

**The Brighton Walkway Garry Oak Ecosystem:  
Urban Restoration in Oak Bay, British Columbia**



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## **Abstract**

The importance and necessity of ecological restoration in urban settings is only increasing, as biodiversity conservation, climate change and human health become a greater part of the global consciousness. The Garry oak ecosystem of the Brighton Walkway, located in Oak Bay, BC, is an excellent example of long-term urban restoration, where volunteers have faced and overcome many of the challenges of volunteer-based restoration work. This report will include a historical and ecological background of the site, as well as the philosophies and goals which have provided structure for restoration work along the walkway. Methods used at the site, particularly of non-native species removal and native species planting, will also be discussed, as will the challenges of conducting restoration work at the Brighton walkway. The report will conclude with recommendations for future work at the Brighton Walkway.



**Spring-gold (*Lomatium utriculatum*)**

## Table of Contents

Abstract.....	2
Table of Contents.....	3
Table of Figures.....	4
Introduction.....	6
What is Urban Ecological Restoration and Why is it Important?.....	6
Maintaining and Increasing Biodiversity.....	6
Climate Change.....	7
Human Health.....	8
Raising Awareness.....	8
Practical Benefits.....	8
The Brighton Walkway.....	9
Garry Oak Ecosystems in British Columbia.....	9
The Brighton Walkway and the Friends of the Brighton Walkway.....	10
Restoration Work through the Year.....	11
Community Use.....	12
The Walkway as a Habitat.....	12
Connectivity.....	12
Goals and Objectives.....	13
Philosophy and Goals of the Site.....	13
Future of the Site.....	14
My Role and Goals at the Site.....	14
Methods.....	15
Non-native and Invasive Species Removal.....	15
Native Species Planting.....	18
Results.....	20
Planting of Native Species.....	20
Non-native Species Removal.....	21
Maintenance of Existing Areas.....	22
Creating New Planting Areas.....	22
Discussion.....	23
Volunteer Restoration.....	23
Public Relations.....	25
Proposals for the Brighton Walkway.....	28
Prescribed Burning.....	28
Solarization.....	29
Split-rail Fence along Hampshire Road.....	29
Neighbor and Public Outreach.....	29
Conclusion.....	30
Acknowledgements.....	31
References.....	32
Appendix A – List of Native and Non-native Plants found at the Brighton Walkway.....	34
Appendix B – Dominant Invasive Species with Notes.....	36

