smelling, working with it, we gain much greater understanding. Furthermore, going out to the garden gets children out of their seats, active and moving about, something that
is increasingly lost on our young generations in such an academic world. The garden can also be used in art classes (drawing, painting, sculpting, plays, etc.), English class (writing poetry about the garden, reports on plants, etc.), social studies (discussing the past history of plants, their uses and connection to people, and how they have helped shape our present), and in math (using plants/plant parts to learn addition, multiplication, etc., counting, geometry, fibonacci sequences, etc.). Further, students can learn to design research surveys, experiments, and their own projects within the garden. This is just a small smattering of the ways the garden can be incorporated in daily school activities. There remain immeasurable ways to engage in the garden. We do encourage that work done in relation to the garden be showcased on the garden bulletin board, or even displayed at a garden party.

- It is recommended that when George Jay Elementary School further develops the area to include their outdoor classroom/nature stage, and natural playground, the native garden is expanded out into and around the area, making it a single incorporative area.

- We also recommend starting a composting project at George Jay Elementary School. This could be used in both the already established LifeCycles Vegetable Box Gardens, and in our Native Species Plant Garden, while reducing waste, teaching students about life cycles and nutrients, and benefiting the health of the gardens.

- A great idea would be to set up a group with other schools that have also implemented native gardens which could meet periodically to discuss problems, ideas, future plans, etc, and ways to engage students and community members. There are a lot of strong ideas and plans being formed, which could be greatly beneficial if shared! Further, this organization of schools for native gardens should create a resource of shared plans, contacts, and resources for schools, organizations, or individuals looking to establish native gardens. On that note, an annual meeting for any type of school garden could also be created and planned. This would allow for even more knowledge sharing regarding successes and areas of improvement surrounding different types of gardens which may result in more native species gardens or introducing the ideas of novel ecosystems which is an emerging idea in restoration.
Section 9: Reflection

A main goal in the creation of this Restoration Design Project was to engage stakeholders in all steps of the process. This became even more important, as we connected with a school and planned to actually hand our project over them after completion. This posed both some aids and challenges. It was helpful, in that while having the ability to design anything at all, we had minimal guidelines as to what George Jay Elementary School was looking for. However, the relationship with the school also provided us with a concrete place to get answers to some of our questions, such as who might be willing to take over management and monitoring after the garden had been implemented. In addition, knowing that the garden would likely actually be implemented gave us an extra sense of dedication to the project. There is a certain sense of excitement, knowing that something dreamed up from your own imagination has a high possibility of coming to fruition. On the other hand, working with real clients also provides challenges in that you have to rely on others and their schedules and put in a large of effort to make the project go smoothly. This was interesting to deal with, as it was a taste of what it might be like to work as an actual consultant or designer in restoration. We had troubles receiving information in a timely manner, and some issues arose over spring break, when we lost contact with the school for two weeks, as they were now on a break which meant putting the project on hold until school came back into session. This was rather unfortunate, but we did our best to include information and wants that had been established before this time, while keeping in mind the client as much as possible when a decision had to be made without them, due to the necessity to finish the project.

Heading into the project, we were rather unsure how to go about it, what exactly we wanted out of it, and what the proper protocol was. As a result, there are definitely things we would do differently if we were to repeat the project. We do not however necessarily see this as a failure to our current project, as this was the first time any of us had attempted a project such as this, and we learned a lot along the way. For instance, a few of us did not actually get to visit the site until we had already worked on the project for some time. This was not detrimental, as others had visited the site, taken photos, explained about it to the group, and we also had the added help of Google Maps. However, going to the site in person definitely helped gain a better understanding of what was going on, and stirred creative juices. Next time we might also try to work out better communication with our site owners, as we did not anticipate the challenge that spring break would bring.

There were also challenges regarding how much detail was to be put in the project. With restoration, there can always be more - more research, more information, more opinions, more ideas. Our group came up with an incredible amount of ideas to go along with the Native Species Garden, many of which we unfortunately did not have the time to add in to this plan. At times it was hard to decide what was essential to our plan, and what was extra. As a compromise, we added in a list of recommendations, for those who carry out our plan to look further into.
Overall, although this project was a definite challenge, we all learned a great deal about the restoration design process. Going into it, we all had relatively little knowledge of the process, and all feel much more well versed, armed with lessons learned and ideas to further investigate. We had something of a struggle to finish all of our ideas in time, and it was very frustrating at times as we attempted to figure out exactly how to carry out our project; however, as a group we have produced what we believe to be a strong document with an enormous amount of effort and care behind it. We are proud to have the opportunity to meet with George Jay Elementary School on Thursday, March 28th, to present and hand over our design to be implemented in a very real way.
Appendices

