# Native Plant Display Garden: A Restoration Project

ES 341

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Figure 1. Map of Current Native Garden and Vegetation

## Legend of Current Native Plant Garden Map

A: Current Signpost

B: Wooden Bench

Red: Signifies Plants to be Removed (Exotic)

Green: Signifies Plants to be Restored (Native) and Trees

| **Trees** | |
|---|---|
| 1 | Blue Spruce |
| 2 | Ornamental |
| 3 | Japanese Maple |
| 4 | Oak |
| 5 | Ornamental Evergreen |
| 6 | Alder |

| **Exotics** | |
|---|---|
| 11 | Ivy |
| 12 | Black Bamboo |
| 13 | Reed Canary Grass |
| 14 | Holly |
| 15 | Himalayan Blackberry |
| 16 | Hedge Hybrid |

| **Natives** | |
|---|---|
| 28 | Nootka Rose |
| 29 | Snowberry |
| 30 | Deer Fern |
| 31 | Lady Fern |
| 32 | Sword Fern |
| 33 | Cattail |
| 34 | Yellow Pond-lily |
| 35 | Duckweed |
| 36 | Oregon Grape (Mahonia) |
| 37 | Rosy Twisted Stalk |
| 38 | Black Gooseberry |
| 41 | Flowering Current |
| 42 | Common Rush |
| 43 | Pacific Ninebark |
| 44 | Thimbleberry |

# Site Description and Problem Identification

## 1. Current Site

The site of our restoration project is a forgotten native plant garden. The site is adjacent to a parking lot and the MacLauren building and is bordered by a heavily used cement biking and walking path on the other side. The garden is highly visible to people in transit on Ring Road or along the near-by path. The native garden is approximately 1.5 acres in size and has a gravel walking path winding through the trees, rhododendrons and native shrubbery. Two ponds and a wooden memorial bench are features of the native plant garden. The garden is at a lower elevation then the surrounding walkways and as a result much of the site is very wet. The site will always have a high input of water because the garden is surrounded by a maintained and non-native lawn which is irrigated. The soil has a very high content of nitrogen and nutrients. The north end of the garden is where most of the native plants are located, while at the south end there are many rhododendrons. The rhododendrons range from being small and unhealthy to larger then any other trees in the garden. The rhododendrons are located in the best drained areas of the garden. The location we have chosen for the first phase of revitalization as a native plant garden includes one of the small ponds. The pond is replenished by an underground irrigation system that was put in when the garden was first developed as an ornamental rhododendron garden. The pond is prone to have a high evaporation rate and it is likely that the pond will always need to be sustained by the irrigation system, as there is no natural source of water.

## 2. History

Our current native plant garden was the original location of Finnerty gardens. Beginning as early as 1974 the land was planted as an ornamental garden mainly to host rhododendrons donated by Jeanne Buchanan Simpson to the University of Victoria. By the summer of 1988 it was clear that the soil did not have the right conditions for a rhododendron garden and the plants were moved to the present location of the Finnerty gardens on the other side of Ring Road. Following the removal of rhododendrons the site was turned into a native plant garden,

known simply as the University of Victoria's Native Plant Garden. The project was organized by the Native Vegetation Committee of the Vancouver Island Public Interest Group (VIPIRG) and funded by UVic's graduating class of 1993. The initial goal for the native plant garden was to be an educational resource for biology, geography and environmental studies students. The area has been maintained by UVic's facilities management but the collection of native plants has not been added to or utilized as a source of education.

## 3. Problem Identification

There are several obstacles to overcome in redeveloping this native plant garden. First of all the site at 1.5 acres is very small and fragmented. The garden will never be a truly functional ecosystem in the traditional sense of the term. This is why we have proposed that the site be restored to a native plant display garden. It will be a very effective place for education and possibly for birds and other small animals, but we recognize that it will always need care from facilities management and that it will not be a truly "wild" place.

One reason for the lack of investment in the native plant garden and a possible problem in the future is the site has been considered as a location for a new building. No group has invested in a long-term commitment because of this. The lack of long-term involvement is necessary to over come to make this garden a success. The dedication of a group to the native plant garden would ensure the site is not forgotten and could potentially save it from being demolished. Long-term involvement in the garden is needed not only from a group such as the School of Environmental Studies but also commitment is necessary from facilities management. They have the knowledge of how to grow and manage a garden as well having the funding and staff to do the work. However they also have other important jobs and projects to do around campus. Engaging facilities management in the project is essential to a continuing success.

The native plant garden faces challenges that are seen elsewhere in Victoria and on the UVic campus, such as invasive species and huge numbers of urban wildlife such as rabbits and deer. Invasives will likely be the least difficult to the two to deal with. English ivy, Himalayan Blackberry, Reed canary grass, Holly and Black Bamboo can be found throughout the site but the garden has been managed and the invasive species have been kept in check overall. Ivy is the

most prevalent but could effectively be removed by hand; because the site is small it is possible to eradicate all of the invasive plants. Protecting native plants from rabbits and deer will be much more challenging, especially for the first few years while the plants are small. Fencing and support for the trees will be necessary until the plants are large enough to regenerate after attacks from deer and rabbits.

Another possible challenge to overcome is adhering to both UVic and Oak Bay policies. For example removing trees after they have reached a certain size is guided by bylaws and may require the transplantation of a tree to another location. This would add burden to any restoration project because of the added time and cost required to deal with these policies.

