Elliott Native Plant Garden

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INTRODUCTION

Restoration projects and protected natural areas are designed to protect natural heritage for all to experience, learn and appreciate (National Parks Directorate, 2008). It is an intentional activity that aids in the recovery of damaged or degraded ecosystems in order to allow them to flourish while people and animals can enjoy them. The goal of restoration work is not to return systems to their exact natural historic state, as contemporary constraints and conditions cause them to develop along altered trajectories (National Parks Directorate, 2008). The goal then, is to accelerate processes that will advance the evolution of an ecosystem in the direction of the area's natural characteristics.

The Elliott Garden Naturescape project was initiated in 2007 by students in ES 341, an environmental restoration course that is part of the environmental studies program. The initial goal to transform this area into a native vegetation landscape put emphasis on maintaining three unique themes, including a Garry Oak ecosystem, Douglas-Fir/Grand Fir ecosystem, and an edible garden. These two specific ecosystems were chosen in an attempt to display the diversity of local biogeoclimatic zones, while the edible garden would encourage students and staff to take interest in the space (University of Victoria: Grounds, 2013). The current restoration project has moved away from a focus on separating these two ecosystems to rather include native plant species from both ecosystems, along with other culturally important local edible and medicinal plant species.

The previous Elliott Garden Naturescape projects were not as effective as they were designed to be. This was largely due to the presence of rabbits on the University of Victoria campus over the last couple decades. The presence of the rabbits was an issue for the garden since the native vegetation was quickly consumed by the enlarged rabbit population. Because of the extermination of rabbits on campus a few years ago, we believe that this will not be an issue for the Native Elliott Plant Garden we intend to create. Browsing by deer is a potential problem for the native plants; however, since there are many other garden areas on campus that are more easily accessible by deer, it is assumed that this centrally located Native Elliott Plant Garden won't attracted them enough to endanger our restoration efforts.

With guidance from Nancy Turner, the plants were strategically selected and placed in appropriate areas of the garden so as to have the most realistic mini-ecosystems within the area. Some plants such as salmon berry and trailing blackberry were discarded from the native plants list because they proliferate at an exceptional rate and would take over the garden area in a matter of a few seasons (Nancy Turner, personal communication, 2013). Mint and ginger were also discarded because they prefer to grow in cooler, wetter areas, and the Elliott Garden is dryer and warmer than such conditions. Berry bushes such as salal and oceanspray were selected for the perimeter of the garden so as to enclose the area with a natural border, with the added benefit of a seasonal snack for passing students and staff. Other berry bushes such as red huckleberry and

thimbleberry are scattered throughout the garden area to encourage human presence in the garden area. Camas and fireweed were selected for the area underneath the garry oak trees as this would be the area they were traditionally grown in by indigenous peoples.

With the pathway winding through the garden, we hope to encourage people to meander through, with the intention of taking their time and enjoying the native plant species by learning their traditional uses by indigenous peoples. A bench will be placed approximately halfway along the path to encourage relaxation and connection with the natural refuge of the Native Elliott Plant Garden.

Traditional Ecological Knowledge (TEK) is an adaptive, local body of knowledge that is developed over relatively long periods of time and handed down cross-generationally (Berkes, 2008). Indigenous cultures worldwide possess a unique traditional ecological knowledge. Traditional Ecological Knowledge is an important factor in native plant areas because it provides a lasting connection to the ecosystem in which one lives. Many plants native to the Vancouver Island region have indigenous uses or play important roles in the traditions of indigenous peoples. By increasing the presence of native species on campus, in conjunction with educational signage, we seek to help maintain the First Peoples' ancestral knowledge of these ecosystems. It is important to do this on a university campus, such as the University of Victoria, because it may help bridge the gap between students and the First Nations whom they feel disconnected from. In so doing, respect for First Nations' culture and sovereignty may

increase, generating more support in the community for such displaced tribes as the Coast Salish.

PROJECT TIMELINE

The timeline is presented as a figure:

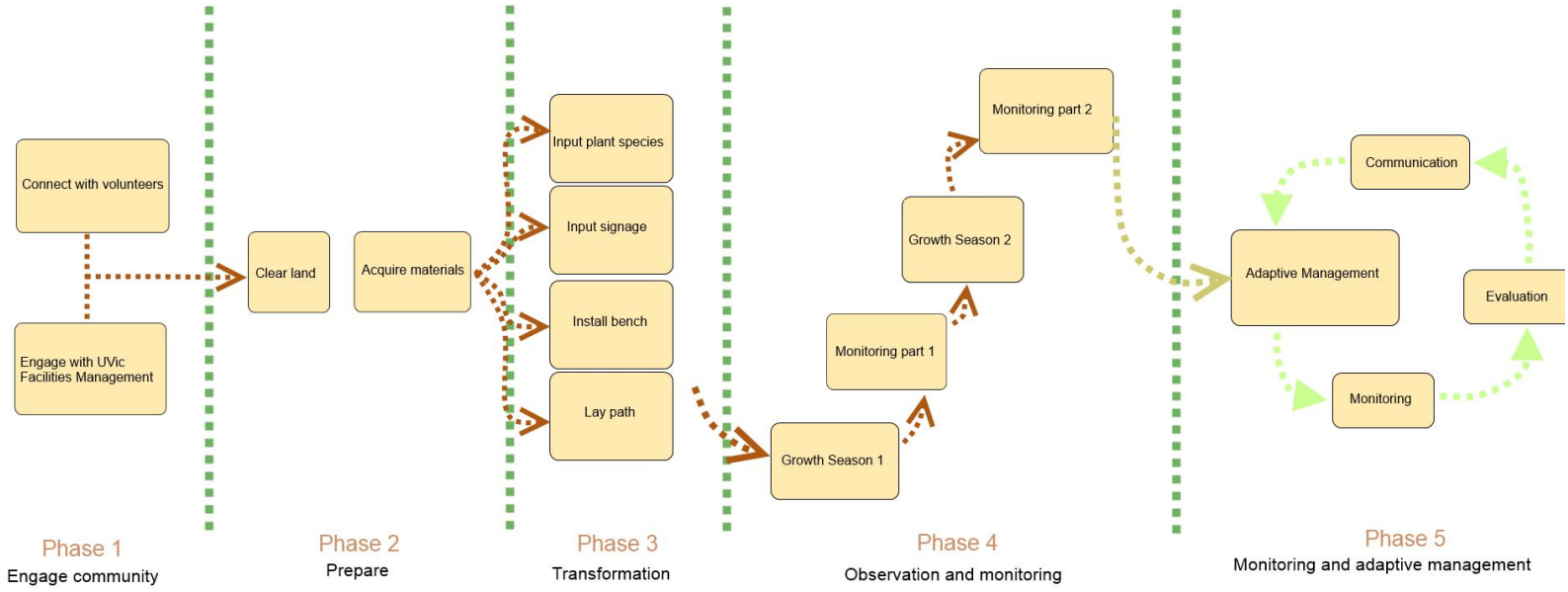


Fig. 1. Phase 1 consists of gathering support for the project in the community through gathering and organizing a group of volunteers, as well as coordinating efforts with the University of Victoria's Facilities Management department. In Phase 2, the area for the path will be cleared through use of a Bobcat, and all needed materials (plants and tools) will be purchased or borrowed. Phase 3 refers to the heart of this project's action plan: the planting and implementation of the native species and path, bench and signage, respectively. Two growing seasons will be monitored during Phase 4: the first growing

season during which time the berry bushes will be protected by chicken wire, and the second in which this wire will be removed. After these "trial" growth seasons, Phase 5 consists of a cycle of adaptive management, in which the results of this project's efforts are compared to its goals, and modifications are made to the garden to bring the desired and actual outcomes closer together. An example of such a change would be a slight alteration in the species makeup of the garden, which might be necessary if a certain species is unable to establish in the garden. A visual representation of adaptive management is presented in figure 2, from the International Union for Conservation of Nature's Ecological Restoration for Protected Areas (2012). Each ring of the helix symbolizes one round of monitoring, developing and adjusting goals and objectives, monitoring, evaluating and adjusting of the restoration efforts. As the project advances through time, it comes closer to realizing the goal of restoring a space through adaptive management, symbolized through the narrowing of the helix.

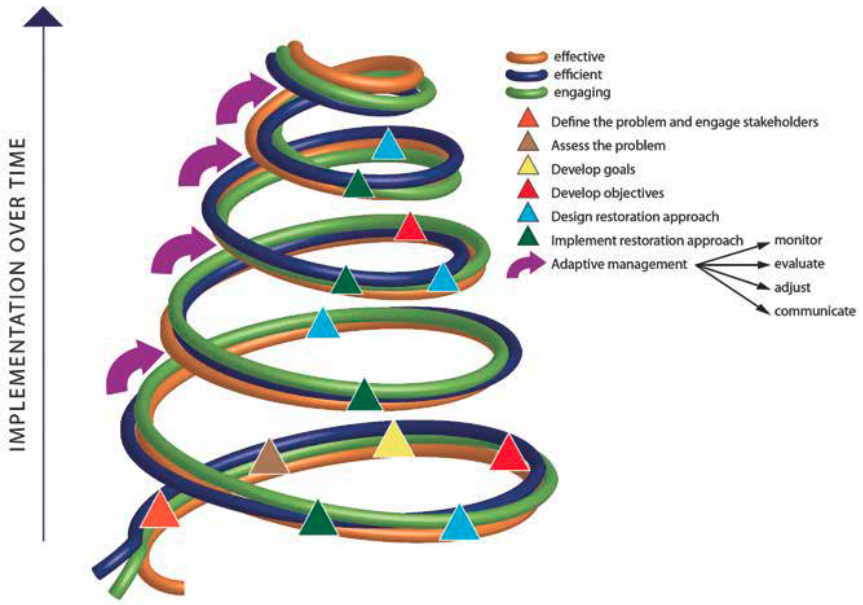


Fig. 2. Adaptive Management of restoration of IUCN Ecological Restoration of Protected Areas document.

GOALS

Setting goals for ecological restoration projects require careful consideration of many factors. These factors include having a goal that is both realistic and achievable in a given time frame, and ensuring a group, rather than individual, decision is made. The goal must account for flexibility within the project, as unforeseen issues may arise at any point during project implementation. We have three main goals with regards to the Elliott Native Plant garden plan.

1) To restore the Elliott Native Plant garden
2) Convert it to a welcoming and educational place for students and staff
3) Create a connection to place
4) Support local businesses

Our primary goal for restoring the Elliott Native Plant garden is to restore the garden to more of a native setting. This will be accomplished by planting a variety of native medicinal and edible vegetation around the perimeter, lining the fencing, as well as dispersed throughout the garden and along the bench and pathway we intend to create.

Our second goal is to create a "self educational" place, where people may educate themselves on native plant species by reading the signs and information provided. An educational setting for both students and staff will be created by placing signs containing plant names and traditional uses beside the newly planted plants. A bench placed part

way along the path through the garden will provide a welcoming setting, and encourage usage of the area for both relaxation, socialization and education.

