

Lorene Kennedy Garden: Back to the Basics

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Our group would like to thank:

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Barry Gates – Malahat Ecoforest Consultants

1.0 Introduction

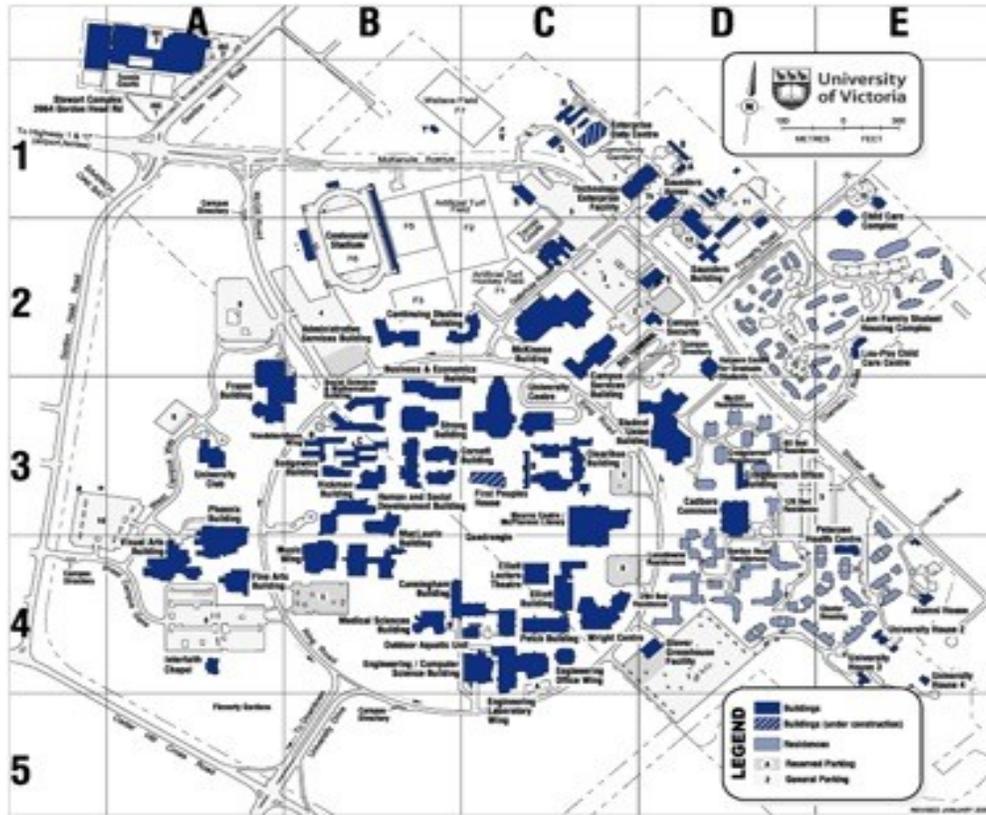
The Lorene Kennedy Native Plant Garden was a project initiated as a combined effort between the Environmental Studies department and Facilities management in 2003. It was planted in memory of the noted botanist Lorene Kennedy and her countless contributions to her field. We have each compiled a set of recommendations and ideas to restore, ameliorate, and exhaust the endless potential of this natural space, this naturescape. Tucked away between the Harry Hickman and Sedgewick buildings, this garden often goes unnoticed and we hope to bring positive attention towards it through our restoration efforts.

Our goal is to achieve a self-regulating natural space that is functioning, beautiful, and an example for future landscaping efforts. We hope to connect individuals to nature and to the campus in the process, because without community support and interest a project like this could go nowhere. The need for maintenance of this naturescape will hopefully diminish over the years becomes more mature and stabilized. Through our monitoring process we will see what works and what does not work, and we can adjust our involvement accordingly.

We hope to see a bright future for the Lorene Kennedy Native Plant Garden through the implementation of our restoration recommendations.

2.0 Site Description

2.1. Location



The University of Victoria resides at 48° 28' N and 123° 19'W on southern Vancouver Island, British Columbia, Canada. The Lorene Kennedy Native Plant Garden is situated between the Sedgewick Building and the Hickman Building, located within the Bowker Creek watershed boundaries (Harrop-Archibald, 2007) just inside Ring Road on the Northwest side of Campus.

2.2. Site History

The Uvic Campus, and the site of the Lorene Kennedy Native Plant Garden, lie on the traditional territories of the Straits Coast Salish peoples. For thousands of years Straits Coast Salish communities practised controlled burning and harvesting food plants such as camas on the land that now hosts Uvic's campus (ES 423 notes, 2009). Prior to European colonization, the vegetation in the surrounding area would have been a predominantly black cottonwood over

story in the riparian zone and Garry Oak and Douglas-fir ecosystems within the Bowker Creek watershed area. The landscape, managed by the Lekwungen people, would have been a much more open landscape rich in biodiversity (Harrop-Archibald, 2008).

After the painful process of colonization, in the late 1800's to mid 1900's the site of the Uvic campus was altered drastically. It was ravaged first by logging and farming and then used as training grounds for the military. Second growth forest and several fires around the turn of the century also contributed to changes in the areas ecosystems (Harrop-Archibald, 2008).

Over the years, the landscape now known as the Uvic campus played host to an air landing strip 1500 ft long around 1932 (figure 2), the Officer's Training Centre of Western Canada from 1940-1943("The Changing Face...", 1999) and to the Head Army Camp and Veterans Emergency Housing ca 1959 (figure 5). At this time the location of the Lorene Kennedy Native Plant Garden was forested land owned by The Hudson's Bay Company ("The Changing Face...", 1999).

In 1962 the construction of the University of Victoria Gordon Head Campus began (figure 3), and by 1963 the first buildings were established. The Sedgewick Building was not completed until 1975 thus, in 1963, the Lorene Kennedy Native Plant Garden site likely remained forested (This can be confirmed by the aerial photo in figure 6).

In May of 2003, the Lorene Kennedy Native Plant Garden was constructed between the Sedgewick and the Hickman Buildings ("Learning blossoms with...", 2003). Dedicated to the noted botanist Lorene Kennedy, the Environmental Studies department worked with facilities management, to transform the space into a naturescape ("Learning blossoms with...", 2003).

3.0 Current Site Analysis

3.1 Biotic Conditions

In order to provide context and describe current ecological and cultural conditions of the site, a current site analysis of the biotic, abiotic and cultural conditions follows. Within the primary site, plant species including Salmon berry, Licorice fern, Oregon grape, Lady fern, Garry Oak, Indian Plum, Dogwood, Evergreen Huckleberry, Snowberry, Strawberry, Arbutus, Twinberry, Dandelion, Nootka Rose, Cups, and 's Mantle have been noted (figure 10). There is a large range of species native to a vast array of different ecosystems all within the same space. Many species are outgrowing the boundaries of the garden and seeds have found their way both into and out of the garden from neighbouring vegetation. Adjacent to the site, the Hickman landscape contains many of the same native species as the garden itself. This landscape also contains invasive species such as Lady's mantle that have worked their way in to the centre site (John Mitchell, personal communication, November, 2009). On the other side of the garden, bordering Sedgewick, Pacific crab apple, Red osier dogwood, Douglas-fir, Oregon grape and many assorted ferns grow abundantly.