# Restoration Goals

## 1. Introduction

The restoration goals identified for this native plant garden promote the ecological and cultural health of the area. The main challenges, not surprisingly, relate to the degree to which the garden has been influenced by human activities, especially agriculture (formally) and urban processes (currently). The goals work within ecological and cultural constraints to achieve the best possible future for this garden. It is understood that the goals, however, are only part of the *process* of ecological restoration rather than the method by which to reach a conclusive end to restoration. In order to identify achievable objectives, constraints have been identified that define the limits to which the area can be restored. The constraints are identified as being either ecological or cultural, though the two are intimately connected.

## 2. Ecological Constraints- Introduction

Environmental restoration seeks to "...initiate or accelerate recovery of an ecosystem with respect to its function, integrity, and sustainability" (National Parks Directorate 2008, 15). The ecological constraints are outlined below in relation to one of these three components.

A. Function: includes the processes that are part of a naturally functioning ecosystem. These include: energy cycles, nutrient cycles, and ecosystem services. Energy cycles are driven by the sun which powers primary productivity. Nutrient cycles are responsible for the distribution of essential nutrients throughout the living and non living parts of an ecosystem. Ecosystem services utilize primary productivity and nutrient cycling to provide processes such as air and water filtration, carbon sequestration (a nutrient cycle), decomposition of material, as pollination and seed dispersal, among many others.

B. Integrity: refers to the species composition and community structure of an area (National Parks Directorate 2008, 15). Species composition is the assemblage of species found in an area. Community structure is the connections between the different trophic levels of an ecosystem and the ways they interact.

C. Sustainability: is the ability an ecosystem has to withstand and/or recover from disturbances. These disturbances could range from natural shifts in climate conditions to human induced change such as urbanization of an area.

## 3. Cultural Constraints- Introduction

Because of its location, the restoration goals for the Native Plant Garden must also comply with a number of cultural constraints. Any restoration work must be in accordance with University of Victoria policies as well as Oak Bay policies. Given the value of land within ring road, and the location's history of being slotted at various times as a building site, it's apparent that any decisions will have to undergo significant consultations to reduce potential conflict between stakeholders. And as with any restoration project, available time, money, and dedication will determine the success or failure of the project.

## 4. Ecological Constraints

| Constraint | Implication on Restoration |
|---|---|
| 1. Lack of adequate baseline | Aiming to restore site to previous condition may be difficult of previous condition is not fully known. |
| 2. Fragmentation/area size | Size of garden site limits its potential to support a fully functional ecosystem |
| 3. Surrounding Land Use | The garden site is surrounded by intense human activity including buildings, parking lots, pathways, and roads. These uses could limit the degree to which the site may function independently of them. The site is not a closed system and thus current land uses will continue to impact site. |
| 4. Continual exposure to invasive and/or exotic species | Although the restoration project includes removal of invasive and exotic species, the location of the site will mean that it will continue to be exposed to species not native to the area. |

## 5. Cultural Constraints

| Constraints | Implication on Restoration |
|---|---|
| 1. Compliance with University of Victoria and Oak Bay Policies. | More intensive restoration activities (i.e. removal of trees) will need to be approved by both of these stakeholders. |
| 2. Compatibility with current and future land uses. | Native garden site needs to be protected from ongoing development within Ring Road. Existing land uses surrounding site need to be compatible with the fragile nature of a native plant garden. Educational users also need to be aware of the sensitive nature of a site undergoing restoration. |
| 3. Limitations of time and money. | In order to succeed, this restoration project will need either volunteer help or the contributions of donors to fund its remediation. |
| 4. Multiple stakeholders may have different views of a desirable future. | Extensive consultations and negotiations would be required before restoration work commenced in order to reach a consensus on objectives and a desirable future. |

## 6. Ecological Restoration Goals:

1. The removal of exotic species:

Invasive plants are the second biggest threat to biodiversity after habitat destruction (University of Victoria 2008). The removal of exotic species, both invasive and non-invasive, will allow native species to flourish. Because invasive species are often generalists which are able to survive under a variety of niche conditions, their presence reduces natural biological diversity. The natural biological diversity found in a site with native vegetation is essential to sustain the integrity of that area.

2. The introduction of native vegetation suitable for existing conditions:

Following the removal of exotic species, it is imperative for native species to be planted as soon as possible to reduce the chances of re-colonization by exotic and invasive species. It is important for the native plants to be suitable for the prevailing conditions of the site, especially since the site may not have the same conditions it formally had before being degraded. In this case, either the site conditions would need to be remediated (i.e. soil remediated to previous composition), or the native plants to be planted would have to be chosen for their ability to survive in the current conditions.

3. The introduction of a variety of native plants to encourage biodiversity:

As mentioned in goal 1, natural biological diversity is essential for an ecosystem to: a) adapt to changing conditions, b) survive natural and human induced disturbances, and c) provide ecosystem services such as those mentioned in A. 1. (Ecological constraints-functions). This can be accomplished by planting a variety of native plant species. It is also good to plant a variety of sub-species (i.e. a few varieties of ferns), if the onsite conditions permit.

4. Proper planning and management of site to encourage water self sufficiency:

In order for the site to be somewhat autonomous, native vegetation needs to be compatible with existing moisture conditions, preferably with little or no artificial input. In order for this to happen, hydrological conditions need to be assessed prior to deciding

which native plants are suitable for the site. If the hydrological function of the site has been degraded or impaired, remediation might have to occur to restore natural water flows.

5. Re-establishment of natural nutrient flows

Similar to goal 4, the re-establishment of natural nutrient flows will make the site more autonomous. Re-establishing natural flows of nitrogen, phosphorus and other key nutrients will reduce the sites dependence on external inputs such as artificial fertilizers. This step also involves establishing plants which have the ability to acquire or "fix" these nutrients from the already existing soil. In addition, steps must be taken in order to allow natural decomposition of dead and decaying material. Something as simple as allowing fallen leaves to decompose on site will assist this process.