Our third goal is to create a connection to place, which will be accomplished by usage of the area for peoples enjoyment and self satisfaction. One connects to nature simply by being surrounded with it, and a native plant garden is the perfect setting for this on campus.

Our fourth goal is to buy from and support local businesses. By purchasing plants and building materials for the pathway and bench from local businesses, the project would not only benefit people who use the garden for enjoyment, but also the community on a larger scale. By incorporating students in the implementation of the garden, more people will have a greater appreciation of the native plant garden and its uses.

Overall, we would like to see this garden used as a place to retreat to, study in, and create a connection to place by increasing familiarity of the local, native plant species and their traditional uses.

OBJECTIVES

A key factor of objectives is they must relate to the goals of the restoration project in some way. Objectives must be measurable and be able to be monitored in some way. The objectives we have for the Elliott Native Plant garden are as follows:

- Create a path through the Elliott garden from the North entrance near the Elliott Building, through the center of the garden, over to the west entrance, near the Cunningham building
- Install a bench half way through the garden in the clearing between the two dead trees, near the center of the garden area
- Plant the native plants around the pathway and throughout the garden following the design outlined in the map
- Place signs near the pathway and plants where people will be able to easily access the information without stepping from the pathway

The objectives are placed in this order so that, come implementation, it will be clear what tasks should be accomplished first. For example, if the plants were planted before the pathway was constructed, some plants may restrict where the path goes and potentially some plants may require a transplant so they are not affected by the pathway through the garden.

Installing the pathway first is critical. This enables the pathway to be constructed without worry of stepping on newly planted plants, and allows the pathway to take the best possible route through the garden setting.

Installing the bench could also harm plants if they were planted first, so by installing the bench second, there is still no threat to any of the plants. Because the pathway will already be in place, it will be obvious where the most appropriate spot for a bench will be, and thus may be installed with certainty.

The plants will be the third main step in our objectives list and they will be strategically placed to be most beneficial to the ecosystem and to education.

Signs will be installed last, since the exact location of the plants will not be determined until they are firmly in the ground. The signs will be located close to the plant they represent, but not so far from the path that they are unable to be read from people walking along the pathway.

THE SITE/BACKGROUND INFORMATION

The Elliott Garden Naturescape project was initialized in 2007 by students in ES 341, an environmental restoration course, part of the environmental studies program. The initial goals to transform this area into a native vegetation landscape put

emphasis on maintaining three unique themes including a Garry Oak ecosystem, Douglas-Fir/Grand Fir ecosystem, and an edible garden. These two specific ecosystems were chosen in attempt to display the diversity of local biogeoclimatic zones, while the edible garden would encourage students and staff to take interest in the space (University of Victoria: Grounds, 2013). This particular restoration design has moved away from a focus on separating these two ecosystems, to rather include native plant species from both ecosystems, along with other important local edible and medicinal species.

The Coastal-Douglas Fir zone is one of British Columbia's diverse biogeoclimatic zones and is found along the southern coasts of Vancouver Island , the Gulf Islands and the lower mainland. Douglas fir ecosystems occur in a range of sites from dry rocky areas to moist valleys. This ecosystem contains an extensive array of native species. Salal, Oregon grape, salmonberry, and sword ferns are often found in the understory of forested areas, while snowberry and ocean spray are often found in the drier areas. Arbutus and Garry oaks are also commonly found growing alongside Douglas Fir. According to the BC ministry of Forests, the Coastal Douglas-fir Zone is home to a collection of ecosystems known as "Saanich", meaning the place of fertile soil. The Saanich ecosystems are restrained to a small portion of Canada and have all the components of a traditional Garry Oak ecosystem (Ministry of Forests, 1999).

Garry oak ecosystems are often composed of a combination of open and closed woodlands, grasslands, rocky shallow soils and coastal bluffs. Furthermore, these associated sites are often found in areas where disturbances such as fire as expected to

occur. This type of Ecosystem can be found from the southwest corners of British Columbia down to southern California, however are only present on the southeast of Vancouver Island and other nearby Gulf Islands within the Canadian borders (Parks Canada, 2013). Garry oak ecosystems are very high in biodiversity and contain a multitude of threatened and endangered species. Species at risk are identified by the expectation that they will become extirpated or extinct if nothing is done to reverse the negative effects of invasive species, and additional human impacts. Therefore Garry Oak ecosystems prove to be an ecosystem worth restoring in order to maintain this type of biodiversity in Canada (Garry Oak Ecosystem Recovery Team Society, 2013).

INTRODUCTION OF PLANT SPECIES

Arbutus

The arbutus is a deciduous tree which can grow to a height of 30 meters. It grows mostly in coastal areas on dry, sunny, rocky sites. It is easily distinguishable by it's red flaking bark. Arbutus is often associated with Douglas fir and Garry oaks and is therefore a common species in Garry Oak ecosystems. Interestingly, the Arbutus is Canada's only native broadleaved evergreen tree, Arbutus produces small clusters of yellowish white flowers. The berries are edible however have minimal flavours and are not widely eaten. The bark of the tree can be used as a tea, to treat colds, stomach problems and tuberculosis. A combination of the leaves and bark have also been used as a basis for contraceptives.