Appendix A: Appendix to section 5

Appendix A.1: Contact Information Groups and Services Involved

George Jay Elementary School
Principal: Leslie Lee
1118 Princess Avenue, Victoria, BC, V8T 1L3
Ph: (250) 385-3381
Email: georgejay@sd61.bc.ca
Website: https://school.sd61.bc.ca/georgejay/Home.aspx
- Students, Kindergarten – Grade 5
- Parent Advisory Council (PAC)
- Faculties Management
- Teachers and Staff Members
- Parents of Students

Victoria School Board District #61
556 Boleskine Road, Victoria, BC, V8Z 1E8
Ph: (250) 475-3212
Website: www.sd61.bc.ca

Lifecycles
Unit #2 – 625 Hillside Avenue Victoria, BC V8T 1Z1
Ph: (250) 383-5800
Email: info@lifecyclesproject.ca
Website: http://lifecyclesproject.ca

Evergreen
Email: info@evergreen.ca
Website: http://evergreen.ca
Evergreen School Ground Greening
Amal Musa
Ph: (416) 596-1495 x327
Email: amusa@evergreen.ca

Habitat Acquisition Trust (HAT)
827 Broughton Street, Victoria, BC
Ph: (250) 995-2428
Email: hatmail@hat.bc.ca
Website: www.hat.bc.ca
Green Spots Program Website: http://www.hat.bc.ca/index.php/donate/13-i-want-to/stewardship/greenspots

Sierra Club BC
Appendix A.2 Potential Nurseries:

Marigold’s Nurseries
7874 Lochside Dr, Saanichton, BC V8M 2B9
Ph: (250) 652-2342
Website: http://marigold nurseries.com

GardenWorks
Oak Bay - 1916 Oak Bay Ave.
Ph: (250) 595-4200
Saanich - 4290 Blenkinsop Rd.
Ph: (250) 721-2140
Website: http://www.gardenworks.ca

Lochside Nursery
Drooley Road at Lochside Drive, Victoria, BC
Ph: (250) 544-3100
Website: www.lochside.ca

Swan Lake Christmas Hill Nature Sanctuary
3873 Swan Lake Victoria, BC, V8X 3W1
Ph: (250) 479-0211
Email: info@swanlake.bc.ca
Website: www.swanlake.bc.ca

Russell Nursery
1370 Wain Road, North Saanich, BC, V8L 5V1
Ph: (250) 656-0384
Email: russellnursery@telus.net
Website: www.russellnursery.com

Nature’s Garden Seed Co.
Duncan, British Columbia
Ph: 1 (877) 302-7333
Email: mail@naturesgardenseed.com
Website: www.naturesgardenseed.com

Down to Earth Gardens & Nursery
1096 Derrien Place, Victoria, BC, V9C3Y3
Ph: (250) 391-9366
Email: downtoearth@shaw.ca
Website: www.downtoearthgardenandnursery.com

Elk Lake Garden Centre
5450 Patricia Bay Hwy, Victoria, BC V8Y 1T1
Ph: (250) 658-8812

Art Knapp Plantland Victoria Garden Centre
5325 Cordova Bay Rd, Victoria, BC, V8Y 2L3
Ph: (250) 658-1013
Website: www.artknappplantland.com

Le Coteau Farms Nursery & Garden Centre
304 Walton Place, Victoria, B.C. V9E 2A4
Ph: (250) 658-5888

Metchosin Farm
Fiona Hammersley Chambers
542 Wootton Road, Metchosin, BC  Email: info@metchosinfarm.ca
Webmail: www.metchosinfarm.ca

Appendix C: Potential Retailers for Equipment and Tools:

Canadian Tire
2959 Douglas Street, Victoria, BC, V8T 4N1
Ph: (250) 361-3152
Website: www.canadiantire.ca

Home Depot
3986 Shelbourne St, Saanich BC V8N 3E3
Ph: (250) 853-5350
Website: www.homedepot.ca

Lee Valley Tools
Appendix A.3: Potential Soil Removal & Delivery:

Michell Excavating Ltd
7473 East Saanich Road, Saanichton BC, V8M 1W2
Ph: (250) 625-1640

J.S. Bobcat & Excavating
4283 Carey Road, Victoria, BC, V8Z 4H1
Ph: (250) 888-6530

Appendix A.4: Plant Profiles

(For photographs, refer to corresponding number on Plant Profile Photos, page ____ of this appendix)

Please Note:

Whenever planting, caring for, harvesting, or handling plants, be sure to be gentle. Treat all plants with respect, and acknowledge both the past connections and histories of these plants with the native peoples, as well as the direct relationship you currently are fostering with these living species. Take only as much as needed, and if selecting from the wild (or in your own garden), try to harvest from different areas; ensure that you leave more than enough of the plant and/or population to still flourish, and that plenty remains for other harvesters and animals to enjoy. Whenever you take something from a plant, give something back, whether that means weeding the area a little, pruning off dead ends to stimulate growth, or planting some fallen seeds. You may also quietly sing a song as you work with the plants, to express your gratitude for their help to you – whatever way you choose, ensure that you and those around you respect the life and history of the plants.