6. To restore integrity to native plants presently on site.

The health of the native plants currently on site can be improved by the implementation of a few gardening practices. Examples are: protecting native plants while performing restoration tasks, removing of excessive dead and decaying plant matter from the pond, removing of invasive plants.

## 7. Objectives to Achieve Ecological Restoration Goals

| **Ecological Restoration Goals** | **Specific Objectives to Attain Goals** |
|---|---|
| 1. The removal of exotic species | The hand removal of the following plants: spruce hybrid hedge plants, Black Bamboo, English Ivy, Holly, Reed Canary Grass, Himalayan Blackberry. |

| | |
|---|---|
| 2. The introduction of native vegetation suitable for existing conditions | The following plants have been identified as being suitable for the specific site conditions. See attached maps for optimum placement locations.<br>Bracken Fern, Common Juniper, Field Mint, Broad-leaved Starflower, False-box, Nodding Onion, Trailing Blackberry, Skunk Cabbage, Devil's Club, Arrowhead (Wapato). |
| 3. The introduction of a variety of native plants to encourage biodiversity | See above box. |
| 4. Proper planning and management of site to encourage water self sufficiency | Currently, the site is dependent on an irrigation system. The site has been identified as being moderately wet, with poor draining, clay rich soils. The site is an elevational low point and thus should be able to be self sufficient in terms of water. The above mentioned plants have been chosen for their compatibility with the sites hydrological conditions. |
| 5. Re-establishment of natural nutrient flows | This would be done with the introduction of specific plants with particular nutrient fixing capabilities. In addition, the management of the site would facilitate this by encouraging natural decomposition of material (i.e. fallen leaves, branches, dying shrubs, etc would be left to decompose rather than being hauled away) |

## 8. Cultural Restoration Goals

1. To increase the gardens education potential through:

a) Better signage of common native species along with their descriptions and uses

b) Continuity of restoration by subsequent students and volunteers

Currently, there seems to be a re-emergence of interest concerning the importance of native plants and of ecological restoration in general. This garden has great potential to educate people regarding these topics. Many people find it fascinating to learn about the historical First Nations uses of native vegetation. The goal for this garden would be to include a selection of the more useful plants that are native to this area. These plants would have signs beside them providing a thorough description of the plant along with traditional uses. This process will help reconnect culture and the environment, people with nature. With this increased awareness, it can be expected that more people will become interested in preserving the site and fostering its

education potential. Attached in this document is an example of what could be included on the signs (see Appendix).

As well, in order for this restoration to be successful our long term plan for continual management and monitoring needs to be adhered to. It was noted by facilities management personal that many student initiated projects lacked the continuity required to keep a restoration project on track over an extended period of time. This cycle is difficult to address given that many students do not live full time in Victoria, or become involved in other employment opportunities after the academic year ends. However, there could be the possibility of either the Environmental Studies Department or the Restoration of Natural Systems Program to adopt this site and the restoration project and incorporate hands on ecological restoration work into their courses. Because most courses lack the extra time for extensive hands on restoration work, this agreement could be in conjunction with Facilities Management. This mutual agreement would provide long-term successful management and monitoring of this ecological restoration project.

2. The protection of this Native Plant Garden from being a future building site:

Through the research on this project, it was discovered that the site of the Native Garden has been slated, more than once, for being a building site. It should not have come as a shock given the sites excellent location. As well, the University's continual expansion places enormous pressures on the last vestiges of forests, meadows, and gardens around the area. This restoration project, should it be carried out, might compel the University to protect this site, especially if the restoration project was a component of a Faculties program or its courses.

# Plan for Achieving Goals

## 1. Scope

The native plant garden is currently under the care of facilities management and our plan does not propose to change this. The planners and employees of facilities management have the knowledge and the resources to maintain a successful garden. Furthermore they are more likely develop local knowledge of the area over the scale of many years, whereas students could, at

most, observe the site over four years. Although facilities management would have ultimate control over the site, a continued involvement from students and faculty from environmental studies, geography and biology would be necessary. Students would help with planning each new phase as well as providing volunteers to help plant and upkeep the garden. Faculty involvement would insure a commitment over a longer period of time. Student involvement in the planning and planting process would achieve both the goals of community involvement and education.

This restoration project is to continue over a scale of years. We have planned out the first phase in which exotic and invasive species will be removed from one section of the garden, to be replaced by native plants with signs describing their cultural and medicinal values. During the first phase processes will be set in motion to guarantee the restoration project is continued over time. We propose that a long-term invested interest in the site is formed through cooperation in planning and planting the first phase. When facilities management has purchased plants and chosen a time class of ES 341 or 321 or volunteers from other departments could be invited to participate in planting. If the first phase were successful professors would meet with facilities management and agree to make a commitment to the site. Environmental studies professors could agree that one option for the term restoration project could be to design a new phase of the garden's restoration. Environmental studies 200 could begin to take students through the garden on their campus tour, establishing some knowledge of the garden in students just beginning their time at UVic. Future 341 restoration projects could assess whether this relation between departments and facilities management is functional and where improvements could be made. It is difficult to forecast exactly where problems could arise but one possibility is that the same professors do not teach ES 341 all the time and interests among them may vary.