At one point in time Gordon Head was home to large mammals such as elk, wolves, bear and cougar. Currently these large game are gone and little information exists regarding vertebrate and invertebrate species on campus. Probable species residing on Uvic grounds include the house mouse, deer mouse, Norway rat, raccoon, black-tailed deer, grey squirrels, garter snakes and European rabbit (-Archibald, 2008).

Many types of birds found on campus at one time rely on low shrubs for foraging including warblers, vireos, flycatchers, Spotted Towhees, Golden-crowned Sparrow and Fox sparrow. The Downy Woodpeckers and Band-tailed Pigeons are also reliant on Garry Oaks while others still rely on arbutus (-Archibald, 2008). of these types of vegetation are found in the native plant

garden.

3.2 Potential Problem Species

As noted by John Mitchell (personal communication, November 2009), many species in the native plant garden are outgrowing the designated area. Twinberry and Strawberry have been kept at bay by grounds but ideally we would be able to let them grow naturally. Invasive plants such as 's mantle spreading into the site may be a problem without regular weeding. Another species of concern is the European rabbit. Evidence at the site suggests that rabbits are present and foraging in the garden. They may prevent the growth of new plants and do considerable damage to the existing vegetation. Rabbit burrows were not noted at this time but may be an issue in the future especially with the onset of site disturbance during restoration efforts.

3.3 Rare, Threatened and Endangered Species.

The native Douglas squirrel seems to have disappeared altogether from the Uvic campus, possibly replaced by the grey squirrel (-Archibald, 2008). Although camas was originally planted in the garden in 2003 we have not observed any evidence of camas being present today. This is a very important staple of the Garry Oak ecosystem and culturally significant food for the First Nations people of the area.

3.4 Abiotic Conditions

The Lorene Kennedy native plant garden, situated in the Coastal Douglas-fir Biogeoclimatic Zone, lies in the rain shadow of the Olympic Mountains and the mountains of Vancouver Island. Located at the junction between buildings, it is one of the natural areas at Uvic. Slightly raised at the centre and sloping down towards the borders, the garden receives approximately 70 cm of rain annually (-Archibald, 2007). In addition, the area's moderate climate creates ecosystems high in productivity. The garden itself is irrigated although the

frequency and duration of watering is not known at this time.

Lying within the Bowker Creek groundwater boundaries, the garden is one of the university's natural areas. The campus slopes slightly from west to east but the majority of the natural areas are on flat or low lying areas that contribute to water storage and may retain storm water (-Archibald, 2007). Due to an increase in impervious surfaces on campus (23.5% of campus covered) the runoff has doubled from 1956-2004 (-Archibald, 2007).

The soil composition of the garden site consists of the original native Uvic soil that is generally a clay-based soil mixed with bark mulch. Further testing of soil composition may be done as outlined in the methods section. Geologically, the native plant garden is in the area of campus lying on the edge of the drumlinoid ridge. It consists of Victoria Marine Clay, a very stiff to hard clay near the surface but increasingly soft at a depth of around six metres. In thickness (< 5 m to > 8m), the clay deposits are relatively impermeable. Beneath the Victoria Marine Clay lies bedrock (-Archibald, 2007). The eastern side of campus consist of a drumlinoid ridge of Pleistocene deposits. Consisting of silt clay till mixed with sand, the upper layer is relatively impermeable Vashon till. Beneath the till layer, the interglacial Quadra layer consists of dense silty sand and poorly graded sand. Above the Vashon Till, a thin layer of superficial beach lag silty sand easily saturated in the winter covers some areas (-Archibald, 2007).

3.5 Cultural conditions

Weeded and watered by grounds, the Lorene Kennedy native plant garden provides an array of native plant species and edible berries for the perusal of all who pass by it. Although full of native plant species, people are directly responsible for the upkeep and maintenance of the landscape. Had they not been planted together, the many different plant species growing in the garden would not all naturally occur in the same ecosystem. While it provides the opportunity

for students to study plant species, it is currently heavily reliant on human interference.

Upon restoration, the garden will provide an opportunity for ES students to monitor and evaluate the success of the project continuing the adaptive restoration project. The garden will be a project for students to study in the future and will create a native plant ecosystem connecting green spaces on campus. Students using the path leading through the space will view the native ecosystem and if savvy may enjoy an edible berry or two.

4.0 History of the Lorene Kennedy Native Plant Garden Restoration Project

4.1 Summary of Previous Restoration Efforts

In 2003, the Lorene Kennedy native plant garden was established as a combined effort between the School of Environmental Studies and facilities management ("Learning blossoms with...", 2003). The guiding concept of naturescape is a landscaping concept, emphasizing restoring, preserving and enhancing wildlife habitat in both urban and rural areas alike. The idea for the space was to create new habitats for wildlife using native species, reduce the need for excessive watering and ease the use of chemical pest control (Uvic communications, 2009). According to John Mitchell (personal communication, November, 2009), the project's focus was to see what could be done with all native species. Original plans also included providing a sense of place for students, giving them the opportunity to put field skills to use while enhancing and restoring native ecosystems on campus ("Learning blossoms with...", 2003).

John Mitchell of facilities management stated that grounds had very little involvement with the original planting and creation of the garden. At the onset, they were involved in laying the sidewalks, depositing the dirt, and positioning some rocks. The majority of the garden was planted by volunteers. It contained indigenous plants such as Garry Oak, ocean spray, huckleberries and sedum ("Learning blossoms with...", 2003). were put up explaining the naturescape concept. Afterwards, John Mitchell put in four or five arbutus trees, fern, cornice, twinberry, camas, satin flower, sedum and moss (unknown species).

Since then, the signs have been removed and a plaque commemorating the garden was presented by the President of Uvic: David Turpin. Periodic weeding and maintenance has been ongoing but no further planning or development has been implemented (Eric Higgs, personal communication, November, 2009).

4.2 Previous Restoration Challenges and Future Suggestions

Quantifying and verifying success in achieving objectives of the original plan for this project is difficult. Without clear policy, goals, and objectives we have little insight into the success or failure of the plan. No original plans are available to establish a reference point with which to monitor and evaluate the goals and criteria for success of this project. The information regarding original plans in this paper is derived solely from newspaper articles and interviews. Species lists and a photograph from the garden in 2003 were also acquired this way (see figure 9).

Information obtained from John Mitchell suggests that there are some flaws to the original design. Four or five arbutus trees were planted in the fall of 2003, yet only one remains and in poor condition (the trunk is blackened). Another problem outlined by Mitchell is the size of the garden. The plants, he says, are too strong, or too big for the area. Grounds does a lot of pruning and the strawberry, twin berry and cornice has to be “held back”.

In addition to the pruning done by grounds, there is evidence of rabbits feeding on the low-lying plants. A rabbit fence may help vulnerable plants and new plants’ survival rate in the future.

Suggestions for future restoration projects include documenting all restoration projects in detail for further reference, researching site conditions and creating as close to a natural landscape as possible, and monitoring and adapting the restoration plans over time.

Figure 1.



Image: Bowker Creek watershed

Figure 2.



Image: Gordon Head air landing strip (1500 ft long) September 8, 1932.
Source: National Air Photo Library, A4517-57

Figure 3.