Edibility:
None of the plants in this garden will cause damage if ingested. However, it is extremely important that you never eat a plant unless you are completely sure of what it is. As this garden is to be implemented at an elementary school, the plants that are here recommended are perfectly edible, and even delicious. All of the berries and fruits grown in the garden are excellent in making jams, preserves, pies, crumbles, jellies, juice, syrup, and sauces. They are also wonderful fresh off the plant, and most can be dried (if not, it has been mentioned in the plant’s profile). The more a person interacts with a plant, the more they will be interested in it, learn about it, and care for it. Having children tasting, and finding food growing naturally, rather than on a grocery store rack, is an essential part of this project! However, be sure to instill in children that one should NEVER eat a plant you are not 100% certain of what it is!

Growing Season:

Though each plant has a slightly different growing season, as defined in our plant profiles, it is noteworthy that Victoria has an extending growing season due to our location, and so flowers and berries will often bloom/ripen earlier and longer.

Plants:

Note: unless otherwise stated, all information has been obtained from Royal BC Museum (n.d.), United States Department of Agriculture Natural Resources Conservation Service (June, 2003), King County Native Plant Guide (2008), and Habitat Acquisition Trust Native Plant Chart (2012).

1. Salmonberry
Rubus spectabilis

Description: Golden brown bark with magenta flowers, deciduous, dark-green toothed leaves and sharp thorns. Bears edible yellow or reddish, raspberry-like edible fruit.

Height: Up to 4 m
Soil: Moist - wet
Light: Sun-shade
Bloom Period: Berries ripen May to June (one of the earliest)

Interesting Facts:
- Attract hummingbirds and other birds
- Fire-resistant
- Edible berries and sprouts
- The ripening of the salmonberry is associated with the song of Swainson’s thrush, also known as the ‘salmonberry bird’ in many languages.
- Historically, berries were often collected by owner of a Nuu-chah-nulth patch until enough were gathered to hold a feast. Afterwards, the patch would be open to all.
- Salmonberries have varying taste, and are labeled as untasty to some, and loved by others.

Uses:
- Both berries and sprouts were eaten by northwest coast peoples.
- Sprouts can be gathered in the spring until early summer, peeled, and eaten raw. Though more work, they can also be steamed. The sprouts have a sweet, juicy flavour.
- Berries can be eaten ripe off the plant, though do not dry well. Historically, they were often eaten with salmon. They have long been known as a favourite food of children.
- Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces

Caution:
- Can spread easily if not maintained; can be thicket forming
- Do not collect in buckets deeper that 5 cm, or the weight of the soft berries will squish those at the bottom

2. Red Huckleberry
Vaccinium parvifolium

Description: Bright green branches and small leaves that are not toothed. Mostly deciduous. Greenish-yellow or pink urn-shaped flowers up to 5mm long. Bears bright red, round, edible berries.

Height: Up to 4 m
Soil: Dry-moist
Light: Part shade - shade
Bloom Period: Flowers April-June; Berries late summer

Interesting Facts:
- Eaten by all coastal aboriginal groups within their range
- Attracts butterflies
- Attracts birds
- Fire resistant
- In the past, berries were harvested with a comb-like tool, which was often made of yew wood. Later, people sometimes poured the collected berries and leaves down a strip of curvy, wet wood: the leaves would get caught in the depressions, and berries roll into the waiting basket.
- Sechelt peoples smoke-dried the berries using branches of the bush as part of the fire fuel.
There is a story that says that Asin, monster woman-of-the-woods created the red huckleberry. Anyone who eats the berries, will lose all reason and be carried off to the woods.

- Often grows out of rotting stumps with salal plants.
- Favourite food of bears

Uses:
- Berries were used as bait when fishing in streams
- Berries can be dried and eaten like raisins (singularly), mashed and dried in cakes (for later use), or stored soaked in grease or oil. They may also be eaten fresh.
- Juice of berries can be drunk as a beverage to stimulates appetite. May also be used as a mouthwash.
- Leaves and bark can be prepared as a decoction to be gargled for sore throats and inflamed gums
- Leaves can be used fresh or dried in tea
- Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces

Caution:
- Does not transplant easily.
- Can spread easily if not maintained
- Deer enjoy browsing on this plant

3. Salal
Gaultheria shallon

Description: An evergreen shrub, creeping to erect with leathery, thick, egg-shaped leaves 5-10 cm long that are finely toothed. White or pink urn-shaped flowers that hang in one direction off the branch. Bears reddish-blue to dark-purple edible berries.