## 2. Achieving Restoration Goals:

A pond and garden in good health is a rich and varied array of flora and fauna living together. In a circumstance where pond and garden diversity or health has been diminished, restorative practices should be preformed to reverse that degradation. A display of a variety of healthy native plants is also a great tool for public education. If an authentic display does not exist it is possible to restore one. The following restoration activities have been designated to

address specific objectives set to restore pond and garden health, and to promote public awareness of a native pond system.

1. Removal of Exotic Species

| Name of Undesirable Plant or Animal | Restoration Activity |
|---|---|
| Black Bamboo | 1. Remove all bamboo from the three locations around the pond (See Fig. 1). At the north end right by the current sign post there is the largest growth. At the south east and west corners of the pond there are smaller growths that have been cut back to some extent.<br>2. The black bamboo is an ornamental plant, but is undesirable because of its ability to out compete the other vegetation and thus decreases biodiversity.<br>3. A reasonable amount of work will be required to dig up the bamboo as the stalks will need to be completely removed to prevent its reappearance. |
| English Ivy | 1. Remove the large patch of ivy at the south end of the pond.(refer to Fig. 1). This can be accomplished by physically pulling ivy vines up and out of the ground and surrounding vegetation.<br>2. Plant a Devil's Club in the south west corner of the pond in the place where the ivy was the densest to hinder the resurgence of ivy (refer to Fig. 2). |
| Holly | 1. Remove small holly bush that is located at the south west corner of the pond. (refer to Fig. 1) |
| Reed Canary Grass | 1. Remove all Reed Canary Grass from the pond edge (refer to Fig. 1) and replace it with Common Rush, Skunk Cabbage or Arrowhead as is shown in Fig. 2.<br>2. Reed Canary Grass is a strong plant and will suppress native vegetation if left to its own devises. |
| Hybrid Hedge plants | 1. Remove the hybrid hedge plants (refer to Fig.1) and transport them to a new site wherever possible (in accordance with Oak Bay bylaws)<br>2. The complete removal of the hybrids will require a significant amount of work due to their heavy weight and root systems.<br>3. Their evergreen needles fall and can lower soil pH to levels which are not conducive to the vegetation we are restoring. Nor are they accurate examples of vegetation common to the site. |

2. Introduction of Native Vegetation Suitable for Existing Conditions:

All native vegetation chosen to introduce to the site has been met to match the site conditions. Currently the site is very moist for the majority of the year and contains a pond year round. Soil nutrient levels are quite high due to fertilizers used on the grass fields surrounding the garden. The majority of the soil underneath the top fertile level is made of clay materials. The following tables provide a list of chosen vegetation and some information on the plants themselves.

| **Name** | **Bracken Fern - Pteridium aquilinum** |
|---|---|
| Description: | deciduous, round stalk, triangular leave, straw colored to green, rhizomes spreading |
| Height: | often over 15cm tall |
| Growing condition: | low elevations, clearings, dry to wet forests, or acid sites ex. bogs to lake shore, |
| Points of Interest: | Is the worlds most wide spread fern (Pojar, 1994) Rhizomes of the Bracken fern were used as a food source used by most Coastal Indians and some interior groups. Rhizomes were usually harvested in early spring. They can be eaten pealed and raw or prepared by steaming or pit cooking. Young shoots were also consumed. However consumption of Bracken Fern is not recommended. |

| **Name** | **Deer Fern - Blechnum spicant** |
|---|---|
| Description: | Evergreen, medium sized fern, 2 types of fronds, paired leaflets, oblong leaves |
| Height: | 20-80cm |
| Growing condition: | moist to wet forest, stream banks, bogs, low lands |
| Points of Interest: | Used by Native people as a medicine for skin sores. According to Hesquiat elders deer have been seen rubbing their antler stubs on the plant after the antlers have fallen off. An important winter food source deer and elk. |

| **Name** | **Common Juniper - Juniperus communis** |
|---|---|
| Description: | Evergreen, trailing branches, needle-like leaves, prickly, dark green, shedding red-brown bark , small berries bluish when ripe |
| Height: | less than 1 meter |
| Growing condition: | dry soil, rocky conditions, open woods near sea-level to subalpine |
| Points of Interest: | Indian uses for Junipers include as fumigants, deodorizers, cleansers, and medicine for urinary infection and during childbirth. Berries were not often used as food, however branches and berries could be boiled to make teas. |

| **Name** | **Evergreen Huckleberry - Vaccininum ovatum** |
|---|---|
| Description: | bushy, evergreen, leaves: alternate egg shaped leaves, flowers: light pink, bell shaped, small, clusters, berries: dark purple, small, round, shinny |
| Height: | 0.5 4 meters |
| Growing condition: | coniferous forests, edges and openings, low elevation, acidic soil and good drainage |
| Points of Interest: | The edible berries, ripen in October to November. Native people from the Alaskan to Californian coast were known to travel far and wide for these berries. They are said to be better after the first frost. The leaves are high in vitamin C and can be chopped and boiled to make tea. Tea can be useful in stablizing blood sugar levels |

| **Name** | **Broad-Leaved Stonecrop -**<br>**Sedum spathulifolium** |
|---|---|
| Description: | succulent herb, ground cover, leaves: crowed, fleshy, flat, alternate, light green to red, flowers: Bright yellow, 5 petals, pointed, numerous seeds |
| Height: | 20 cm |
| Growing condition: | rocky out crops, coastal bluffs, forest openings, course soil, low to mid elevations |
| Points of Interest: | Songish (Straight Salish) women chewed the leaves of this plant in the ninth month of pregnancy thinking that it would eases childbirth. |