Camas - Camassia quamash

Camas grows is a perennial plant which emerges early in the spring and grows to a height of up to 1 meter. Camas grows wild in moist meadows, preferring full sun to partial shade. Camas has been widely eaten by coastal first nation, as a very nutritious staple root vegetable. It is important to note that the white flowered Death camas species is extremely toxic and cannot be consumed like *Camassia.* However, very small portions of this poisonous camas has been used as a numbing agent to treat toothaches, sprains and bruises. Camas bulbs can be used as cough medicine by boiling down the bulbs to make a thick juice. A decoction of the root can also be used to induce labor.

Evergreen Huckleberry (Vaccinium ovatum)

This slow growing evergreen shrub can grow from 2 to 4 feet in both height and width. It prefers full sun to part shape and is often found in coniferous forest, especially edges or opening, on the beach fringe in the salt spray zones. This evergreen shrub produces pinkish-white flowers in mid spring, and black coloured berries in the summer. Tea made from the leaves of evergreen huckleberry can be given to women after childbirth in order to regain strength. A decoction of the leaves has been known to aid in the treatment of diabetes.

Fireweed- Epilobium angustifolium

Fireweed is a robust perennial herb which grows to a height of 1 to 3 meters. It is often found in streamside and upland habitats, and often found in disturbed sites. Fireweed produces pink edible flowers which can be made into a delicious jelly. New shoots can be cooked or eaten raw as greens. The leaves can be used to make tea, and can also be used as a poultice to apply to skin to treat rashes, burns, bee stings, aches and swelling from arthritis (Gwich'en Social and Cultural Institute, 2002).

Flowering Currant

This medium growing upright deciduous shrub can grow to a height between 3 to 9 feet with a spread of 2 to 4 feet. It prefers full sun to partial shade, and is often found in dry open woods, rocky slopes and previously disturbed sites. This is a hardy drought resistant plant. Although the berries are edible, they are not tasty and therefore are rarely eaten.

Garry Oak-*Quercus garryana*

This drought tolerant deciduous tree can reach a height of approximately 20 meters. This tree is delicate in that it is easily taken over by the Douglas Fir, and therefore depends on disturbance in order to persist in an area. The Garry oak is often found in open meadows, and rocky slopes along the Pacific Coast. The acorns are technically edible, however are very high in poisonous tannins which need to be leached from the fruit before consumption. Tannins can be removed by soaking the acorns in several changes of water. The acorns can then be used to make a dense flour. The bark decocted to make a tincture useful for treating tuberculosis however it is important to note that both the bark and shoots are inherently poisonous due to high tannin levels (Turner, 1995).

Kinikinik-Arctostaphylos uva-ursi - Kinnikinnick, Bearberry Ericaceae (Heath Family)

The slow growing spreading evergreen ground cover can reach a maximum height of 4 to 6 inches, with a spread of up to 15 feet. It prefers sun and partial shade, often found in sandy, well drained exposed sites on dry rocky slopes and dry forest. This groundcover plant is highly adaptable, but requires adequate drainage to succeed. Kinnikinnick produces pinkish white flowers in spring, followed by edible red berries in the fall. Although the berries are edible, they are mealy in texture. Traditionally, First nations used the leaves of the plant to smoke as a replacement for tobacco (Kuhnlein & Turner, 1991).

Ocean Spray

This medium growing vase-like deciduous shrub can grow to a height of 8 to 12 feet. It prefers sun to partial shade in both dry and moist open sites, in woods, thickets, and coastal bluffs. This shrub is a hard, drought tolerant plant which can grow successfully almost anywhere. Creamy white flowers are produced in the summer. The clusters of flowers are great for attracting pollinating insects and birds and is therefore a plant important for supporting biodiversity. The wood is extremely hard, and has traditionally been used for carving. An infusion of the flowers has been known to treat diarrhea, and ease symptoms of measles and chicken pox.

Oregon Grape: Mahonia nervosa / Mahonia aquifolium Berberidaceae (Barberry Family)

This evergreen shrub is found in dry, open and rocky areas. It can grow to a height of 3 feet tall and spread to approximately 5 feet. Yellow flowers are produced in late spring, followed by the production of dark blue berries. The berries are edible but are also quite tart, and therefore are often mixed with other berries when consumed. The bright yellow inner bark of this plant can be used to make a vigorous dye (Turner, 1995).

Red huckleberry (Vaccinium parviflorum)

This upright deciduous shrub can grow to a maximum height of 12 feet, with a total spread of 4 to 6 feet. It prefers partial to full shade in coniferous forests, usually under canopy. This shrub produces small bell flowerings in the spring, and edible red huckleberries in the summer. The juice of the berries can be consumed to stimulate appetite. The bark can be used in a decoction, gargled to treat for sore throats and inflamed sums. The leaves can also be used for tea (Turner, 1995).

Salal- Gaultheria shallon - Salal Ericaceae (Heath Family)

This medium growing evergreen shrub can reach a height of 10 feet. Often found in coniferous forest, on rocky bluffs and on the seashore. This is an extremely hardy, drought tolerant plant. This evergreen shrub produces flowers during spring, with mature edible berries produced throughout the summer. The leaves can be chewed to act