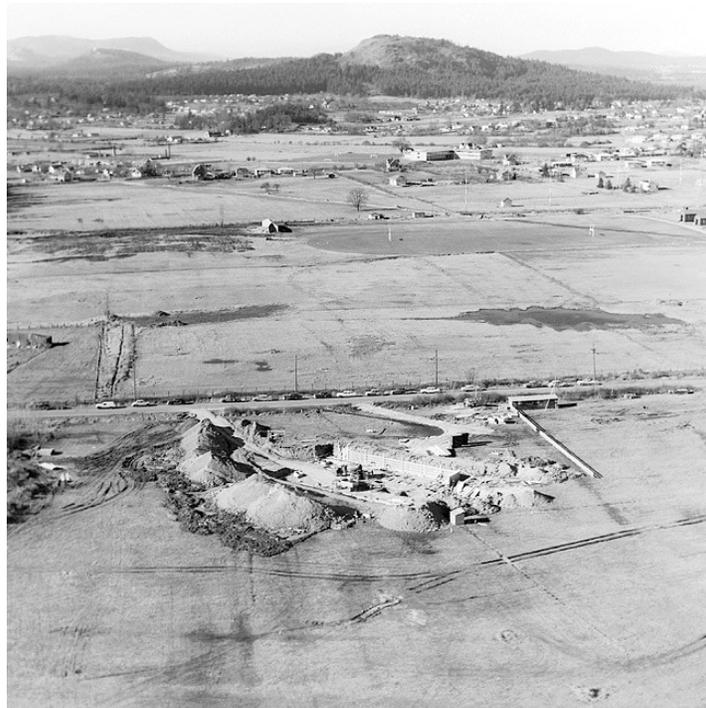


Image: Aerial view of the Gordon Head campus showing the excavation for the Clearihue Building, the first building on campus, March 12, 1962

Source: George N.Y. Simpson photo, UVic Archives 46.107.

Figure 4.



Image: An aerial view of the University of Victoria campus lands in October 1964, showing the Elliott Building, McPherson Library, Clearihue Building, the residences and the Student Union Building.

Source: J.J. Phillion photo, UVic Archives 20.103.

Figure 5.



Image: Gordon Head Army Camp and Veterans Emergency Housing on the West side of Finnerty Road.
Source: Maps BC 2144-76.

Figure 6.

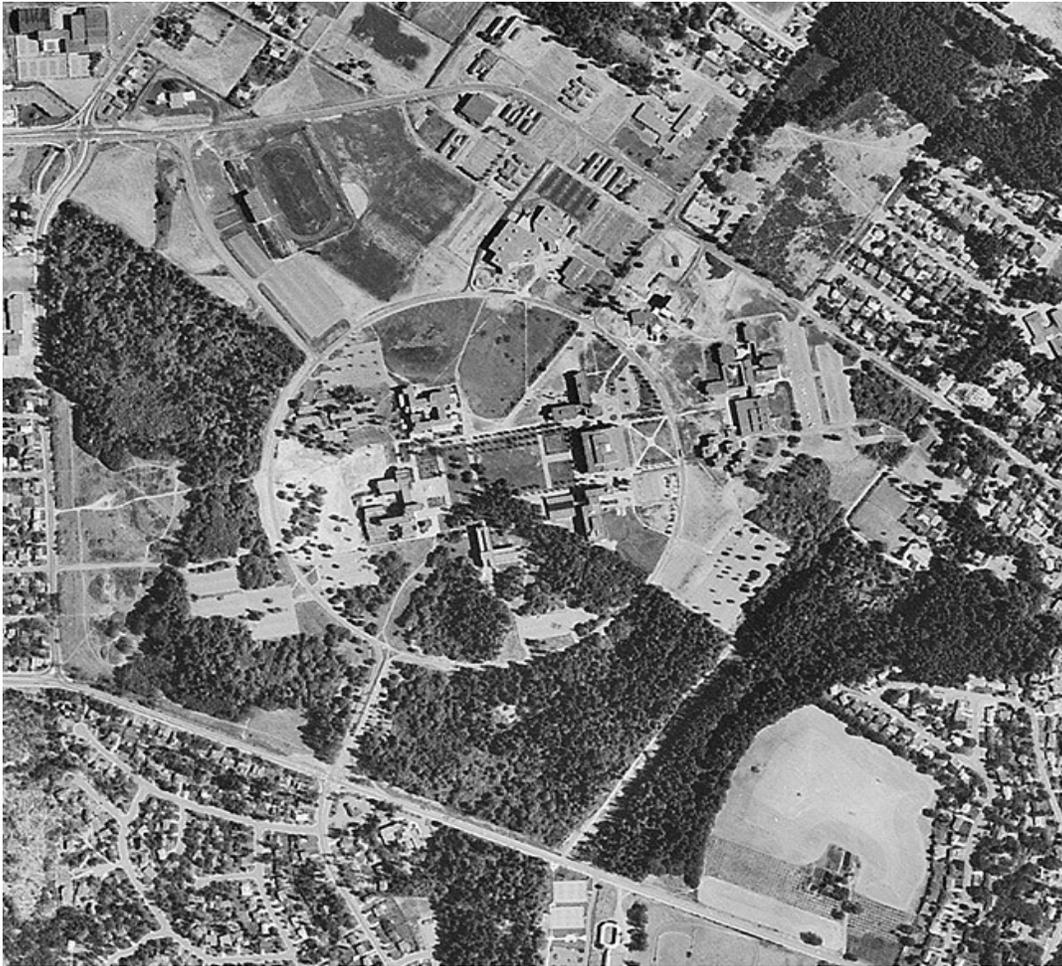


Source: Maps BC 5091-267.

University of Victoria Campus Lands, 1964

Image: Construction of the Ring Road, Clearihue, McPherson, Elliott, and student housing. Student Union Building is the only complete building. Finnerty Road still open through the middle of the quadrangle.

Figure 7.



Source: Maps BC 7760-267.

University of Victoria Campus Lands, 1975

Image: Finnerty Road closed, and Centennial Stadium and track completed. Clearihue Building and McPherson Library expanded. Cadboro Commons, Lansdowne Residences and Cunningham Building completed. University quadrangle landscaped and Sedgewick completed. McKinnon Gymnasium and Saunders Buildings completed.

Figure 8.



Lorene Kennedy native plant garden 2003
Source: <http://web.uvic.ca/sustainability/buildings.php>
Retrieved: November 18, 2009

Figure 9.