## Table of Figures

Figure 1 -- Garry oak ecosystem distribution in Greater Victoria, c. 1800 and 1997 .....	37
Figure 2 – Garry oak ecosystem distribution in Greater Victoria, 1997.....	38
Figure 3 – Present distribution of Garry oak ecosystems in British Columbia (red denotes Garry oak ecosystems).....	39
Figure 4 – Map of the Brighton Walkway .....	40
Figure 5 – Map of the Brighton Walkway, Length of the Walkway Currently Being Restored .....	41
Figure 6 – Map of the Brighton Walkway, Restoration Site Boundaries .....	42
Figure 7 – Map of the Brighton Walkway, Surrounding Streets Labeled .....	43
Figure 8 – Map of the Brighton Walkway, Elevation.....	44
Figure 9 – Map of the Oak Bay Centennial Trail .....	45
Figure 10 – Volunteers at the first “ivy pull” of the Brighton Walkway, April 2006 .....	46
Figure 11 – Volunteers sitting on a large pile of English ivy that was removed from the site that day, April 2006.....	46
Figure 12 – Brighton Walkway from Hampshire Road, bench before the plant bed was put around it, December 2006.....	47
Figure 13 – Brighton Walkway from Hampshire Road, deep in snow, December 2008 ..	47
Figure 14 – Spreading leaf mulch on the new bed around the bench near Hampshire Road, January 2009.....	48
Figure 15 – Brighton Walkway looking down on the new bed around the bench, near Hampshire Road, January 2009 .....	48
Figure 16 – Carol, Lynda and Pam at the Brighton Walkway .....	49
Figure 17 – Rick and Carol at the Brighton Walkway.....	49
Figure 18 – Bluebell with deep root system going down between rocks .....	50
Figure 19 – Volunteers Rick, Carol, Lynda and Pam at work removing periwinkle and bluebells .....	50
Figure 20 – Map of Garry oak ecosystems relative to the Brighton Walkway, 1997 coverage .....	51
Figure 21 – Native plants and non-native glory of the snow ( <i>Chionodoxa luciliae</i> ) emerging after periwinkle removed .....	52
Figure 22 – Periwinkle spreading from neighbor’s garden .....	52
Figure 23 – Pam removing ivy from the rock wall .....	53
Figure 24 – Lynda removing ivy and non-native grasses from the top of the rock wall ..	53
Figure 25 – Rock wall formerly covered in English ivy.....	54
Figure 26 – New plant bed at the end of Roslyn Road, prior to restoration .....	54
Figure 27 – New plant bed at the end of Roslyn Road, post restoration .....	55
Figure 28 – Grasses in the process of deadheading, revealing Garry oak seedlings .....	55
Figure 29 – Dirt to be removed following bluebell removal .....	56
Figure 30 – Sedum and mosses planted following non-native plant removal .....	56
Figure 31 – Laburnum tree with seedlings underneath.....	57
Figure 32 – Laurustinus tree .....	57
Figure 33 – Naked broomrape and non-native sedum .....	58
Figure 34 – Early autumn, looking up the walkway from Hampshire Road, large numbers of snowberry visible.....	58
Figure 35 – Transplanting camas seedlings .....	59

Figure 36 – Camas seedlings from Lynda’s backyard..... 59  
Figure 37 – New area planted near Hampshire Road ..... 60  
Figure 38 – Ferns in new area near Hampshire Road..... 60  
Figure 39 – Fern removed from makeshift pathway after being damaged..... 61  
Figure 40 – Laburnum tree with new ferns below ..... 61  
Figure 41 – Pam removing dead grass from beside a neighbor’s house..... 62  
Figure 42 – Sign on a lamp post near the entrance to the Brighton Walkway ..... 62  
Figure 43 – Sign on railing along walkway ..... 63

## **Introduction**

Several years ago my husband and I went for an evening walk through the village section of Oak Bay; on a whim, we decided to follow one of the side streets through a residential area, and we found ourselves at the foot of a walkway reaching up into high rock faces and almost-overwhelming oak trees. We took the path, and found our way up the dark steps into a place that didn't seem to belong amongst all of these homes, with its grand trees and steep rock faces; and yet at the same time it didn't feel out of place, it was simply unexpected. Several years later, I was surprised to learn that this very place was to be the site for my final project for my Restoration of Natural Systems diploma. Though I had only been there once, the Brighton Walkway had made a strong impression on me and had remained in my memory as a very unique place.

The Brighton Walkway is part of a network of Garry oak (*Quercus garryana*) ecosystems found across the Oak Bay landscape. The Friends of the Brighton Walkway have been working to restore the walkway for several years, primarily through the removal of non-native and invasive species, and the planting and maintaining of native species. My role at the site was to learn and practice methods of restoration as guided by the Brighton volunteers, as well as to learn about Garry oak ecosystems and the challenges of long-term restoration work.

## **What is Urban Ecological Restoration and Why is it Important?**

While ecological restoration in almost any setting is important, I would like to focus on why urban ecological restoration is important since an urban setting is the context of the Brighton Walkway.

### ***Maintaining and Increasing Biodiversity***

At all levels of nature, from the individual up through species and ecosystems, biodiversity is being lost at a rapid rate (Schaefer, 2011). The resilience of these systems is also being lost as they become more fragile and incomplete through the loss of native species; this problem is compounded by greater susceptibility to invasive species as the

system is weakened, allowing for the admittance of non-native species which can cause further degeneration (ibid.).