| **Name** | **Field Mint - Mentha avensis** |
|---|---|
| Description: | aromatic perennial, leaves from an upright stalk, leaves: opposite, saw-toothed, flowers: white to light purple, 5 lobed clusters in leaf axils |
| Height: | 15- 80 cm |
| Growing condition: | streambanks wet meadows and clearings, lake shores, low to mid latitude |
| Points of Interest: | Widely used dried and then boiled for teas. This tea is good for digestion and in stronger doses can be used as a medicine for colds and coughs. Dried and crumbled leaves were also used to season meats. |

| **Name** | **Broad-leaved Starflower- Trientalis latifolis**<br>**A.K.A. Western Starflower, Indian Potato** |
|---|---|
| Description: | perennial, stem erect, leaves: terminal whorl, egg shaped, flower: pink to rose, star-like, 6 petals, on a curved stalk coming from the center of the leaf whirl |
| Height: | 10- 30cm |
| Growing condition: | open forest, thickets, meadows, low- mid elevation |
| Points of Interest: | Tubular were gathered and eaten by some costal aboriginal groups. |

| **Name** | **Falsebox - Pachistima myrsinites**<br>**A.K.A. Mountain Boxwood, Oregon Boxwood** |
|---|---|
| Description: | low, dense, evergreen, branches are red-brown, leaves: opposite, oval, shiny, margins are toothed, flowers: marroon, very small fragrant, 4 petals, clustered along the branch |
| Height: | 20- 80 cm |
| Growing condition: | coniferous forest, rocky openings, dry slopes, low to mid elevations |
| Points of Interest: | good winter food source for deer |

| **Name** | **Thimbleberry - Rubus parviflorus** |
|---|---|
| Description: | shrub, light brown bark, leaves: large, light green, maple leaf shaped, fuzzy, alternate, flowers: white, large, fruit: shallow domed, raspberry like, clustered, red when ripe, sweet, seedy |
| Height: | 0.5 - 1.5 m |
| Growing condition: | open sites, shorelines, low- mid elevations<br>caution: can form dense thickets |
| Points of Interest: | Edible berries and ripe between June and July. Gathered and eaten by most Costal and Interior Native Groups. Berries can also be dried and made into cakes. Young shoots can also be eaten. |

| **Name** | **Nodding Onion - Allium cernuum** |
|---|---|
| Description: | perennial, clustered bulbs, smelling strongly of onion, leaves: grass-like, flowers: pink to light purple, umbrella-shaped clusters at the end of a stalk. |
| Height: | 10 -50 cm |
| Growing condition: | sandy soil, dry, open woods or exposed areas, often with douglas fir, low elevations |
| Points of Interest: | Nodding onions were eaten by Northwest Coastal Groups and some Interior Native Groups. Roots were dug and could be eaten raw. However usually they cooked in pits until black in color. This plant belongs to the same genus as garlic, leeks and chives. |

| **Name** | **Trailing Blackberry - Rubus ursinus**<br>**A.K.A. Dewberry** |
|---|---|
| Description: | Trailing, leaves: alternate, deciduous, dark green, toothed, flowers: white or ping, clusters from leaf axils, fruit: black |
| Height: | 50 cm |
| Growing condition: | often in disturbed areas, open forest,<br>caution: can behave like a weed in urban areas |
| Points of Interest: | Edible berries can be harvested in July. Female and male plants are separate, and the male plant does not produce fruit. Leaves can be made into tea, and have been used as medicine to remedy diarrhea, dysentery, cholera, excessive menstruation, fevers and sores in the mouth. |

| **Name** | **Stinging Nettle - Urtica dioica** |
|---|---|
| Description: | Perennial, spreading rhizomes, stinging hairs, tall upright stalk, leaves: opposite, narrow oval shaped, saw-toothed, flowers: tinny, numerous and dense, drooping clusters at the leaf axils |
| Height: | 1- 3 meters |
| Growing condition: | Meadows, stream banks, open forest, needs rich moist soil, lowlands to subalpine elevations |
| Points of Interest: | This nettle was important to Native groups for making fish nets and snares. Cooking removes the stinging properties of the plant and then it can be eaten as a green. |

| **Name** | **Skunk Cabbage (Lysichitum americanum)** |
|---|---|
| Description: | Large elliptic leaves often 1.5 m long. Greenish yellow flowers located on a spike. Flowers appear before or with the leaves in the early spring. Flowers have a very distinct skunk smell. |
| Height: | 30-150 cm tall |
| Growing Conditions: | Grows in wet to very wet nitrogen-rich soils. Is shade-tolerant. Usually associated with Lady Fern and Devil's Club. |
| Point of Interest: | Leaves of the plant were used like "wax paper" for lining baskets, drying racks and steaming pits.<br>Medicinal use for headaches: leaves were crushed and then inhaled. |

| **Name** | **Devil's Club (Opopanax horridus)** |
|---|---|
| Description: | Thick crooked stems, armed with large yellow spines. Leaves are alternate and large (35 cm across) and in a maple leaf shape. |
| Height: | 1-3 m tall |
| Growing Conditions: | Grows in wet water collecting sites and nitrogen rich soils. Is shade-tolerant. |
| Point of Interest: | Very important medicinal plant. The inner bark of the roots was and is still used to treat arthritis, ulcers and digestive tract ailments. |

| **Name** | **Wapato (Arrowhead) (Sagittaria latifolia)** |
|---|---|
| Description: | All leaves are at the base and are shaped like an arrowhead. The leaves are 25 cm long and stay above water. Flowers are small and white and grow in whorls of 3 on a long stem. The plant has a thick over wintering rhizome as a root system. |
| Height: | 20-90 cm tall |
| Growing Conditions: | Semi-aquatic plant, grows in marshes, ponds and lakes. Usually rises above water but can be partially submerged. |
| Point of Interest: | The rhizomes and tubers of the plant are eaten by ducks, muskrats and people. First nations of the Columbia baked the Wapato tubers and relied highly upon their high starch content. |