Height: 0.2-5 m (very variable)
Soil: Dry-moist
Light: Part shade - shade
Bloom Period: Berries ripen July-Aug

Interesting Facts:
- Best ground cover plant for northwest areas; very versatile
- In the wild, can become impenetrable thickets
- Often seen in floral arranging and landscaping, as well as easily growing wild
- Very adaptable
- Attracts birds
- Attracts butterflies
- Deer resistant
- Fire resistant and drought tolerant
- The berries were the most plentiful, and important fruit for many aboriginal peoples on the northwest coast
- The Kwakwaka’wakw dipped the ripe berries in oolichan grease at feasts
- Haida used the berries to thicken salmon eggs

Uses:
- Hunters and hikers often chewed on salal leaves to suppress thirst and hunger
- Berries can be eaten both fresh, or dried in cakes or singularly
- Can be used to sweeten other foods
- Leafy branches are used in pit-cooking, as fuel and for their flavour
- Used for flavour is fish soup
- A tiny drinking cup can be made by shaping the leaf into a cone
- Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces

Caution:
- Does not transplant well
- Can spread easily if not maintained; can form thickets

4. Oceanspray
   Holodiscus discolor

Description: Multiple arching brown stems, with edible, large white/cream lilac-like flower plumes about 10-17 cm long, that later turn brown. Deciduous, dull green broad leaves, coarsely toothed, about 3-6 cm long.

Height: Up to 4 m
Soil: Dry-moist
Light: Sun-shade
Bloom Period: Early Spring to Winter

Interesting Facts:
- Flower clusters bloom white spring to summer, then turning brown and remaining throughout the winter
- Also known as ‘ironwood’, because of the strength and hardness of the wood. It was often made harder by heating over a fire, and later polished with horsetail stems
- More tolerant of sun, can even survive on highway edges without extra watering
- Attracts birds
- Attracts butterflies
- Drought tolerant
- Fire resistant
- Provides cover for numerous birds, ground animals, and even tree frogs
- Provides fall colour

Uses:
- Used to make digging sticks, spear and harpoon shafts, bows and arrow shafts by almost all coastal groups from BC southwards
- Can be used for salmon barbequing sticks, inner-bark scrapers, halibut hooks, cattail mat needles, and knitting needles
- The browning flowers can be steeped in boiling water to make an infusion drank for diarrhea, especially in children. Also drank for measles, chicken pox, and as a blood tonic
- Also previously used in construction as nails
- A poultice of bark and leaves can be used to treat burns and sores

5. Tall Oregon Grape
Mahonia aquifolium

Description: Yellowish bark and wood with holly-like, broad evergreen leaves. Bright yellow clustered flowers followed by edible purple berries. Rhizomatous.

Height: Up to 3 m
Soil: Dry-wet
Light: Sun-shade
Bloom Period: April to May

Interesting Facts:
- Attracts birds
- Attracts butterflies
- Prevents erosion
- Drought tolerant
- Fire resistant
- Deer resistant
- The bark is bright yellow inside because of an alkaloid, berberine.

Uses:
- Berries can be eaten
- Shredded bark of stems and roots can be used to make a bright yellow dye, particularly for baskets
- Bark and berries were used medicinally for liver, gall-bladder, and eye problems
Eating many of the berries at once was an antidote for shellfish poisoning.

Liquid from the bark of boiled woody stems helps treat itchy eyes.

Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces.

6. Wooly Sunflower
Eriophyllum lanatum

Description: Sprouts solitary circular, yellow, flowers that are 4 to 6.5 cm wide. Stems and narrow; leaves are covered in white hairs. Seeds are narrow and smooth with four angles.

Height: 10 – 60 cm
Soil: Dry-moist
Light: Part shade-shade
Bloom Period: May - July

Interesting Facts:
- Deer resistant
- Attracts bees, butterflies, beetles, and moths
- High drought tolerance (the white hairs conserve water by reflecting heat and reducing air movement across the leaf)
- The flower, is actually a flowerhead of multiple florets

Uses:
- A poultice from the leaves can be used to treat aching body parts
- Rubbing leaves on the skin can prevent chapping
- The dried flowers were used as a lover charm by some aboriginal groups

* Some information was additionally obtained from Pavek’s (2011) and Hebda’s (n.d.) work.