The greatest cause of biodiversity loss is most commonly attributed to destruction of habitat, often through urbanization, which has become a global trend (Kowarik, 2011). Because cities are often found in biodiversity hotspots (higher levels of biodiversity can be found in urban areas than in rural because cities are often located on waterways which are naturally rich in species [ibid.]), it is increasingly important to consider urban restoration in order to protect native species and provide opportunities for them to live successfully in an urban setting.

When restoration work is undertaken in an urban area, Kowarik (2011) suggests that it should be understood whether the species being threatened by urban growth can survive in an urban setting, and to what extent. It may be that a given species can exist in a city, but is not able to establish self-sustaining populations; in such cases, Kowarik (2011) argues that urban habitats alone are not enough and that semi-natural remnants in urban regions be protected for such species, particularly if they are rare or endangered, and that impacts of new urban growth are minimized in these regions. However, it should be noted that any type of urban habitat can make significant contributions to biodiversity conservation (ibid.).

### ***Climate Change***

Ecological restoration in an urban setting can contribute to mitigating climate change by restoring ecological services and repairing environmental degradation at sites where damage has occurred (Seabrook, Mcalpine & Bowen, 2011). Restoration sites can also serve as an early warning system for the effects of climate change on native species, as well as a means of monitoring how invasive and non-native species respond to change (Kinver, 2011). Additionally, if native plants are supported in urban areas through restoration efforts, the sites may in the future provide important biological material for repopulating non-urban areas as climates change and plants can no longer live in their current habitats; an example would be Garry oak ecosystems in British Columbia, which

may be more common in the future as the climates in British Columbia grow warmer (Province of British Columbia, 1993).

### ***Human Health***

There is no shortage of studies demonstrating that contact with nature is highly beneficial to human health, and even that our health is dependant upon the ecosystems in which we live (Dean, van Dooren & Weinstein, 2011; Kowarik, 2011). General better health is one of the primary benefits gained through contact with green spaces, as well as more rapid recovery from stress, enhanced development of children, and the potential to lessen hyperactivity disorders in adolescents (Kowarik, 2011). Ecosystem services provided by green spaces also include “culturally enriching” benefits such as accessibility of areas for physical activity, psychological restoration, and aesthetic preferences (Dean, van Dooren & Weinstein, 2011).

Dean, van Dooren & Weinstein (2011) hypothesize that areas with increased amounts of biodiversity, such as an urban forest with a large diversity of species, are more beneficial to human health than more homogenous green spaces, like golf courses. Kowarik (2011) addresses this question by drawing from studies conducted in urban areas where psychological benefits were positively correlated with species richness of plants and birds; in the case of plants, higher levels of biodiversity correlated with participants’ ability to reflect.

### ***Raising Awareness***

Urban restoration is an important means of raising awareness about biodiversity and conservation, as urban green spaces are a common way for city residents to experience nature (Kowarik, 2011). Using this contact between people and ecosystems is an important opportunity for sharing information about biodiversity, as well as a chance for strengthening the emotional bond people feel with the natural world.

### ***Practical Benefits***

Urban restoration has several practical benefits, beyond the conservation of biodiversity. Urban green spaces, particularly those composed of native species, provide corridors

between protected areas for both plants and animals; these corridors allow species to have a greater range (such as predators like hawks), and to disperse seeds to other sites (through wind or being carried by a bird or animal).

Sites that are home to native plants need far less maintenance and watering than areas where non-native plants are dominant; in light of municipal costs and water conservation, the use of native plants is highly practical.

## **The Brighton Walkway**

### ***Garry Oak Ecosystems in British Columbia***

The Brighton Walkway is a Garry oak woodland, a type of ecosystem that was once common in Greater Victoria prior to urban development (see Figures 1 and 2); Garry oak ecosystems of all types are now considered endangered or threatened (Province of British Columbia, 1993). Because the Brighton Walkway is a relatively heterogeneous example of a Garry oak ecosystem patch, it is difficult to classify exactly which category of woodland the Brighton site falls into. The topography of the site is varied, from steep rock faces to moderately sized grassy areas, and the species composition and soil types do not fit within the categories described by Fairbarns (2010); however, when looking at the broader category of Garry oak woodland, as compared to a Garry oak meadow or wetland, the site and its native species certainly fit well within the woodland parameters.