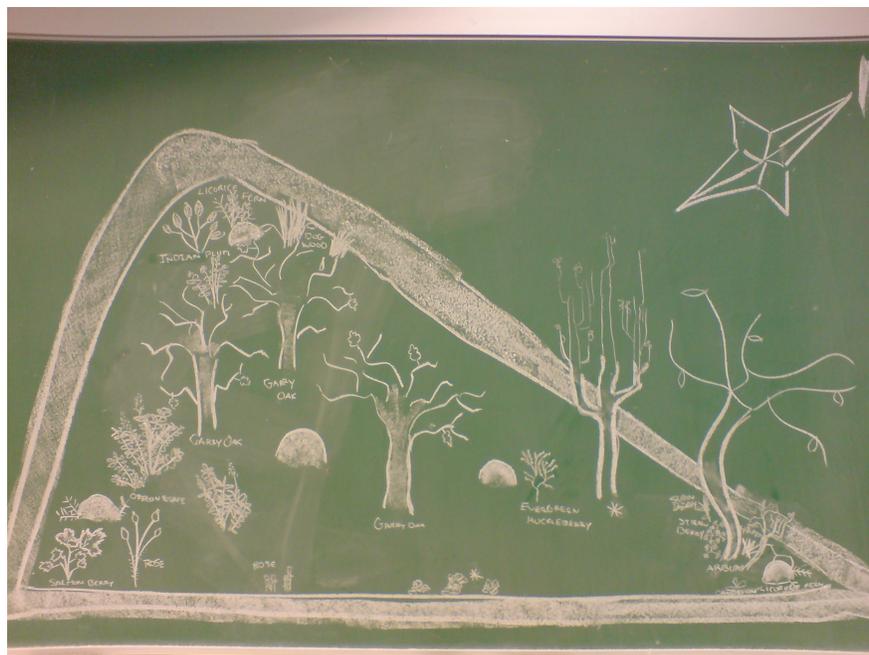


Diagram of species found in Lorene Kennedy native plant garden Fall 2009.
From left to right clockwise: Salmon berry, Licorice fern, Oregon grape, Lady fern, Garry Oak, Indian Plum, Dogwood, Evergreen Huckleberry, Snowberry, Strawberry, Arbutus, Twinberry, Dandelion, Baldhip Rose.

5.0 Goals and Objectives for the Lorene Kennedy Garden

For our group's restoration project in the Lorene Kennedy Garden we have come up with a combination of ecological and cultural goals. The ultimate objective is to naturalize the space so that there is reduced fragmentation, increased function, and a higher and more involved public awareness and appreciation of the garden. The Lorene Kennedy Garden is a beautiful area that has already had a lot of work done to help it evolve as a native plant garden and naturescape, and we hope to further its success through our recommendations. With the following goals we have laid out we are aiming to create an effective, efficient, and engaging environment (Parks Canada and the Canadian Parks Council, 2008).

5.1 Goal 1: Naturalize the space and veer away from the idea of a “garden”:

- I. Encourage *Gary Oak* the *Coastal Douglas Fir – Shore pine – Arbutus*. These two ecosystems are native to and thrive in the area.
- II. Remove the sprinkler system. This is an unnatural irrigation feature and the plants that exist in this garden should be able to survive with the amount of rain water available. Certain plants need more water than others, and the Lorene Kennedy Garden currently has a mixture of different plants that need different amounts of water to survive. We realize that some plants may die off if we remove the sprinkler system, however this is just the natural process and we want to let the garden regulate itself as much as possible. These plants will also contribute to the garden as nutrients in the soil, food for decomposers, and so on.
- III. Remove the two concrete walkways that surround the garden. Having a concrete surface

surrounding a natural space can restrict water permeability and the garden's species' ability to grow and disperse. It will also decrease storm water runoff in the area because it will absorb more rainwater (Sustainable Urban Management).

IV. Reduce fragmentation. By removing the concrete pathways this will allow corridors to connect all the natural spaces and create a bigger area for the garden to expand in. We want to change this garden from a series of disconnected patches into a space that is connected by corridors.

5.2 Goal 2: Make the garden functioning and self-regulating:

- I. Create a pervious surface for the site by spreading mulch over the entire garden and not allowing the pathways to become compacted down. Water flow is very important to an ecosystem and with the removal of the sprinkler system that is currently in place, a naturally irrigated site will reduce the demand of water supply on campus and the amount of human intervention needed for the maintenance of the garden.
- II. Remove exotic plants such as the English Ivy. Exotic plants can be detrimental to native plant survival because they are beyond the range in which they evolved and they often have few or no threats to their survival. In order for the Lorene Kennedy Garden to be self-regulating exotic species need to be removed so they do not interfere with the native species ability to grow and survive.

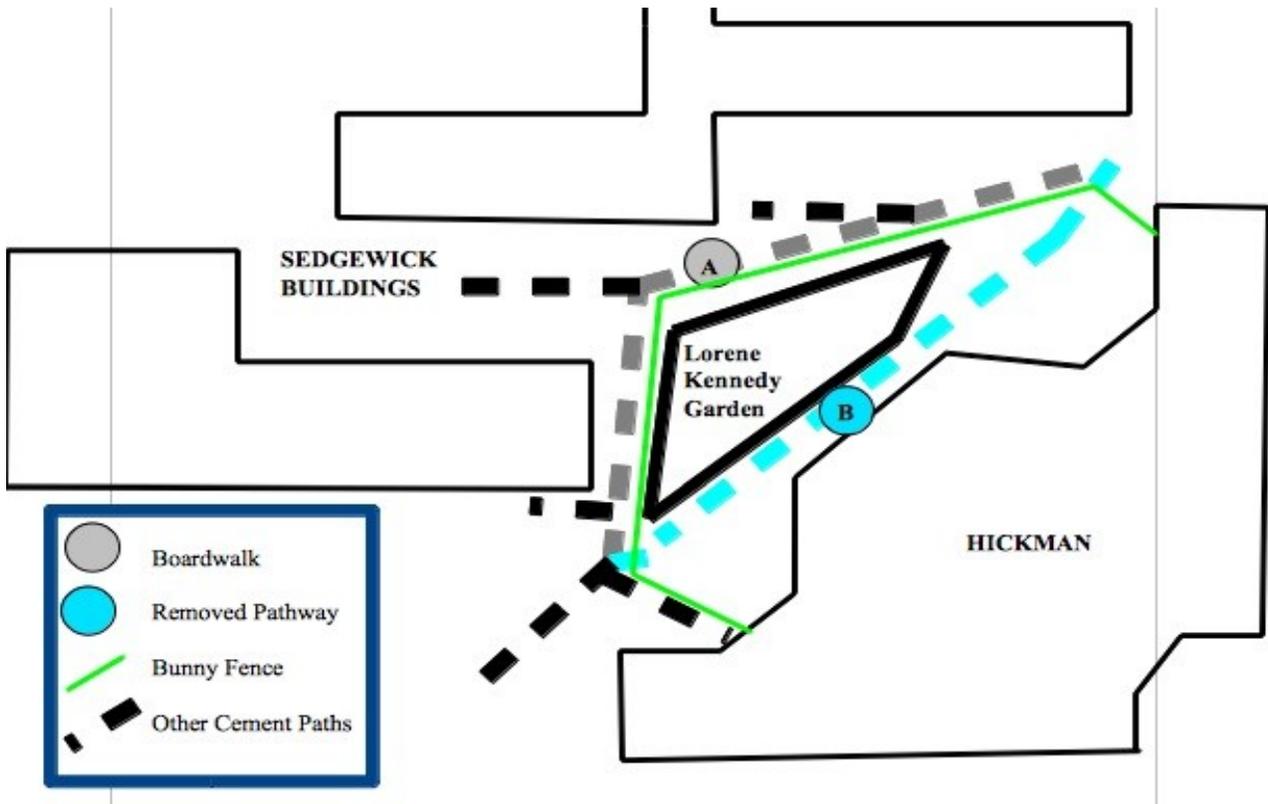


Figure 10: The two different pathways that surround the Lorene Kennedy Garden will be changed to decrease fragmentation.