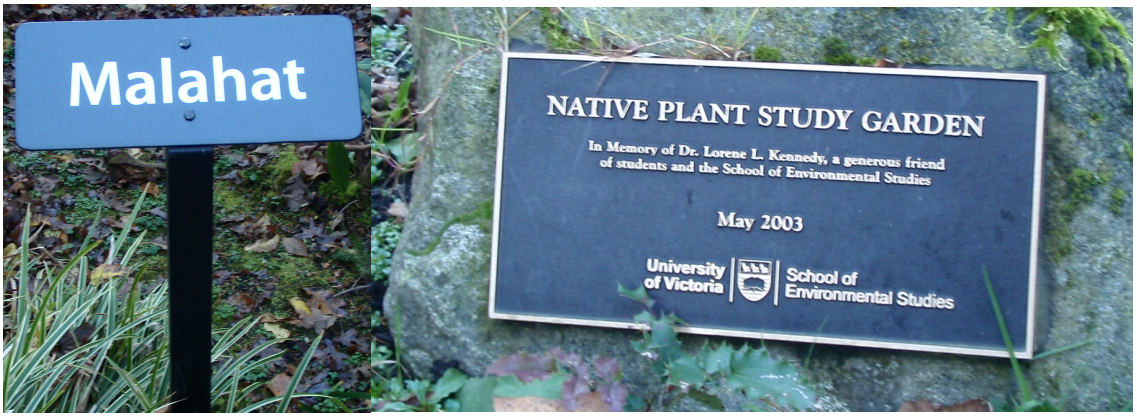
as a hunger suppressant and also encourages salivation. The leaves can be used to make tea useful in treating diarrhea (Turner, 1995).

Thimble Berry- Rubus parviflorus - Thimbleberry Rosaceae (Rose Family)

This shrub can reach a height of 10 feet tall and is usually found in open areas, shorelines, and low density forests. This plant produces bright red edible fruit in mid to late summer. The berries can be eaten raw or dried, and make a superb jelly. The young shoots of the plant can also be cooked or eaten as a raw green vegetable. Both the berries and young shoots are rich in vitamin C. A tea made from the leaves can be used as a tonic to clean the blood, alleviate nausea, and tone the stomach. It is also successful at treating diarrhea, dysentery, and anaemia. A poultice of the leaves can be used topically to treat wounds and burns (Turner, 1995).

SIGNAGE

To fulfill our goal of creating educational plaques we will be implementing signage next to the species planted and the existing trees. These signs will be supplied and engraved from Heritage House Trophies on stainless steel plates with black impressions. We chose stainless steel because it is the most resilient to weather and is less likely to be stolen or tampered with. The plaques are 4" x 8" and finished on Cerdec black laser engraving (John, Heritage House Trophies, personal communication, November 22nd 2013). Our goal is to introduce signage similar to the existing ones already on campus. Attached to this document are images of the current native plant garden signs to provide an example of what the Elliott garden may look like once completed. These pictures were taken from the Segewick building and Finnerty gardens November 2013.



SIGNAGE SCRIPT

Arbutus - *Arbutus menziesii.* astringent berries edible if cooked. Traditionally, chewing leaves treated colds and sore throats. Bark and leaf infusion treated bladder infections, stomach aches, cramps and colds.

Camas - Camassia quamash. Edible Bulbs which must be cooked in order to digest. Boiling the bulbs to make a thick juice can be used to as a cough medicine.

Evergreen Huckleberry - Vaccinium ovatum. Tea made from the leaves can be used as a decoction to treat diabetes.

Fireweed - Epilobium angustifolium. Pink edible flowers. New shoots can be harvested and raw or cooked. A leaves can be used to make a poulice, useful for treating rashes, burns, bee stings, aches, and arthritis.

Flowering Currant - *Ribes sanguineum.* Produces edible berries, however do not have an attractive taste.

Garry Oak - *Quercus garryana.* The only oak native to B.C., common in southwestern B.C. and southern Vancouver Island. Keystone species of Garry Oak ecosystem.

Kinnikinnik - Epilobium angustifolium. Evergreen groundcover. Edible red berries. The leaves can be dried and smoked as a replacement for tobacco.

Oceanspray - *Holodiscus discolor*. Small dry fruits can be eaten raw or cooked. Straight young shoots exceptionally hard wood, used to make arrow, harpoon and spear shafts. Leaves or dried seeds' tea used to treat influenza, bark tea used to treat internal bleeding, diarrhea, stomach upset, flu and colds.

Oregon Grape - Mahonia nervosa / Mahonia aquifolium Berberidaceae. Tart, edible berries. The bright yellow inner bark of this plant can be used to make a vibrant dye.

Red Huckleberry - Vaccinium parviflorum. Red edible berries. The juice of the berries can be used to stimulate appetite. The bark can be used as a decoction to treat sore throats and inflamed gums. The leaves can be used to make tea.

Salal - *Gaultheria shallon*. ubiquitous, sweet berries essential for many Aboriginal Peoples. Chewing leaves suppresses hunger, and leaf tea acts as tonic for diarrhea, coughs and tuberculosis. Leafy branches used as fuel for pit-cooks.

Thimbleberry - Rubus parviflorus. Edible berries, very high in Vitamin C. Tea made from the leaves can be used as a tonic to clean the blood, alleviate nausea and tone the stomach. Also useful for treating diarrhea, dysentery and anaemia. A poultice made from the leaves can be used topically to treat wounds and burns.