Garry oak ecosystems are found primarily in British Columbia, Washington, Oregon and California. In British Columbia, the Garry oak ecosystem is geographically limited and is found primarily on the southeast coast of Vancouver Island and the southern Gulf Islands, making it one of the rarest ecosystems in the province (Province of British Columbia, 1993) (see Figure 3).

Garry oak ecosystems prefer a warm climate and can tolerate dry conditions well. They are found in areas where the soil drains quickly, and often on steep south- and west-facing slopes (Province of British Columbia, 1993). They also thrive in areas with

exposed bedrock, where many other trees would do poorly, and also areas where periodic fires are part of the natural disturbance regime (ibid.).

Traditionally, First Nations used periodic fires in Garry oak ecosystems to burn back grasses and shrubs, as well as small trees, thus maintaining an open savannah-like landscape which made hunting easier (Province of British Columbia, 1993). Mature Garry oaks are quite fire-resistant and herbaceous plants grew back quickly following low-intensity fires (Capital Regional District, 2011a), providing an important source of food and medicinal plants for First Nations, particularly camas (*Camassia quamash* and *Camassia leichtlinii*) (Province of British Columbia, 1993).

### ***The Brighton Walkway and the Friends of the Brighton Walkway***

The Brighton Walkway is located in Oak Bay, British Columbia, Canada (see Figures 4-8). The Brighton Walkway is a footpath which follows the trajectory of Brighton Avenue between Hampshire Road and Victoria Avenue, approximately 136 meters in length, varying between 14 and 22 meters of elevation. At its approximate midpoint, the walkway intersects with the end of Roslyn Road.

Before any restoration work took place at the Brighton walkway, the site was completely overrun by non-native invasive species, particularly English ivy (*Hedera helix*) and Himalayan blackberry (*Rubus discolor*). In 2005, local resident Rick Marshall envisioned a plan to restore the Brighton Walkway and return it to functioning as a Garry oak ecosystem. In August of 2005, he consulted with his Roslyn Road neighbors and some of the future volunteers went for the first walk through the site to assess what would need to be done. On September 14, 2005, with the support of local residents, Rick presented his plan at the Oak Bay Municipal Hall and received approval from Oak Bay. Over the winter months Rick canvassed his neighbors for ideas about the site and planned out how to proceed. In 2006, the Brighton Walkway was officially established as part of the Centennial Trail in commemoration of Oak Bay's centennial year (see Figure 9),

In the early spring of 2006, the Friends of the Brighton Walkway volunteers met for the first time at the Brighton Walkway and had their first English ivy pull on April 17 (see Figures 10 and 11, as well as Figures 12-15 for more images from the early years of the walkway). The initial group of volunteers was composed largely of local residents, though a few non-residents were also interested in restoring the site. The first work was the heaviest, with the removal of huge quantities of English ivy and Himalayan blackberry, as well as smaller species like daphne laurel (*Daphne laureola*). While removing these non-native species, the volunteers tried to watch for native species, and were able to preserve a few native plants, including a rose and miner's-lettuce (*Claytonia perfoliata*). The local resident volunteers were primarily interested in the removal of the large non-native species, so when this work was finished in the early autumn of 2006, most of them stopped coming to the site, leaving the core group of Rick, Carol, Lynda and Pam, who remain working at the site until today (see Figures 16 and 17).

Currently, the four core volunteers work at Brighton on Sunday mornings and work for at least two hours, often longer, depending on the season. Work is carried out all through the year in almost any type of weather, with the exception of heavy rain or snow. See Appendix A for a partial list of native and non-native plants found at the Brighton Walkway.