- I. Replace walkway 'A' (refer to Figure 10) with a raised boardwalk. Allow space each plank for organic matter to be able to pass through and for water permeability. This will help with maintaining the continuity, and the water flow as well as reduce compaction from the use of trails.
- II. Partially fill in walkway 'B' with native plants that match the plants that are already in the garden, as well as a dead log. This will connect the garden to some of the surrounding vegetation which will allow more room for the different plants and increase the ecosystem's function.
- III. Plant more edible berries and edible fungi, as well as mychorryal fungi. This will increase

the functioning of the ecosystem and provide a food source for humans and other animals.

5.3 Goal 3: Raise awareness of this garden, give it an identity as a natural, self-regulated naturescape in the middle of a busy, urbanized environment.

- I. Make the garden's sign more noticeable. Not many people know about this garden, and if the sign marking the garden was more noticeable, more people would be aware of the existence and purpose of this naturescape.
- II. Create a clear purpose for the Lorene Kennedy Garden. Through restoration, with both the volunteer involvement and the increased health of this ecosystem, this place will become more important to individuals and to the campus as a whole. It will serve as a naturescape and an example of an untouched space that can fend for itself without much human intervention.

5.4 Goal 4: Create a monitoring plan with guidelines for Facilities Management in order to maintain the restoration efforts.

- I. This will include detailed steps that are outlined in our Monitoring section on page ____.
is crucial to the success of the Lorene Kennedy Garden in the future.

6.0 Site Plan

The proposed project would be completed in the fall so as to ensure plenty of rain for the first few months of newly establishing plants and fungal colonies.

Sequence of events

1. Remove two sidewalks and irrigation lines
2. Construct bunny fence
3. Identify and weed exotics
4. Introduce soil
5. Build boardwalk
6. Spread kelp and mix gently into upper soil horizon
7. Introduce snags and nurse logs. Inoculate with fungi
8. Plant
9. Apply mulch (5 cm)
10. Distribute fungi spores: Fungi propagation techniques
11. Apply additional mulch (2.5 cm)
12. Introduce orchard bee habitat

Accounting

13. Labour, Budget, Sourcing and Materials

6.1 Remove sidewalks and irrigation lines

The existing irrigation system will be removed. The cement walkways will be broken up and removed along with the underlying substrate to depth of 40 centimetres. Debris is disposed of at Victoria Materials Deposit, located at 343 Bay Street, Victoria.

6.2 Fence Construction

A secure fence will be put in place before the project commences until it has been determined that the plants are established enough to withstand some grazing by rabbits. An identical design to the recent black plastic ones constructed on campus, consisting of plastic mesh fence and steel posts. As an added precaution to prevent burrowers, the mesh will be dug into the soil to a depth of 40 cm and angled slightly below ground towards the path.

6.3 Identification of Immigrant plants

All individuals deemed native will be left alone to grow wherever they occur. An exception would be made if multiple individuals are growing too close to one another and instead, some might be transplanted to gaps elsewhere in the landscape. All of the non-native species will be removed before the mulch is applied. As much of the root systems will be removed as is possible, especially with hardy species like dandelions (*Taraxacum officinale*) and some grasses.

6.4 Introduce Soil

A blended soil will be imported and distributed to the location of the former path as well as beneath the location of the boardwalk. The previous ground contours will be retained but they will be smoothed out where the former path was. A total of 8 cubic yards will be used.

6.5 Pathway

Construct a 1.2 m wide boardwalk (former path was 1.9 m wide) at a height of 15 cm from the ground. There will be a 3.6 m span between posts that will be set on top of patio foundation blocks. There will be 1 cm spacing between boards on boardwalk floor to allow organic matter to fall through and to allow some light to penetrate through. Railings are not to be included in the design. There will be three ramps installed to enable access to boardwalk from all current points.

6.6 Kelp Application

Kelp harvested from the local beaches will be used as a source of micronutrients for the entire bed. The blades are rinsed of saltwater before being applied as a top dressing (at a depth of 2 to 3 cm) that can be worked lightly into the surface of the soil, so as not to disturb the roots.

6.7 Introduce nurse logs and snags, inoculate with fungi

Six 'nurse logs' will be introduced and inoculated with fungal spores. Logs will be 6-8 inches in diameter and collected from woods on campus, as some have ample supplies apparently dumped by grounds keepers. More recently cut logs will be selected over older ones that have already become inhabited by a plethora of organisms. Three will be a hardwood like Garry oak and three will be Douglas fir. Three of them will be placed on former path in an un-orderly fashion.

Two snags will be erected in the garden. They will be dug one meter into the ground and be three and four meters in length. They will be placed towards the centre of the newly expanded patch, maintaining maximum distance from buildings and people. One will be Garry oak and the other will be Douglas fir.

Refer to section 6.10 "Distribute fungi spores" for inoculation technique.

6.8 Restoring Native Vegetation

Species	Location	Quantity
Deer fern (<i>Blechnum spicant</i>)	Beneath boardwalk	40 individuals transplanted from forests on campus.
Pacific trailing blackberry (<i>Rubus ursinus</i>)	Along former path. Prefers dry sites (Compton, 2009).	15, 1 gallon plants

Target Ecosystem

Our target ecosystem is The Coastal Douglas-fir zone (Using the biogeoclimactic zones of British Columbia), and more specifically an ecotone of two zonal site associations: *Gary Oak*

and the *Coastal Douglas Fir – Shore pine – Arbutus*. (Meidinger & Pojar, 1991). Refer to appendix 1.0 for general plant communities associated with these site associations.

6.9 Introduce mulch

Mulch will be added to the site as part of a long-term fertilization plan and water retention strategy. A covering will be applied at a depth of 2.5 cm on areas that already have mulch, while a depth of 5 cm will be applied to areas without (under boardwalk and location of removed path). Mulch will be pulled away from tree bases to prevent rotting of living tissue. A total of 3 cubic yards will be spread throughout site.

6.10 Distribute Fungi Spores: Fungi propagation techniques

Spores of various species will be collected in the wild and verified by a mushroom expert. Propagating techniques are to be borrowed directly from Paul Stamet's "Mycelium Running: How Mushrooms Can Help Save The World" (2005).

Propagation upon the ground

1. Spores collected by spore printing individuals onto glass.
2. Bathed in salt and sugar bath. The salt repels bacteria and the sugar feeds the germinating spore.
3. Resulting mixture is sprayed onto bed upon 5 cm of mulch

Propagation upon dead logs and snags

Both Garry oak and arbutus logs are considered suitable tree species for cultivating edible mushrooms upon. (Stamets, 2005) Logs chosen are to be four to eight inches in diameter.

1. "Plug spawn" will be used to inoculate the logs. These are small pieces of wooden doweling cultured with fungal mycelia *in vitro*.

2. Small holes are drilled into logs and plugs are inserted gently with a hammer.

Edible fungi species:

Native saprophytic and mychorizal species of fungi will be collected locally and verified by an expert before collecting their spores and inoculating mulch and fungi. Mycorrhizae are selected for compatibility with tree species Gary Oak and Arbutus.

The following species are relatively easy to identify and are less likely to be confused with the poisonous varieties found in the area (Arora, 1991). That said, one should always choose not to eat a wild mushroom if less than 100% positive of its identification.

Growing from mulch: A liquid application of spores will be applied in randomly distributed patches (each no larger than 1 m²) throughout the freshly laid mulch (Stamets, 2005).