3. Introduction of a variety of Native Plants to encourage biodiversity

| **Native Plant to Introduce** | **Location on Site** | **Special Considerations** |
|---|---|---|
| Braken Fern | Near the pond in most soil | |
| Common Juniper | Replace the hybrid hedge plant at the entrance to the garden | |
| Field Mint | Near the current sword fern that is right across from the wooden bench | Near path so public can appreciate |
| Broad-leaved Starflower | Near the current alder patch | |
| False-box | Beside the path | |
| Nodding Onion | In the large section that currently contains Black Bamboo at the front of the pond. | |
| Trailing Blackberry | Sporadically throughout the garden close to the path whenever possible. | Is a delicious berry and should be placed near the path so people could sample it. |
| Skunk Cabbage | Shade tolerant-intolerant<br>Prefers deep damp soils<br>Along pond edge | Is best planted while still a juvenile as it is still small and less likely to break apart. |
| Devil's Club | The south west corner of the pond in the location where previously | Spikes contain a toxin that may irritate the skin. Make sure to wear proper protective |

| | | |
|---|---|---|
| | there was high density of ivy. | materials when working with this plant. |
| Arrowhead | Is a semi aquatic plant and will grow partially in the pond and partially on the edge. | Tubers are edible. |

4. Proper planning and management of site to encourage water self sufficiency

In order for the site to be somewhat autonomous, native vegetation needs to be compatible with existing moisture conditions, preferably with little or no artificial input. In order for this to happen, hydrological conditions need to be assessed prior to deciding which native plants are suitable for the site. If the hydrological function of the site has been degraded or impaired, remediation might have to occur to restore natural water flows.

5. Re-establishment of natural nutrient flows

Similar to goal 4, the re-establishment of natural nutrient flows will make the site more autonomous. Re-establishing natural flows of nitrogen, phosphorus and other key nutrients will reduce the sites dependence on external inputs such as artificial fertilizers. This step also involves establishing plants which have the ability to acquire or "fix" these nutrients from the already existing soil. In addition, steps must be taken in order to allow natural decomposition of dead and decaying material. Something as simple as allowing fallen leaves to decompose on site will assist this process.

6. To restore integrity to native plants presently on site

| Name of Organism | Restoration Activity |
|---|---|
| Nootka Rose | 1. Trim bushes down to 1.5 m height so that other plants in the garden are able to both attain sunlight and be seen by the public. |
| Duckweed | 1. In the autumn do a full sweep of duckweed from the water surface. Duckweed will function optimally if the older plants are removed leaving room for new plants to grow in the spring.<br>2. Removing the duckweed before it grows back also allows the pond to "breath". This allows some oxygen to diffuse across the water's surface and increases the dissolved oxygen content in the pond.<br>3. Currently duckweed covers less than 15% of the pond surface and maintenance is required to make sure it stays that way. |

| | |
|---|---|
| | 4. A fine-meshed sampling net is a great tool with which to scoop up the small plants. |
| Small invertebrate organisms in pond water | 1. Remove dead and decaying plant material from pond. If left in the system, the decaying plant matter will use up oxygen in the water as it decomposes. This could in turn compromise the health of small aquatic organisms living in the pond which are beneficial to the biodiversity of the garden.<br>2. Dead plant material can be pulled away from the rest of the plant. |
| Yellow Pond–lily and other aquatic plants | 1. Build up of plant matter at the bottom of the pond can lead to high amounts of nutrients and other substances that could hamper the ability of surrounding vegetation to thrive and do well. A slow and steady removal of dead or excess vegetation around the pond ensures a healthy environment for the pond system (Suffolk Wildlife Trust, 2007)<br>2. This is best accomplished in the autumn months. |

## Rational for Choosing the Native Plants

The physical site design encompasses both the selection of native plants for the proposed garden, as well as, the placement of the new flora. Species were selected in consideration of the limits of this restoration project while attempting to achieve the project goals. In addition, consultation with Facilities Management was conducted. In this consultation expertise was offered on both selection and placement of new plants. Facilities Management also explained current and possible resources that are and could be available to the site given their resources. Plants with particular cultural, historical and physical characteristics were emphasized in the list of proposed botanical additions for the site.

The growing conditions of each proposed plant meet the physical conditions of the current garden. Soil type, moisture levels, and sun exposure were the physical parameters that were considered in the selection of each plant. The majority of suggested plants are hearty and low maintenance; this will encourage healthy introduction and continuation of the new plants.

A primary goal is to increase species number and diversity at the site. There are several beneficial effects of this. An increase in plant diversity will in turn enhance habitat space and encourage more diversity of insects, birds and spiders. In addition, increasing plant diversity could encourage further human interest and use in the site. Furthermore, gaining biodiversity will add educational opportunity and value to the existing garden.

Emphasis was placed on selecting plants with historical significance. Several of the proposed plant species have and continue to play significant roles in Coastal Native culture in the area. Plants used for food, medicinal purposes, or folklore were given priority in the proposed restored garden.

Food plants were another priority in selection of possible plants featured in the restored garden. Several berry bushes have been suggested to heighten food value of the site and food security on campus. The expectation is that the fruit can be harvested and enjoyed by students, faculty and the public. Other plants such as the Field Mint can also be collected and dried for tea or seasoning.