### ***Restoration Work through the Year***

The majority of planting work takes place in the autumn and spring, depending on the plant species and the readiness of the site. In the summer, maintenance and watering dominate the activities; given that Garry oak ecosystems are dry during the summer, watering is generally limited to newly planted areas where individual plants need extra support while they are being established. Removal of invasive species takes place throughout the year, depending on the plant species; for example, Spanish bluebells (*Hyacinthoides hispanica*) are removed in the spring when their leaves have emerged and are large enough to be grasped, but before the plant produces flowers (see Figure 18). Some invasive species, such as periwinkle (*Vinca minor*), can be removed at any time of year, which provides work during the winter months when planting is not possible (see

Figure 19). Preparation of new planting sites can also be carried out during the winter, which includes the removal of existing non-native plants and debris, and, if necessary, the covering of the area with newspaper and leaf mulch to reduce the number of non-native plants that will emerge in spring (particularly bluebells).

### ***Community Use***

The Brighton Walkway is used by a wide range of the general public, including people of all ages, as well as their pets (dogs in particular). The walkway is used as both a means of going between two points (utilitarian) and as a portion of a longer route for recreational walking or running (leisure). The walkway is used throughout the year, though use is higher when the weather is favorable.

### ***The Walkway as a Habitat***

Due to many factors influencing the ecosystem of the Brighton Walkway, it is not a typical Garry oak ecosystem in terms of animal species diversity. The lack of connectivity between highly fragmented Garry oak ecosystems, the recentness of the walkway's restoration, the relatively small size of the patch, and the high level of use by local residents all contribute to a lower level of diversity than may be found in a typical Garry oak ecosystem outside of a city. A great variety of birds use the site; through the course of a year, an owl, woodpeckers and hummingbirds were seen, as well as many types of common songbirds. Deer also frequent the site and browse on leafy vegetation.

The most frequent animals at the site are dogs. Owners generally keep them on a leash and walk along the designated trail, so they are not seen as a negative presence on the walkway.

### ***Connectivity***

Determining the connectivity of the Brighton Walkway with other Garry oak ecosystems is difficult, as the sites are highly fragmented, particularly in Oak Bay and Victoria proper. Using the Natural Areas Atlas layer of the Regional Community Atlas (Capital Regional District, 2011b), I found that as of 1997 there are no Garry oak ecosystems within a kilometer of the Brighton Walkway (see Figure 20). The nearest site is Gonzales

Hill Park, which is more than 1.2 km from the Brighton Walkway. I know from personal experience that there are several areas near the Brighton Walkway where Garry oak trees are growing, even in a small stand occasionally; however, these are not considered adequately large to be considered Garry oak ecosystems by the atlas. Even the Brighton Walkway is not included in the atlas as a Garry oak ecosystem, perhaps because the Garry oak layer was compiled from data from 1997. It would be interesting to see an updated version of the layer given that 1997 was almost 15 years ago, and that urban restoration may have added several important sites over the last several years.

## **Goals and Objectives**

### ***Philosophy and Goals of the Site***

The philosophy behind the Brighton Walkway was developed by the Friends of Brighton Walkway volunteers. The primary goals of the restoration work are to return the site to the state it would have been in prior to the introduction of non-native and invasive species, and to bring it to a condition in which it can function as a self-sufficient Garry oak ecosystem which only requires minimal maintenance.

To these ends, only plants that were originally found on the site by volunteers are planted, meaning that even if a species is native to a Garry oak ecosystem but was not present at this particular site when restoration began, it will not be introduced.

Fortunately, native species diversity at the site is high, with new species coming out as non-native plants are removed (e.g., when periwinkle was removed, Hooker's onion [*Allium acuminatum*] and Fool's onion [*Brodiaea hyacinthine*] both came out) (see Figure 21). According to Schaefer (2009; 2011), this would suggest that the site history or the "ecological memory" of the area is sufficient for native species to regain a foothold when non-native plants are removed; however, Schaefer may also propose that the ecological memory of the site now includes non-native species, and that their presence will continue to influence the composition of the site for some time, requiring continued efforts to extricate them from the area.