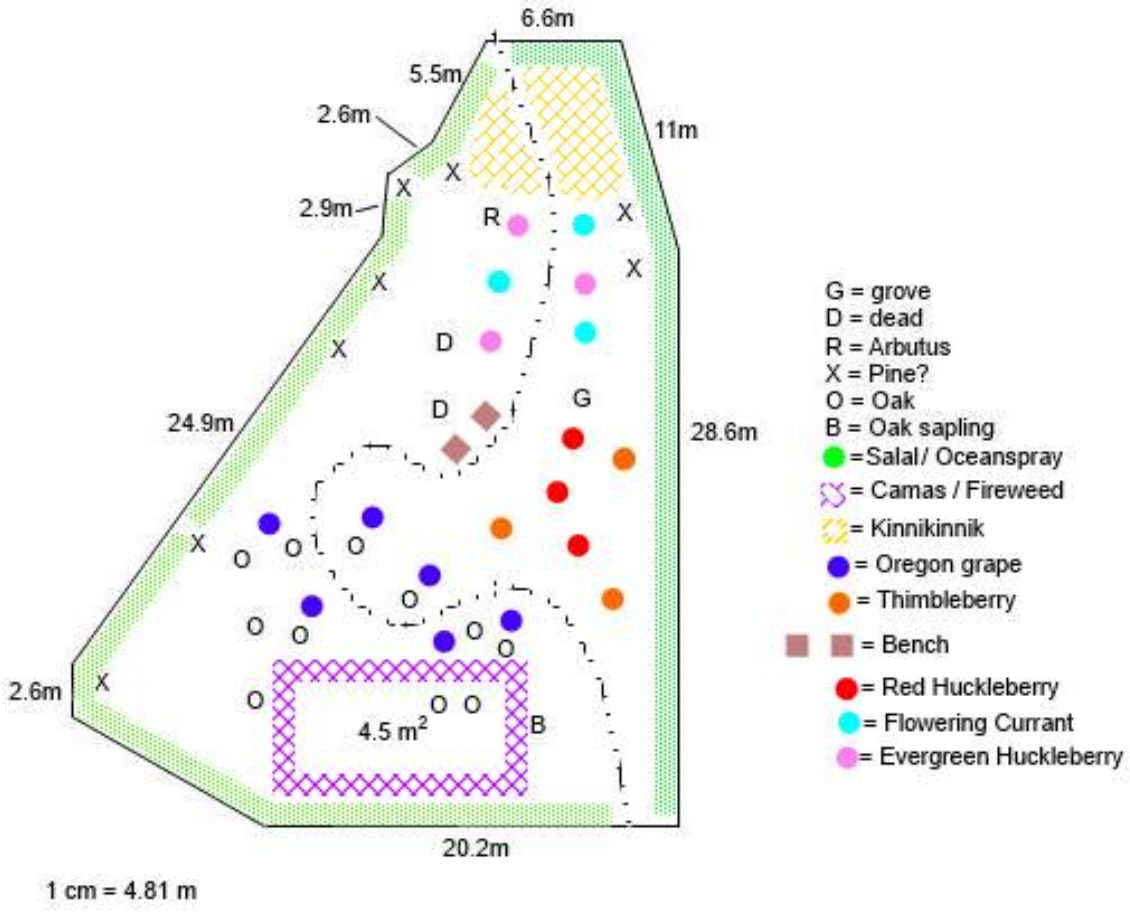
MATERIALS REQUIRED

- Shovels (for each volunteer)
- Gloves (for each volunteer)
- Chicken wire (20 meters)
- Stakes (60 stakes to hold chicken wire)
- Gravel (for pathway)
- Bench
- Plants

- Signs

- Bobcat (to create path)

MAP OF ELLIOTT GARDEN AREA AND PLACEMENT OF PLANTS



BUDGET

Gravel ($30.55/yard*7 yards)	$213.85
Gravel Delivery	$65
Bench	$450
Labour (36.58/hour*12 hours)	$438.96
Signage ($35/sign*10 signs)	$350
Sign transportation	$0
Chicken Wire	$53.37
Camas (12.99/gallon*2 gallons)	$25.98
Evergreen Huckleberry (9.99/gallon*3 gallons)	$29.97
Flowering Currant (9.99/gallon*3 gallons)	$29.97
Kinnikinnik (3.69/gallon*16 gallons)	$59.04
Ocean Spray (9.99/gallon*25 gallons)	$249.75
Oregon Grape (10.99/gallon*6 gallons)	$65.94
Red Huckleberry (12.99/gallon*3 gallons)	$38.97
Salal (9.99/gallon*25 gallons)	$249.75
Plant Transportation	$0
Planting Labour	$0
Additional Labour	$0
TOTAL	**$2320.55**

OVERVIEW OF BUDGET

The gravel and path base will be supplied from Trio Gravel Mart Ltd. and delivery to the university may be done by this same company for an additional fee. (Trio Gravel Mart Representative, personal communication, November 20th 2013). Path construction and bench placement will be organized and facilitated in conjunction with the Facilities Management Department and labour costs are shown above.(Rhonda Rose, personal communication, November 20th 2013). Signage will be supplied and engraved by Heritage House Trophies and may be picked up by one of the volunteers for no extra cost. (John, Heritage House Trophies, personal communication, November 22nd 2013). Chicken wire will be placed around the berry bushes for the first growing season and may also be picked up by a volunteer for free. Plants will be collected from Russell's Nursery and because the order is over $500 the project may qualify for a 40% discount (Susan Tice, Russell's Nursery, personal communication, November 12th 2013). This would lower overall costs by approximately $300, making the grand total just over $2000. This discount has not physically been applied in the chart above because it is under the discretion of Russell's Nursery. Transportation of plants will be conducted by volunteers and be of no cost as we will rely on their vehicles for this service. Volunteers will do the physical planting of species and materials like shovels and gloves will be supplied via the Management Department. All other costs are located in the diagram on the previous page. Additional costs may be apparent in the future but will depend upon management strategies and potential threats and therefore cannot be placed explicitly in this projection.