- King Bolete (*Boletus edulis*)
 - Found among oaks and conifers (pine, fir, spruce, hemlock)
- Chanterelle (*Cantharellus cibarius*)
 - Found among with oaks and conifers
- Hedgehog Mushroom (*Dentinum repandum*)
 - Found among both hardwoods and conifers

Growing from dead logs:

- Oyster Mushroom (*Pleurotus ostreatus*)
 - Grows on dead oaks, conifers, alders, cottonwoods (Stamets, 2005).
- Chicken of the Woods (*Laetiporus sulphureus*)
 - Grows on dead oaks and conifers (Stamets, 2005).

Mychorryzal fungi species:

Association with Garry Oak (*Quercus garryana*)

Cenococcum geophilum – (Valentine et al., 2002)

Association with Arbutus (*Arbutus menziesii*)

Dead Man's Foot (*Pisolithus tinctorius*)(Massicotte et al., 1993).

A species commonly used in restoration projects (Arora, 1986).

6.11 Introduce additional mulch

Apply mulch of the same type evenly at a depth of 2 cm to the entire bed. This step completes the process of spore inoculation and requires 2 cubic yards of mulch.

6.12 Introduce Orchard bee habitat

Habitat for the native Blue Orchard Bees (*Osmia lignaria*) is created by drilling multiple holes into a piece of wood following the basic directions as outlined by Bambara (2001). The wooden block will be placed in back corner away from the path and people.

13. Labour Task Distribution

Trades people

- Tear up and remove cement walkways and substrate beneath – 20 human hours
- Construct boardwalk. - 18 human hours

UVic Grounds

- Remove irrigation system. 2 human hours
- Install snags – 4 human hours
- Construct fence – 2 human hours

Volunteer

- South Vancouver Island Mycological Society – 8 human hours
- Weeding of invasives – 4 human hours
- Plantings and soil transfer– 24 human hours
- Kelp collecting, rinsing and spreading – 2 human hours
- Building bee hive – 2 human hours
- Inoculating mushroom spores and mycelia – 6 human hours

6.13 Materials, Labour, Sourcing & Budget

Table 1.0 – Materials, Sourcing, Labour and Budget				
Item	Quantity	Source	Cost	
Boardwalk	FSC (Forest Stewardship Council) certified wood	Malahat Ecoforest Consultants	1690.00	
	Patio foundation blocks	Home Depot	48.00	
Fence	Dumping fee for asphalt and underlying material	Victoria Materials Depot 343 Bay Street Victoria. 250.386.9417	60.00	
	Black plastic mesh	Home Depot	45.00	
	Stakes		32.00	
Plants	Pacific trailing blackberry	Fraser's Thimble Farm 175 Arbutus Rd., Salt Spring Island 250.537.5788	180.00	
	Deer fern	Transplanted from forests on UVic campus without over-harvesting any area.	-	
Substrate	Mulch	Peninsula Landscape Supplies Ltd. 2078 Henry Ave West. Sidney 250.656.6719	155.00	
	Soil		240.00	
	Delivery		134.00	
Fungi	Nurse logs	UVic property	-	
	Snags	UVic property	-	
	Spores	Local wild supply. If local supply proves insufficient, Fungi Perfecti has a limited selection from which substitutes may be selected.	-	
	Plug spawn	Fungi Perfecti Olympia, WA. 360.426.9292 http://www.fungi.com	30.00	
	Spray bottle	Home Depot	4.00	
	Untreated wood 40 cm X 15 cm X 15 cm	Donated by Jordan Brubacher 250.519.6805	-	
	Trades	@ 32/hour Farmer Construction Ltd. 2925 Douglas St., Victoria. 250.388.5121 @ 32/hour	1216.00	
Bee hive	UVic Grounds Crew		256.00	
	Volunteers	University of Victoria Students Society South Vancouver Island Mycological Society	-	
Labour		TOTAL	\$ 4090.00	

7.0 Monitoring

7.1 Why we monitor

The final step of the restoration plan is the monitoring and evaluation process. After the planting of the Lorene Kennedy Garden in 2003, there has been no-follow up which is the main problem we are addressing in our project. Long-term success, (as designed based on the defined goals and objectives) is critically dependent on effective and on-going communication between those who restore, those who continue the management, those who monitor, and those who use the space.

Parks Canada offers the following goal of monitoring:

“Monitoring should be directly integrated into the design of restoration projects in testing restoration hypotheses, in assessing the ongoing condition of the restored ecosystem, and in enhancing engagement, learning and visitor experience”. (Parks Canada, 2008)

The above addresses both the ecological and socio-cultural aspects of an effective restoration project. Ecologically, the process of monitoring and evaluation provides us with a means of noticing changes in the ecosystem, which we can then use to create an adaptive management plan. We are able to ensure that the outcome remains successful with succession and there are not other negative effects that we did not predict, or not originally observe. From a socio-cultural perspective, monitoring and evaluation is a method from which social interest and community involvement is sustained. This is achieved from the hands-on work required to evaluate the area and gather data, and also from the communication which (as mentioned previously) is a very important component both for long-term success and for connecting communities.

7.2 Techniques

Parks Canada uses the phrase 'ecological integrity condition monitoring' to describe a specific monitoring goal which is to ensure that the restoration has not compromised the ecological integrity of the site (Parks Canada, 2008). They define ecological integrity as, "a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes" (Parks Canada, 2008). This is important criteria of successful restoration, and thus should be an element of monitoring and evaluation for all projects.

For this restoration project, we are proposing a monitoring and evaluation plan that is composed of five measurements. They are:

- 1) Species List

This will involve observing the area and recording what species are present, and whether they are healthy, or seem to be struggling in this environment. We will use this list, and over time add to it the plants, which have successfully been carried by the wind, or by animals, and subtract from it the species which are not surviving well in the new naturalscape, and do not last in succession. This list will be ever-changing, and thus an up-to date reference of current conditions, and also a possible way to notice the presence of a species which is having negative effects on other species, or does not comply with our goals and objectives, so that we can adjust our management accordingly. The original list can be seen as part of the site description, and the monitoring measurement will follow the same format and will build-upon this template. Another reason the monitoring of present species over time is a result of our plan to remove the existing irrigation system. We hypothesize that some of the current species will struggle in the drier

condition, especially over the summer months on campus. Our observations will allow us to learn which species are consistent with our theory, and which are not greatly affected so we can replace the former with the latter as necessary.

2) Soil Analysis

Understanding the soil will allow us to make more informed decisions about what plants will be able to thrive in the conditions, and also can be another indicator of



changes within the ecosystem. To complete this soil analysis, we recommend the purchase of the 'Rapitest Soil Test Kit'. The following information, picture, and chart have been found at: <http://www.biconet.com/testing/rapitestSoilKit.html>

N	Nitrogen is synonymous with plant nutrition. It is directly responsible for producing leaf growth and green leaves. A deficiency causes yellow leaves and stunted growth. Too much nitrogen causes over-abundant foliage with delayed flowering; the plant becomes subject to disease and its fruit is of poor quality.
P	Growing plants need phosphorous. It is the major constituent of plant genetics and seed development. A deficiency causes stunted growth and seed sterility. Phosphorous aids plant maturity, increases the seed yield, increases fruit development, increases vitamin content and aids the plant's resistance to disease and winterkill.
K	Potash strengthens the plant. It helps form carbohydrates and promotes protein synthesis. It will improve the color and flavor of fruit. It further aids early growth, stem strength and cold hardiness. Plants deficient in potash are usually stunted and have poorly developed root systems. Leaves are spotted, curled and appear dried out at the edges. Yields for potash deficiency are low.
pH	Plants also need to correct pH (acidity / alkalinity) level, which controls how well plants utilize the nutrients available in your soil. All plants have a pH preference, so it is important to know the pH level of your soil. You can then choose plants with the same pH preference, avoid those that will not do well in your soil or know how to go about supplying their special growing needs. By testing your soil, you determine its exact condition so that you can fertilize and/or adjust pH more accurately, effectively, and economically.