Physical design of the garden was based on physical conditions, microsites within the garden and on suggestions from Facilities management. Preexisting native plants will be left intact and in place. Invasive and non-native will be removed, with the exceptions of the non-native trees. With this template the suitable plants will be placed in the open areas and at appropriate micosites based on specific growing conditions of each plant. Furthermore, large and tall plants will be planted nearer to the center of the garden, while small and short plant will be planted near edges. This will ensure an elongated line of sight for people to enjoy. Finally food plants are suggested for the outside edges and near the paths of the garden to allow increased access and limit the trampling of neighboring plants.

As specific examples arrowhead, devil's club and skunk cabbage's specific growing conditions have been elaborated on.

The three are either aquatic or thrive in wet soils and nutrient rich conditions. Skunk cabbage and devil's club also commonly grow alongside many of the same plants that are already present in the garden such as lady fern, cattail and thimbleberry. Arrowhead was chosen as it is a native aquatic and is commonly employed in restoration projects for several reasons. It has an ability to form large stands on the water's edge which prevents erosion and it is very effective in filtering stagnant water. Devil's club is beneficial to its surrounding soil by acting as a buffer to maintain soil pH (Washington Native Plant Society, 2007). If planted at the south end of the pond, near the large evergreen tree it could benefit the surrounding vegetation for a number of reasons. It would prevent the soil from becoming too acidic, it's large leaves would provide

shelter and shade over the pond, and its tenacity may help to prevent the resurgence of ivy in that currently ivy-dense spot. Skunk cabbage is not only well suited for the site conditions but also has cultural and ecological importance. Not only is it a lovely ornamental plant, but the pungent smell it produces strongly attracts a number of beneficial pollinating insects.

## Cultural Restoration Goals

### 1. Increase the Educational Potential of the Garden through the development of Signage

Attractive and interesting signs are an effective way to inform the public on of the native flora of the native pond system. There is currently a sign post located at the north end of the garden. It states that this native garden was restored in 1993; organized by the Native Vegetation Committee of the Vancouver Island Public Interest Group (VIPIRG) and funded by UVic's graduating class of that year. Unfortunately like the initial restoration attempt, the sign has become overgrown and outdated and is in much need of renovation.

Instead of one title sign, several new signs could be placed along the path beside the garden. Each sign could be specific for an interesting plant displayed in the garden. The signs would include a photo and methods to identify the plant. It would also state why the plant is beneficial to the pond system as a whole and provide examples of the sort of uses it has for humans and animals. Ideally the information presented would be clear, concise and whenever possible engage the reader to appreciate the plant. An example of a possible sign displaying the rather outlandish devil's club is attached and could be used as a guideline.

In addition to updating the title sign, the official name of the garden could do with a rekindling itself. Currently the garden is known as "The Native Plant Garden" which suggests that at the time of its creation it was the only one. Today however, UVic campus is able to boast a variety of native displays and this old name may no longer properly identify with the garden.

# Monitoring

## 1. Introduction

Broadly speaking, the monitoring component of our project will revolve around five principles. Ensuring that exotic species are permanently removed from the site, ensuring native vegetation is thriving in the garden, that the native vegetation is as diverse as possible, that the water on site be self sustaining, and allow for natural nutrient flows. Also, success of the monitoring process will rely on socio-cultural factors, such as continual commitment to the site. Such commitment should entail awareness of factors affecting the garden offsite. Such factors can include increased traffic around the area, rabbits, and new invasive species being transplanted from other areas. The methodology for carrying out monitoring of the site is aimed at making data collection easy, so as to be able to engage groups with little expertise. Also, it is our aim to have the results from the data collection inform subsequent management efforts.

## 2.Methodology

Monitoring of our site will focus around species diversity, species richness, soil conditions, and the level of invasive species present. The monitoring will rely on continuous evaluation of these components at six month intervals. By monitoring these components regularly it is possible to account for unanticipated variables in data, which may require correction mid-course to prevent the project from failing. In order to properly identify the components listed above, the site will have five separate monitoring quadrants that measure approximately six metres by six metres. The quadrants have been identified because of their differences in hydrology, level of invasive plants present, soil composition, and aesthetic qualities. As a whole, these various conditions will be able to give us a holistic view of the site's health.

## 3. Description of Quadrants

Quadrant 1 is a high visibility site toward the north entrance of the garden. It is currently occupied by a hybrid spruce plant, a blue spruce, and various exotic trees. Quadrant 1 is more

elevated than Quadrant 3 and therefore the soil is less wet. This quadrant contains a minimum amount of invasive species and will give a good picture of how native plants are working with the soil conditions. Quadrant 2 has a high level of invasive plants, specifically Black Bamboo and Himalayan Blackberry. Quadrant 3 has some pond bank exposed and a mix between invasive and natives. It will give us a good indication of how native plants are doing in wetter conditions. Quadrant 4 As this quadrant has the highest concentration of invasive plants, it will allow us to identify if invasive species are overtaking or re-establishing themselves quicker than the native plants in the area. Quadrant 5 resembles quadrant 1 in hydrology and plant distribution. It is its own quadrant to make measurement more uniform.

## 4. Methodology continued

The quadrants will be staked out with small pieces of wood with ribbon attached to the ends, so as to make the quadrant easy to identify. At six month intervals measurements will be taken at every quadrant and will be compared against the previous data sets to be able to adjust for changes experienced. Measurements will be but are not limited to:

-Counting the number of invasive plant shoots present, as there possibly will be overlap from other plants into the quadrants. For example, Himalayan blackberry may have branches present, but that are not rooted into the ground.