7. Red Columbine
Aquilegia formosa

Description: Perennial herb with simple, slightly hairy stems, and green leaves divided twice to make three sections. Drooping red and yellow flowers with central protruding stamens and styles.

Height: Up to 1 m
Soil: Dry - moist
Light: Shade – part shade
Bloom Period: March to July; Fruits June to August

Interesting Facts:
- Very attractive to hummingbirds
- Attracts butterflies
- Called ‘red rain-flowers’ in Haida; children were told not to pick the flowers or it would rain
- The Nuxalk peoples refer to it as the ‘grizzly-bear’s den’
- The common name – Red Columbine – comes from the Latin columbina, meaning ‘dove-like’. You can notice that the arched petals and spurs of the flowers look like a quintet of doves in a ring around a dish.
- Fire resistant

Uses:
- Milky pulp created from scraping roots with a sharp rock can be put on sores to help form a scar.
- Leaves can be chewed and spat on sores
- Aboriginals used the plant in various ways to treat diarrhea, dizziness, aching joints, and possibly venereal disease
- Seeds have been used to treat headaches, sore throats, stomatitis, heart problems, kidney and urinary problems, and fever
- Seeds used to treat the skin rash and/or itch caused by poison ivy
- Has been used for ceremonial medicines and perfumes
- Roots can be used to treat gastrointestinal problems

*Some information was additionally obtained from Wennerber’s (2006) work.

8. Pacific Bleeding Heart
Dicentra formosa

Description: Soft perennial with rose-pink, heart-shaped flowers, grey green lacy foliage, and rhizomes. Numerous, fern-like leaves.

Height: 25 – 45 cm
Soil: Moist
Light: Part Shade - Shade
Bloom Period: February - July

Interesting Facts:
- Attracts birds
- Attracts butterflies
- Dicentra means ‘two-spurred’ in Latin, which refers to the two spurs on the outer petals; formosa means ‘beautiful, handsome, well-formed’.
- The pacific bleeding heart and ants have a symbiotic relationship. Their seeds contain oils that ants like to eat. These ants then spread the seed throughout a forest to grow into new plants.
- Fire resistant

Uses:
- Roots can be used in a drink for skin problems, and has been used to treat syphilis, cramps, and other diseases
- Root tinctures or hot compresses can be used in pain relief and applied externally to bruises and sprains
- Has been used internally to calm nerves after frightening experiences or trauma
- Roots are gathered in the summer and fall until leaves start to turn for medicinal uses

This information was taken from the USDA plant profile (n.d.) Sierra Club BC foundation’s website (n.d.), and Tkaczyk’s (2008) work.

9. Indian-Plum
Oemleria cerasiformis

Description: Purplish-brown bark with deciduous, pale-green, lance-shaped leaves that are not toothed. The greenish-white flowers that are somewhat bell-shaped are of the first to bloom in spring, falling in 5-10 cm long clusters. Bears edible peach-coloured fruit similar to small plums, which turn bluish-black when ripe.

Height: 1.5-5 m
Soil: Dry - Moist
Light: Shade – Part Shade
Bloom Period: March

Interesting Facts:
- Creates shelter for small mammals
- Attracts birds
- Attracts hummingbirds; an important early-season nectar source for them
- Attracts butterflies, moths and native bees
- Fire-resistant
- Only female plants fruit. It is therefore important to ensure both male and female plants are in your garden.
- When crushed, the leaves smell like cucumber
- Some First Nations call them ‘choke-cherries’ because of their bitter taste when unripe, however are enjoyable when in season
- When the Kwakwaka’wakw ate the berries with oolichan grease at feasts, they were not allowed to drink water.
- Provides fall colour
- Roots resist erosion

Uses:
- Fruits are eaten fresh, cooked, or dried.
- Twigs are chewed and applied to sore areas. Historically, the twigs were sometimes burned and mixed with fish oils before use.
- Bark can be used in a tea as a purgative and tonic.
- Strips of bark were used to bind harpoon tips
- Bark was used as a tuberculosis remedy and mild laxative
- Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces

Caution:
- Can spread easily if not maintained

*Some of this information was additionally obtained from Gonzalves and Darris’ (2009) work.

10. Licorice Fern
Polypodium glycyrrhiza

Description: A smaller evergreen plant, grown from creeping, reddish rhizomes, with fronds that grow 10 – 20 offset pairs of pinnae, which get shorter the closer to the top they grow.