This test kit can be purchased from the mentioned website, for \$19.90 per unit. A few internet searches shows that this is a relatively average price, with results ranging from \$15-20

per unit, depending on supplier, and shipping location. The test kit is a colour coded capsule system, which is used to test Nitrogen (N), Phosphorous (P), Potassium (K) and Acidity (pH) levels in the soil. The importance and relevance of these four testing criteria are summarized in this table from biconet.com:

The testing procedure is also laid-out quite well on the website. It is described quite simply as, “[a]ll you do is take a sample of soil, mix with water, transfer some of the solution to the colour comparator, add powder from capsule, shake and watch the colour develop” (biconet.com). Then the colour results will provide an estimate of the levels of these testing criteria in your soil. This information will allow explanation for which plants will, and will not grow strong in the naturescape area. These results will be saved, along with all the other measurements, for reference purposes.

3) Human Use Patterns

How many people know about the garden?

How many people walk past it each day?

One of our goals throughout the restoration project is to connect people to place. This means that we want local people and visitors to be more aware of the existence of the Lorene Kennedy garden and also to encourage them to visit it more often as a place of inspiration and relaxation, as stated in our goals and objectives. In order to see if we have reached this goal, we will directly monitor the area during specified times to see how many people pass the area, and how many people stop to spend some time. Also, we recommend that volunteers ask people on campus if they are aware of the existence of the garden, and if they know some history about its memorial quality. Overall, we want to see if social connections and interactions have been successfully increased. The

results are to be organized into a chart which will show differences in number of visitors between time of day, weather, and time of year and such variables to create an easy to read outline.

4) Animal Disturbance

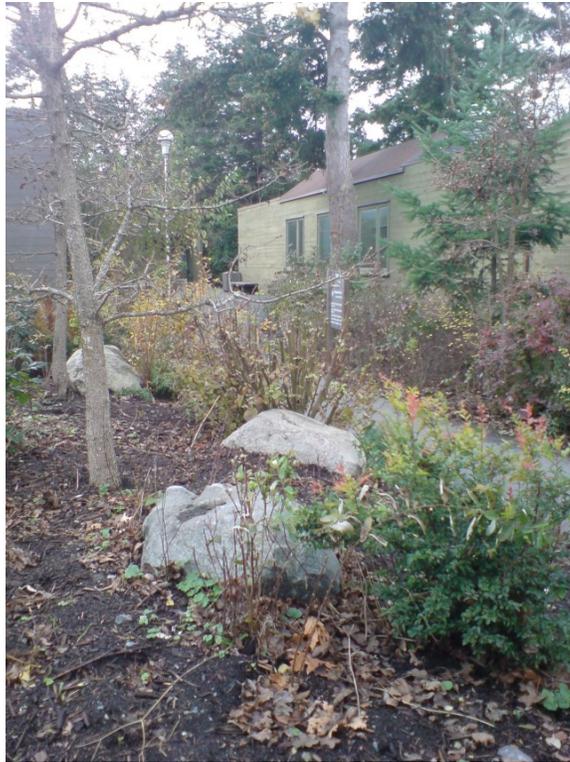
Careful observation of what animal species are attracted to the system, and which use it as a place for food, can be another important indicator of the overall ecosystem characteristics. This will have many similar components to the human use pattern outline. This is because the results will be observation based, and will be organized into a similar chart to show the relationships between different variables and over time.

5) Photo Comparisons

Through our research, we were only able to find one photograph taken of the Lorene Kennedy garden, from back when it was first completed in 2003. As part of this new monitoring plan, we want to increase the photo reference point to three total angles, one of which will be the angle we were able to find in order to have an historical baseline. The reason we take these photos are so that we can qualitatively compare the changes in the landscape. The more consistent we can be in our photo framing over time (this includes location and time) the better we can analyze these changes.

We have chosen three photo-points of the area. They are:

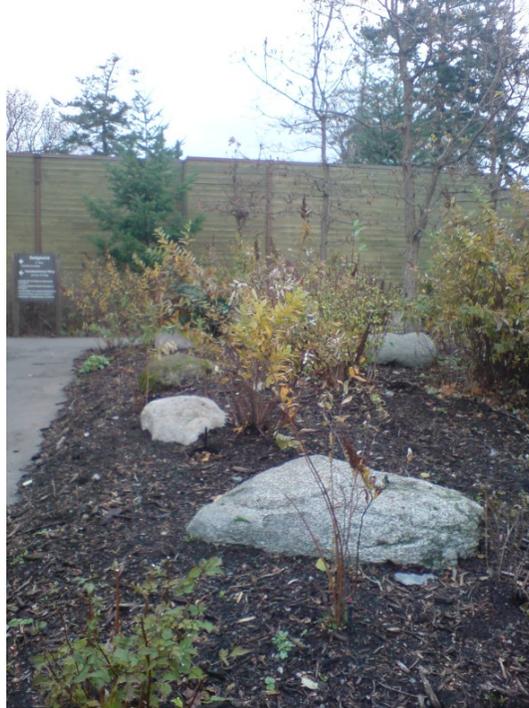
< -- Point 1



< -- Point 2



< -- Point 3



Photos 2&3 represent new reference points, and photo 1 represents the best representation of the photo we found from 2003. The exact points can be seen below on Figure 11, as symbolized by the colour-coded dots. Each photo is taken from its corresponding point, facing towards the garden (towards the Sedgewick buildings).

7.3 Rabbit Fence

As part of our short-term monitoring plan, we have decided to install a rabbit fence for the first year. This will be one time project, as opposed to an ongoing measurement practice. This fence will be placed on the border of the board-walk and garden, and continue to surround the new planting area, as seen below in figure 11. We have decided to do this because of the large rabbit population on the University campus. By installing the fence, we hope to allow enough time for the new native plants to grow and mature and be able to eventually be abundant enough to withstand the inevitable rabbit disturbance. After one year, we will re-evaluate the progress of the native plants, and the system as a whole and confirm if removing the

fence is to be the best decision. If possible, its removal will add to the aesthetic and natural quality of the area. Also it will be confirmation of achieving our goal as a self sustaining system which will not rely on heavy management plans.