-Counting the number of native species present (species richness)

-Counting at what level specific species occur (species abundance)

-Measuring the heights of native species

-Noting what developmental stage the vegetation is in (i.e. seedlings, resprouts, mature, dead)

-Noting soil conditions through qualitative observations

After gathering data from the quadrants, it will be analyzed against previous sets taken to see where the restoration is in its development. For example, if there is a marked increase in Himalayan blackberry, action should be taken to remove it as soon as possible. Conversely, if a native species has shown to have significant growth without it being overtaken from invasives, we

can infer that the system is on its way to recovery. This methodology of course has its problems. For example, a given scenario may see a particular native species outcompete other native species. Problems such as these will require adaptive management. In the scenario stated above, a commitment must be made to establish the biodiversity of the site. Therefore, removal or trimming of the plant may be necessary. A further component to this methodology is writing down the findings of the data, so as future data collectors will have a comprehensive and cohesive starting point. This written document could be a form with fill-in-the-blank problems of the quadrants, a formal report or a combination thereof. These documents will also be a way for stakeholders to engage with one another and assess the best course of action in dealing with problems affecting the site.

Monitoring of the quadrants will ensure that we can select the plants that are desired and not desired at the site. The box below illustrates these plants.

| **Plants to be Removed if Seen** | **Native Plants to be left alone if seen** | **Native Plants to be Encouraged for Biodiversity** |
|---|---|---|
| -Black Bamboo | -Nootka rose | -Bracken Fern |
| -English Ivy | -Thimbleberry | -Common Juniper |
| -Holly | -Snowberry | -Field Mint |
| -Hybrid plant at entrance | -Mahonia (tall and short) | -Broad |
| -Quack Grass | -Rosy Twisted Stalk | -Leaved Starflower |
| | -Deer Fern | -False-box |
| | -Sword Fern | -Nodding Onion |
| | -Lady Fern | -Trailing Blackberry |
| | -Common Rush | -Skunk Cabbage |
| | -Yellow Pond-lily | -Devil's Club |
| | -Duckweed | -Arrowhead (Wapato) |
| | -Cattail | |

Note: Animal species such as Deer and Rabbits also pose a problem to long term monitoring because of their potential for destruction and disturbance of the garden. A continued monitoring plan must adjust for this by fencing the entire region.

| | Level of Invasives | Soil Conditions/Hydrology |
|---|---|---|
| Quadrant 1 | High | Wet to very wet nitrogen-rich soil. |
| Quadrant 2 | High | Clay |
| Quadrant 3 | Low | Acidic |
| Quadrant 4 | Very High | Clay |
| Quadrant 5 | Moderate | Wet |
| Quadrant 6 | High | Clay |

## 5. Cultural Monitoring

Effective monitoring of the project will also require a cultural engagement. Participation in the monitoring process from future generations of students is key to the success of this project. They will need to continually work to remove invasive species from the area, maintain signage at the site, ensure that the native species are thriving in the area, and be able to do data analyses of the quadrants. It is our hope that at the beginning of each semester, ES 200, 240, and 341 students will be given a tour of the grounds with a particular focus on the native plant gardens. Subsequent efforts could be made to offer marks to students who wish to participate in the weeding or planting of new species in the garden. This process will allow for continual education opportunities, proper maintenance and overall cultural intimacy with the site.

## 6. Monitoring through Photographs

Permanent monitoring will also require the site to be photographed every six months to a year. Observation points have been designated at the site to ensure the photographs represent the same areas over time. This will allow comparison between different time frames (Refer to the Appendix). The photographs should be documented at each data collection interval and then archived to create a comprehensive record of the site history.

# Time Line and Budget

## 1. Time Line

Following the removal of invasive and exotic species, the planting of native species will occur during the next regular planting season. These two activities should occur within two months to ensure that invasive species do not re-colonize the site. It is recognized that during the first few years more effort will be required to suppress invasive plants and encourage the native plants to flourish. The interval of time between removal of invasive plants and upkeep of the site over the first few years should be relatively short. Over time however, it is hoped that need for removal and upkeep of the site will be reduced to have minimal oversight.

## 2. Budget

The budget for the restoration of the native plant garden would be in the hands of facilities management. We do not know the scope of their budget and how much would be acceptable to spend on this project. We have researched the per unit price of several plants that we have proposed be planted. We also recognize there will be the added cost of labour and fencing to protect the garden from wildlife. However we suggest that the fencing is reused as each new phase of the garden is undertaken.

-Bracken Fern- $7
-Common Juniper-$7-14
-Field Mint-$7-14
-Broad-leaved Starflower-$10
-False-box-$15
-Nodding Onion-$7
-Skunk Cabbage
-Devil's Club-$25

# Our Group

We feel it is important to include at the end of this report a description of our experience. This has been a unique group project for all of us. Collectively we have never put as much time into establishing solid group dynamics on any other group project in our university career. We met almost weekly (sometimes more) since our group was formed. Often we met in the garden to gain inspiration from the physical site. Our group met not only in the garden but in the library, the SUB and even in our own homes, as well as group fieldtrips to another native plant garden and facilities management headquarters. During this time it would be fair to say that we all became friends.

We all feel that we have established a lasting connection to our garden. We collaborated in group discussions and brainstorming and yet each took initiative on our own. At each successive meeting we brought new information not only for our own sections but to aid our group members. Although each person was responsible for their own section we each contributed significantly to each section of the project. We shared our findings and pointed one another in the right direction with research findings to other resources. Because of our group cohesion we unanimously agreed that we one mark on our group project as a whole, refraining from staking claims to individual sections.

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