Height: Up to 70 cm (though usually smaller)
Soil: Moist
Light: Shade – Part Shade
Bloom Period: Year-round; if low rainfall in the summer, can grow dormant

Interesting Facts:
- Most often found growing with mosses on rotting logs or in big leaf maples
- Fire-resistant
- Licorice fern is an epiphyte; this means that it is not parasitic, but uses other plants for support
When the rhizome is cleared of the outer layer of brown fuzz, it is translucent green with a sweet licorice taste. The fern’s network of rhizomes help to stabilize forest canopy soil; they create places for mosses and lichens to grow. Contains osladin, which is a steroidal compound 3000 times sweeter than sucrose.

Uses:
- The sweet, licorice flavoured rhizomes can be chewed for flavour.
- Rhizomes can be dried, steamed, scorched, or eaten raw.
- Rhizomes were an important medicine for colds and sore throats.
- Rhizomes can be mixed with bitter medicines (or foods) as a sweetener.
- The rhizomes can be gathered in autumn usually, by following the stem into the moss it is buried in, being careful not to strip the moss off.
- Has been used to decrease mild allergic reactions, such as hives, sore lungs, or bee stings.
- Also used for lung irritations, stomach and colon irritability, inflamed mouth, throat and gums.
- The Makah peoples chewed the peeled, roasted rhizome and swallowed the juice for coughs.
- Cowlitz peoples drank an infusion of crushed rhizomes and young fir needles for the measles.

Caution:
- Difficult to grow without a rotting log to plant it in.

*Some of this information was additionally obtained from Larkin’s (2005) work.

11. Deer Fern
Blechnum spicant

Description: Smaller fern that is tufted at the end of short rhizomes. There are two kinds of fronds, with the sterile, evergreen leaves pressed to the ground, more leathery with purplish-brown stipes, and fertile, deciduous leaves growing upright from the center of the plant, that are much more narrow.

Height: 20 – 80 cm
Soil: Dry - wet
Light: Shade – Part Shade
Bloom Period: Year-round

Interesting Facts:
- Fire-resistant
- Important winter food for deer and elk in areas
- Hesquiat elders learned to use deer fern on skin sores by watching deer rub their antler stubs on the plant after their antlers had fallen off
- If lost, children were told to seek out deer fern to eat the roots, and prevent thirst with the leaves

Uses:
- The young fern leaves were chewed as a hunger and thirst suppressant
- Leaves were used as medicine for skin sores
- Considered an emergency/famine food for many first nations groups
- Leaves can be boiled for tea and drank as a general health tonic

*Some information was additionally obtained from The Garden Helper website (n.d)

12. Maidenhair Fern
Adiantum pedatum

Description: Deciduous fern with delicate, fan-like fronds growing from scaly rhizomes. Dark brown to purple-black stipes growing relatively parallel to the ground.

Height: 15 – 20 cm
Soil: Moist - wet
Light: Shade – Part Shade
Bloom Period: Year-round

Interesting Facts:
- Fire-resistant
- In the Latin name, ‘Adiantum’ refers to the fronds’ ability to repel water, and is translated to ‘unwetted’. ‘Pedatum’ refers to the splayed pinnae and translate to ‘like a (bird’s) foot’
- Called ‘maidenhair’ because of it’s fine, glossy, hair-like strands, and because of it’s masses of dark root hairs

Uses:
- Westerns made teas or syrups from the fronds to treat cold and cough symptoms
- Can be used as a sweetener
- Tea from the fern, and a rubbed on decoction of the rhizome was used to relieve rheumatism
- Tea was also drank for fever, or blown over a patient’s head and chest
- Used in basketry by some First Nations
- The Hesquiat used the leaves in a medicine for strength and endurance, particularly for dancers in the winter
- Used to make cough medicines
- Boiled with sugar to make ‘capillaire’, a syrup said to have emetic properties
- Young girls used it to make their hair yellow

*Some information was additionally obtained from Strauch’s (2000) work.

13. Sword Fern  
Polystichum munitum

Description: Large evergreen fronds, erect to arching that are centrally attached. Sharp-toothed, pointed leaves. Rhizomatous.

Height: Up to 1.5 m  
Soil: Dry-moist  
Light: Part shade-shade  
Bloom Period:

Interesting Facts:
- Adaptable for almost any site condition
- As older fronds die they create good amphibian habitat around their base
- Drought tolerant
- Fire resistant
- Prevents erosion
- Known as ‘pala-pala plant’ in numerous Vancouver Island and Puget Sound languages because of its use in a traditional game called ‘pala-pala’. The game involved a contest between children to pull the most leaflets off a leaf in a single breath while saying ‘pala’ with each one.
- New fronds start as curled stems called ‘fiddleheads’

Uses:
- Often used in landscaping
- Leaves used by northwest coast peoples in pit-cooking
- Used between food in storage boxes, baskets, and berry-drying racks
- Leaves are used as flooring and bedding
- Large rhizomes can be dug in the spring and eaten (generally as a starvation food). They are roasted over a fire or steamed in a pit-cook, before being peeled and eaten.
- Cooked rhizomes can be eaten to treat diarrhea

14. Coastal Strawberry  
Fragaria chiloensis
Description: Perennial herb with short, thick rootstocks connected by short, hairy runners. Leathery, green, strongly-veined leaves, with small white flowers with 5 – 7 petals. Bears edible small, hairy strawberries.