FUNDING

To fund this project we will apply for grants, ask for donations, and count on community help by volunteers. We may potentially work within the UVic Sustainable Grants program and receive up to $500 for this project (University of Victoria Sustainability Project, 2013). This project will also be opened up to the surrounding community by asking for any donations or help from other sustainability groups and environmentally friendly projects. We may call upon university alumni for additional help with this project if all funds are not met, and will continue to do so until then. Costs have been minimized by the continued use of volunteers which will be administered for monitoring and labour. We may propose an application to the Alumni Association addressed to the Grants and Awards Committee for further funding.(Alumni Association, 2013). Coordination between other sustainability groups may also be of a benefit, for example the Environmental Sustainability Council, and UVision; the student society's environmental plan. This way, we may extend our ideas further and recruit more volunteers. We will also work together with the Environmental Volunteer Network which will suffice the need for many determined volunteers.

MEASURING SUCCESS

The long-term goal for the Elliott Native Plant Garden is to modify this space into a welcoming and educational garden that provides food and knowledge about native

plant species. There are a number of interim goals that represent the stepping stones along the way. First is the successful inputting the full range of plant species chosen and, if applicable, their protective chicken wire. Second is the removal of this chicken wire following the growing season; this protective wire would facilitate the plants' establishment, and be removed afterwards as the risk of browsing would be reduced. Monitoring of the garden would occur following both the implantation and the removal of the wire. Third is the observing and recording of further growth of reintroduced plants in the next growing season. This last step would signify that our efforts have likely adjusted the trajectory of the Elliott Garden ecosystem to one that will lead to our imagined garden. We can monitor certain qualities of the garden to serve as proxies for the garden's health.

The outcomes that would signify positive change in the trajectory of Elliott Garden are the recolonization of native plants in Elliott Garden and the space's use by students as an educational refuge. To measure the former aspect we would monitor several qualities of the transplanted species. This would be performed in two phases of our project's timeline: monitoring 1, which follows the reintroduction of plants and their protective chicken wire, and monitoring 2, the period after the removal of the chicken wire. First, as a gross indicator, we would note their presence or absence as this would show whether or not they had been able grow in the Elliott Garden. If they were not able to, this may be due to some combination of poor environmental conditions and competition from invasives. Second, we could study their growth rates intraspecifically, interspecifically, and locally. Vertical growth would be measured for the shrubs,

horizontal growth for kinnikinnik, and density for herbaceous camas and fireweed. Both intraspecific and interspecific analyses of growth rates could be performed with knowledge of their average rates of growth, provided by nurseries. Comparing growth by species would reveal how well suited a certain species is to the habitat, while comparing by location could give us insight into local conditions such as nutritive soil content. If, for example, several species grew well in one corner of the Garden but were stunted in another, this would indicate that the chosen species may not be well suited to certain areas of the Garden. Through gathering these data, we could implement adaptive management in which we incorporate the lessons learned to place plants in areas that they are better suited to. The Garden's use by students and faculty is the latter aspect of success, and would be more of a qualitative assay. This could be accomplished by observing, in person, the presence of students and staff in the garden, and note when visitors gather fruit from the plants or read the signage.

An additional component of monitoring would be checking for external negative influences on native plant health, such as deer browsing, vandalism or littering. The effect of the introduction of White-tailed Deer lead to a reduction of woody plant species diversity (Holmes *et al.,* 2008). Deer browsing would be easy to recognize: shrubs and bushes would be nibbled down to nearly the ground. Unfortunately, there is little that we can do to prevent the deer's potential presence, and they are able to eat many of the chosen native plant species. They are able to overcome the fencing boundary that surrounds Elliott Garden. Further, though the presence of students seems to deter deer from entering the heart of the University of Victoria, the lack of students and faculty

during late evening and morning may open the campus to populations of browsing deer. Our hope is that the current population density of deer and subsequent browsing effects are much lower than that of rabbits five years previously. If this holds true, our project may not be compromised by the severe browsing that decimated the native shrub layer planted by the past restoration group. The frequency of vandalism and littering is dependent on who uses the garden; judging by the other gardens on campus, we feel that this should not pose a problem for Elliott Garden.

VOLUNTEER OPPORTUNITIES

For this project to be tangible, it is essential to acknowledge the necessity of volunteers. Volunteers will help mobilize this project in a multitude of ways including site preparation, planting, assessment, and ongoing monitoring of the space. Volunteers are an important component in the long term success of the space not only by physically managing the space but by encouraging individuals to become connected to the space, creating a larger body of advocacy for the restoration project in the long term. Furthermore, the inclusion of volunteers will inevitably reduce labor costs and therefore reduce the entire cost of the project. Although anyone could contribute their time and efforts as a volunteer on this project, individuals with horticultural skills and general understandings of plant and/or restoration ecology would be an asset. An ideal spot for recruiting these types of volunteers would be within the departments of geography and environmental studies at UVic. By visiting classes or putting up flyers it

would be possible to recruit the volunteers necessary to implement this project. It will be necessary to hold a training day in which volunteers are informed on the goals and objectives of the project, how they will be managed in the long term and the role of future volunteers. For individuals wanting to be involved in the project over the long term, it would be necessary to have already organized collaboration with grounds management in order to ensure that volunteers and university staff are informed on the management needs of the space in the future.

In order to mobilize the objectives of this project, the primary volunteers will be the four authors of this document. Throughout phase 1-5 described in the Project timeline, we hold ourselves responsible for recruiting and organizing additional volunteers, preparing the space, acquiring the necessary materials and plants and delivering them to the space, planting and protecting the new species, and engaging in the primary observation, evaluation, monitoring, and adaptive management processes.