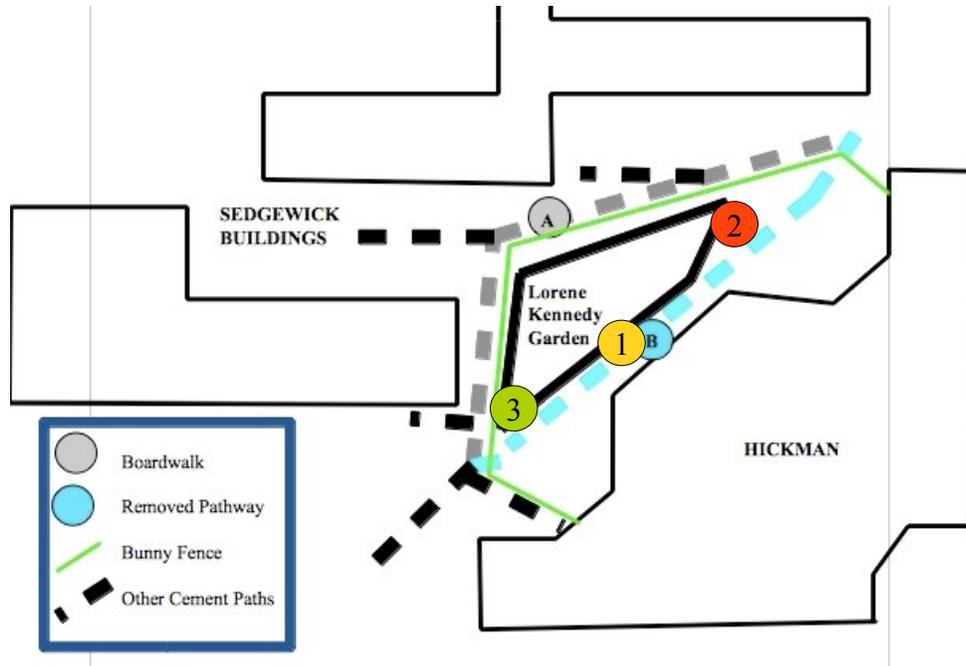


Figure 11

7.4 Timeline and Labour

The above plans are to be completed as soon as the restoration is complete, and we have reached our goals and objectives, as stated previously. This first process of measurements will provide us with a baseline as to the characteristics of our restored naturescape. Afterwards, the 5 measurement categories will be re-monitored and re-evaluated at varying times. As we realize that ecosystems are very complex and always changing, monitoring will at first need to be continued at a more frequent basis, most likely every 3 months for one year. Then as a more long run guideline, due to limited resources, the monitoring and evaluation will be cut back to an annual practice.

Since these monitoring measurement are mainly observation based, straight forward, and

do not require heavy ecological knowledge, they should be easily accessible for community volunteers. For the more difficult procedures, for example species identification, we recommend the assistance of Environmental Studies students and/or Facilities Management employees.

7.5 Management

As stated in our goals and objectives, we are trying to improve and maintain the naturescape quality of the area. This means that we want a scenario where the area will be able to sustain itself with time, and be able to adapt in the long-run to dynamic changes from new species, or new disturbances. Due to this goal, we want a low-impact monitoring scheme. It will be important, as mentioned, to be highly involved in the first year, and then after that we should be able to monitor and evaluate the system mostly through observation, not through disruptive maintenance procedures.

Measurements such as species list, human use patterns, and animal disturbance will be used more as a method for tracking changes, and learning about the development and growth of the area. We will not be constantly creating a management plan that leads to keeping the system with exactly the same plant species and human/animal use as when it was first fully restored. For example, if a non-native plant is introduced to the system we do not want to rush to remove it. Instead, as long as it is not creating problems, or reducing ecosystem function and services, then we will allow it to remain and become part of the land characteristics. This mindset will continue, until the ecological integrity of the area is threatened – as a consistent goal of Parks Canada restoration.

Another use of the results is to inspire maintenance plans. Parks Canada states that monitoring should, “include mechanisms for determining how results will inform subsequent management decisions through an adaptive management approach” (Parks Canada, 2008). This

means that we can use the results to help determine our future management goals, to correct any serious problems we have noticed since the last evaluation period. Then, during the next evaluation we can see if the new management activity has solved, or improved the problem we noticed, and therefore if it should be a continued activity. This will ensure that the management remains flexible and relevant with time.

7.6 Education

Over-time the monitoring progress is to be tracked, and measurements, observations, and photos are to be kept together as reference material. These results, as well our baseline measurements, will create an important historical information source on the garden for future considerations. When we started this project, we were not able to find any documentation or records for the garden, which made it more difficult for us to understand, what was planted, why is was planted, what the target site plan was and etc. By keeping this material we hope to eliminate this problem for future groups.

The process of developing this reference material will be a great opportunity for community engagement and education. The more we are able to get people involved, and teach them about the process of restoration, and the importance of long-term monitoring, the more we will hope to see effective monitoring practices in the future. Volunteers will be able to be involved with the observations, and techniques to gather data, (as described by our 5 monitoring objectives above) as well as assist in the organization of the material into a commonly accessible resource and learning tool. After each monitoring period, the results will also be reported to the university community, most likely by a report on the university webpage. Parks Canada suggests that interim reports such as these, “are important as a means of demonstrating results to obtain ongoing community, political, or financial support (Parks Canada, 2008).

8.0 Conclusion

In conclusion, through looking at the history of the site, the exploration of the current site conditions, the setting of goals, and the implementation of the plan, we hope to create a functioning naturescape. We want to connect people to nature and provide them with a place that is beautiful and a successful ecosystem. If the plan we have set out is followed, we feel it would create a positive output that would better not only this naturescape, but the campus as a whole

There are many goals, justifications, and benefits to both short-term and long-term monitoring. Although none of the results can tell us everything we need to know about the ecosystem over time, our hope is that a combination of different measurements and observations can come together to give us the best idea of the characteristics and ecosystem services in the area, and be an overall determinant of whether the project is a success in the long-run. We hope that we have set a foundation that others will be able to take over after us.

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Appendix 1.0

Gary Oak (Meidinger & Pojar, 1991)

Rare Species:

- White-topped aster (*Aster curtus*)
- Deltoid balsamroot (*Balsamorhiza deltoidea*)
- Great camas (*Camassia leichtlinii*)
- Golden Indian paintbrush (*Castilleja levisecta*)

Other species restricted to Gary Oak ecosystems:

Flowering:

- Common camas (*Camassia quamash*)
- Broad-leaved shootingstar (*Dodecatheon hendersonii*)
- Satin-flower (*Sisyrinchium douglasii*)

Coastal Douglas Fir (Meidinger & Pojar, 1991)

Douglas-fir – Shore pine – Arbutus

- very dry soil moisture regime and very poor to medium soil nutrient regime
- canopy often interrupted
- arbutus
- often has Gary oak present as minor tree species

Shrubs:

- Ocean-spray (*Holodiscus discolor*)
- Mahonia nervosa
- Rosa gymnocarpa
- Tall Oregon Grape (*Mahonia aquifolium*)
- Saskatoon (*Amelanchier alnifolia*)

Herbs:

- Columbia brome (*Bromus vulgaris*)
 - Purple peavine (*Lathyrus nevadensis*)
 - Alaska oniongrass (*Melica subulata*)
 - Broad-leaved starflower (*Trientalis latifolia*)
 - White fawn lily (*Erythronium oreganum*)
 - Pacific sanicle (*Sanicula crassicaulis*)
 - Western fescue (*Festuca occidentalis*)
- likely grazed upon by ungulates
(<http://www.al.gov.bc.ca/range/RangelD/Plants/FestOcci.html>)
- Cleavers (*Galium aparine*)