Height: Up to 25 cm
Soil: Dry
Light: Sun – Part Shade
Bloom Period: April - May

Interesting Facts:
- Drought-tolerant
- Attracts birds
- Attracts butterflies
- Fire-resistant
- Prevents erosion
- Elders report that the plant used to be much more plentiful in the wild, before deer became so abundant
- Provides fall colour

Uses:
- Popularly eaten fresh; too juicy to dry like other berries
- Leaves can be steeped to make clear, sweet tea
- Leaves can be chewed and applied as a poultice on burns
- The Skokomish made tea from the entire plant for diarrhea
- Haida used the leaves as an ingredient in a female tonic
- Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces

Caution:
- Can spread easily if not maintained

15. Red Flowering Currant
Ribes sanguineum

Description: Reddish-brown bark and alternating, deciduous leaves with hairy undersurfaces, and white to rose coloured flowers about 1 cm long, arranged in drooping clusters of about 10-20 flowers. Bears small, edible fruits.

Height: 1 – 2 m
Soil: Dry - Moist
Light: Sun – Part Shade  
Bloom Period: April - June  

Interesting Facts:  
- Attracts pollinators  
- Attracts hummingbirds  
- Attracts birds  
- Attracts butterflies  
- Provides forage for the larvae of over 24 types of butterflies and moths  
- Good wildlife shelter for songbirds, small mammals  
- ‘Sanguineum’, translated, means ‘blood-red’  
- Their bloom is known as a sign of coming spring and hummingbirds  
- Red flowering currant is unarmored; no thorns  
- Fire-resistant  
- Drought-tolerant  

Uses:  
- Edible, but very tart berries; they were eaten by various Coast Salish groups  
- Not usually collected for drying – eaten fresh  
- Berries used in jams, jellies, pies, juice, syrup, preserves, crumbles, and sauces  

Below are all the plant images
Materials:

Plant Profile Photos
(Refer to Plant Profile Corresponding Numbers for more Information)
Picture references:

A.4.2: References


Appendix B: Monitoring and Evaluation

- Untreated control plot
- Soil Test
- D.3 Example of Monitoring and Evaluation one of the four goals
- Photo-point Monitoring

B. 1 Untreated Control Plot

Create at least one section of the site that is sectioned off (using a boundary of some kind) that will have no restoration occur on it. It is suggested for it to be a two-feet by two-feet area that be used to compare restoration results and effort to. It also provides with a present on-site reminder of what the site used to be.

B. 2 Soil Test

To be done for at least once with the current soil on the site, at least once for the soil brought into the site, for the soil after plants have been planted, then done once every temperate season (Winter, Fall, Spring, Summer). Also note that this table and the soil tests should be done multiple times to increase the replication which leads to more accurate and meaningful results.

B. 2.1 Soil monitoring is an important part of the native species garden, as it is the foundation that will grow and support all of the species present. The following is a Monitoring survey that can be completed in monitoring and evaluating soil on the site over time:

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>ANSWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the pH of the soil?</td>
<td></td>
</tr>
<tr>
<td>What is the result of testing for Nitrogen (N)?</td>
<td></td>
</tr>
<tr>
<td>What is the result of testing for Phosphorus (P)?</td>
<td></td>
</tr>
<tr>
<td>What is the result of testing for Potassium (K)?</td>
<td></td>
</tr>
<tr>
<td>What is the classification of the soil?</td>
<td></td>
</tr>
<tr>
<td>What colour is the soil? What does it look like?</td>
<td></td>
</tr>
<tr>
<td>How many different species of insects were found?</td>
<td></td>
</tr>
<tr>
<td>List the types of insects found.</td>
<td></td>
</tr>
<tr>
<td>Describe the moisture and feeling of the soil.</td>
<td></td>
</tr>
<tr>
<td>Describe the smell of the soil.</td>
<td></td>
</tr>
<tr>
<td>Are there many non-soil objects in the soil? Rocks? Leaves? Garbage? How much?</td>
<td></td>
</tr>
<tr>
<td>What else do you notice about the soil?</td>
<td></td>
</tr>
</tbody>
</table>

B. 2.2 Evaluation Table and Adaptive Management Strategy
The following survey can be filled out after completion of the monitoring survey. Here, previously collected information is evaluated to see if it falls within the realm of healthy soils.