CONCLUSION

The purpose of this project was to encourage engagement between people and their immediate environment with a focus on education of native plant species and their uses. By incorporating traditional uses of these native plants into the garden by the use of signs, we are stressing the importance of indigenous knowledge historically embedded in the land in the Victoria area. The pathway, signs and bench clearly portray the goals

and objectives laid out in the project design, and the plants were strategically chosen to allow for optimal growth and success. This project heightens the values of the University of Victoria and helps to relay these values to the general public. With this project, we hope to educate people and inspire a deeper connection with nature and the traditional uses of native plant species.

FUTURE RECOMMENDATIONS

Future monitoring will be required, and our group members have expressed interest in seeing this project go through and are happy to become involved in the future monitoring and management plans. A survey of the student population may be conducted to determine the effectiveness of the garden and the sign information. Additional monitoring will be conducted by Facilities Management Department and coordination with volunteers.

REFERENCES

Alumni Association. (2013, November 21). *Grants*. Retrieved from University of Victoria: http://alumni.uvic.ca/grants.php

Berkes, F. (2008). *Sacred ecology.* New York, NY: Routledge.

British Columbia Ministry of Forests Research Branch. (1999). The Ecology of the Coastal Douglas-fir Zone. *Ecosystems of British Columbia Special Report Series #6.* Retrieved from http://www.for.gov.bc.ca/hfd/pubs/docs/bro/bro30.pdf

Garry Oak Ecosystem Recovery Team Society. (2013). Species at Risk. Retrieved from http://www.goert.ca/about/species_at_risk.php

Gwich'en Social and Cultural Institute. (2002). Fireweed. Plant Database, Retrieved from http://plants.gwichin.ca/node/25

Holmes, S. A., Curran, L. A., Hall, K. R. (2008). White-Tailed Deer (Odocoileus virginianus) Alter Herbaceous Species Richness in the Hiawatha National Forest, Michigan, USA. *American Midland Nationalist,* **159**(1): 83-97. Retrieved from http://www.jstor.org.ezproxy.library.uvic.ca/stable/20491314

Keenleyside, K., Dudley, N., Cairns, S., Hall, C., Stolton, S., Valentine, P. (2012). *Ecological Restoration for Protected Areas.* International Union for Conservation of Nature and Natural Resources. Retrieved from https://portals.iucn.org/library/efiles/edocs/PAG-018.pdf

Kuhnlein, H. V. and Turner, N. J. (1991). Traditional plant foods of canadian Indigenous Peoples. Nutrition, botany and use. *Molecular Nutrition & Food Research*. Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/food.19930370334/ abstract

National Parks Directorate. (2008). *Principles and guidelines for ecological restoration in Canada's protected natural areas.* QC: Parks Canada and the Canadian Parks Council. Retrieved from http://www.pc.gc.ca/docs/pc/guide/resteco/index_e.asp

Parks Canada. (2013). Species at Risk Act. Retrieved from http://www.pc.gc.ca/nature/eep-sar/index.aspx

Turner, Nancy J. (1995). *Food Plants of Coastal First Peoples*. Royal British Columbia Museum Handbook series. UBC Press.

University of Victoria: Grounds (2013, November 17). Office of Campus Planning and Sustainability. Retrieved from http://www.uvic.ca/sustainability/operations/grounds/index.php

University of Victoria Sustainability Project. (2013, November 15). *UVSP Sustainable Grants Program*. Retrieved from University of Victoria Sustainability Project: http://uvsp.uvic.ca/uvsp-sustainable-grants-program/

APPENDIX 1

Who Did What?

Emily- I focused mainly on the introduction, goals, objectives, conclusion and future recommendations. For the introduction I also incorporated parts of a paragraph Becky wrote on the background of the Elliott Garden Naturescape. Chris also contributed to the introduction by incorporating the traditional ecological knowledge aspect of our project. The goals and objectives sections were written by myself, however the general concepts were a collaborative effort as these were the main points of our project. The materials required list was a collaborative effort as well as the future recommendations, although written by myself, were a collaborative brainstorm effort. The title page and conclusion were done solely by myself. We also collectively brainstormed the plant list and placement of plants in the garden area, although I was not responsible for the specifics of either.

Becky- Plants - I focused on the research of both the native ecosystems associated with the Elliott Garden, including the Garry Oak ecosystem and the Douglas Fir. I was also responsible for putting together the medicinal and edible functions of the various plants and then converting that information into the signage scripts. I wrote a small piece of the background of the initial creation of the Elliott garden and a piece on volunteer opportunities associated with our project. As mentioned by Emily, there are also other pieces which were a collaboration of the whole group.

Chris- I created the map and timeline graphics with a computer program, paint.NET. I wrote the "measuring success" and "project timeline" sections, as well as engaged in group discussions that lead to the "goals and objectives", "materials needed", and "future recommendation sections". In addition, I was involved in the groupthink that produced our ideas of where to place which native plants in the garden.

Helen- My focus was mainly on the budget and funding section as well as communication between outside parties. I collected information on the pricing of all materials needed and emailed and called all the various groups we will be working with. Throughout the project i have contacted Trio Mart Ltd. , Heritage House Trophies, The Sign Pad, and many of the plant suppliers including; Swan Lake Nursery, Russell's Nursery, and Saanich Native Plants. I called all the businesses and companies in the area to get competitive pricing so the cost of our project could be kept to a minimum. I also kept in contact with Rhonda Rose of the grounds department, Bently Sly of Environmental Services, and David Perry the Director of Capital Development. I contributed to other aspects of this project although I did not specifically write the sections including native plant species and materials needed among others. I also took pictures around campus of the different signs used and created the short powerpoint presentation we will be giving on Thursday.