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>ANSWER (Yes or No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the pH of the soil between 5.5 and 6.5?</td>
<td></td>
</tr>
<tr>
<td>Does the Nitrogen (N) level correspond to the pH level?</td>
<td></td>
</tr>
<tr>
<td>Does the Phosphorous (P) level correspond to the pH level?</td>
<td></td>
</tr>
<tr>
<td>Does the Potassium (K) level correspond to the pH level?</td>
<td></td>
</tr>
<tr>
<td>Is the soil classified as Loam or Loamy?</td>
<td></td>
</tr>
<tr>
<td>Is the soil dark chocolate brown in colour?</td>
<td></td>
</tr>
<tr>
<td>Are there three or more species of insects found?</td>
<td></td>
</tr>
<tr>
<td>Are Earthworms on the list of species found?</td>
<td></td>
</tr>
<tr>
<td>Is the soil receiving enough moisture from rainwater, and water collected from the Rain Barrel?</td>
<td></td>
</tr>
<tr>
<td>Does the soil smell fresh? Moist? Rich?</td>
<td></td>
</tr>
<tr>
<td>Is the soil free from rocks and garbage?</td>
<td></td>
</tr>
<tr>
<td>Does it have additional organic matter?</td>
<td></td>
</tr>
</tbody>
</table>

If the answer is yes to all questions, your soil is healthy! The pH is ideal, the nutrients are present and ready to be taken up by the plants, the soil has as an equal balance of sand, silt and clay, a humus layer is present, insects, and in particular Earthworms are present, and the soil is not being contaminated. If, however, your answer is no, it is time to re-evaluate your site and reconstruct new ideas! (Please refer to 7.5.1 for, A Note of Monitoring and Evaluation)

B.2.3 Classifying Soil

Listed is a website from Envirothon BC which has a document labelled “Soil Science.” Download file, click on folder labelled “Soil” and under section 3 Sample Procedure it details how to this. Also on page 5 is a figure (also below) showing the different types. [http://www.rbc.bc.ca/envirothon/resourcepackages.html](http://www.rbc.bc.ca/envirothon/resourcepackages.html)
B.3 Example of Monitoring and Evaluation one of the four goals

Goal #2: Create a plant garden that functions as an ecological community of native species. Some elements of an ecological community include (but are not limited to) biodiversity, structural complexity composed of abiotic and biotic factors. With that in mind here is a table of how monitoring and evaluation could look like:

Monitoring Form

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many different species of native plants are present in the garden?</td>
<td></td>
</tr>
<tr>
<td>How many in total came from donations?</td>
<td></td>
</tr>
<tr>
<td>How many were from children’s own garden?</td>
<td></td>
</tr>
<tr>
<td>How many were from a local farm or nursery?</td>
<td></td>
</tr>
<tr>
<td>How many in total were bought?</td>
<td></td>
</tr>
<tr>
<td>Were a bat box and Mason Bee Nesting Box installed?</td>
<td></td>
</tr>
<tr>
<td>How many volunteers were involved in implementing the plan?</td>
<td></td>
</tr>
</tbody>
</table>

Evaluation Form:
To be answered as a group, or individually, then discussed

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were there at least 10 native plant species planted after soil was in place?</td>
<td></td>
</tr>
<tr>
<td>Did people bring donations from their backyards?</td>
<td></td>
</tr>
<tr>
<td>Were plants donated from sources outside of the immediate George Jay School community?</td>
<td></td>
</tr>
</tbody>
</table>
Was the bat box and Mason Bee Nesting Box made by hand or bought from a local store?

Is there enough momentum, passion and energy seen during the implementation that maintenance, adaptive management, monitoring and evaluation seem likely to occur as the next step?

Did you (individually or as a group) celebrate the implementation of the garden?

If yes was answered for all questions, then Goal #2 was completely successfully. If no was answered, do the people involved feel it decreased the success of creating a plant garden? If so, how could this be avoided for future implementation processes?

B.4 How to do Photo-point Monitoring

Photo-point monitoring (four cardinal directions, 3 pics every 5 feet, 2 aerial pictures)

Four photos (N, S, E, W) from center of area
When photos were taken, date, time of day
Mark photo point to ensure photos are taken at the same spot each time
3 photos: Ex: 10 metres away, 2 metres away (one photo pointed down, another higher up)
Materials needed: Camera, 2-metre stick
Date, Time, Photographer, Site, Photo number, comments
(Page 134 of BC Grassland, Chapter 6, page 134, Comparing Year 1, 2 etc)
Same location, same time of year, some horizon (angle of camera)
Set up a tripod at specific distance