Another important aspect of the philosophy behind the site is that it is meant to be a natural space, not a garden. Though some maintenance is done along boundaries with neighboring houses, plants at the site is not manicured or pruned for visual appeal, rather for system function. The Oak Bay Native Plant Garden is an example of a native plant site that has been cultivated with its physical appearance as a higher priority; in the case of the Native Plant Garden, it is the hope of volunteers that visitors will see how beautiful native plants can be and consider using them in their own landscaping.

### ***Future of the Site***

The general feeling amongst volunteers is that the Brighton Walkway site is nearing completion. The last potential large project is the removal of non-native grasses from the site, which would encompass a large part of the walkway and require a great deal of work.

If attempts to remove non-native grasses are successful, volunteers may attempt to create a Garry oak meadow in some of the flatter, grassy areas of the walkway. Volunteers had tried to do this some time ago, but the native plants that were transplanted were quickly overtaken by non-native grasses and miner's-lettuce.

If and when the project to remove non-native grasses was complete, volunteers would ideally like to see local residents take ownership of the site and maintain the walkway as needed (e.g., removal of non-native plants as needed, cutting grasses back from the pathway). If this was not possible, then volunteers would be willing to visit the site on a bi-weekly or monthly basis to perform basic maintenance.

### ***My Role and Goals at the Site***

My role at the Brighton site was as a volunteer and student, from October 2009 to November 2010. The Brighton site volunteers gave me wonderful guidance and taught me many methods of restoration work, particularly non-native species removal and native species planting. During my time at the site, I planted native species, removed non-native and invasive species, prepared bare areas for new plantings, propagated seedlings,

documented species, watered plant beds, interacted with the public, and performed general maintenance duties.

When I began work at the Brighton site, my goals were to practice restoration work in a non-academic setting, and to learn about Garry oak ecosystems first hand. I was also hoping to observe how the public interacted with the site, and possibly to foster greater public awareness of the walkway. I hope to fulfill this latter goal through a website with information about the Brighton Walkway.

## **Methods**

### ***Non-native and Invasive Species Removal***

Several approaches were taken to removing non-native and invasive species from the Brighton Walkway; the method used depended on the species being removed. Three primary species were the focus of species removal at the site, namely bluebells, English ivy and periwinkle, though many other non-native species were present in varying degrees (including Scotch broom [*Cytisus scoparius*], daphne laurel, and Himalayan blackberry). Additionally, a multitude of non-native grasses are present at the site.

As noted in Province of British Columbia (1993), non-native plants may make up to 30 percent of the species in a given Garry oak ecosystem; special mention is made of non-native grasses, which are particularly prevalent. Capital Regional District (2011a) lists the following as the most common non-native and invasive plants found in Garry oak ecosystems in British Columbia: Scotch broom, Himalayan blackberry, English ivy, orchardgrass (*Dactylis glomerata*), Kentucky bluegrass (*Poa pratensis*), sweet vernalgrass (*Anthoxanthum odoratum*) and hedgehog dogtail (*Cynosurus echinatus*).

### **Removal by Hand**

The most common method used was the removal of individual plants by hand. This usually involved a tool such as a trowel or small pick to reveal the base or roots of the plant, and then the full plant was removed carefully by hand. This was the most effective

way of dealing with bluebells, the most prevalent and persistent non-grass, non-native species at the site; however, often the bulb was buried so deep that the stalk would break off through attempts to reveal the bulb (see Figure 18), thus leaving the bulb in the soil to grow the next season if it was not retrieved. Removal by hand was also the chosen method when dealing with periwinkle, which has a deep root system and spreads easily; in this case, yearly maintenance will be necessary because the source plants are in a neighboring garden where they are part of the landscaping (see Figure 22). Likewise, English ivy was removed by hand (with the assistance of strong clippers) from a rock face at the eastern end of the walkway (see Figures 23-25).

The time of year was influential as to which species could be removed by hand, particularly since foliage needed to be both present and identifiable; for example, bluebells could only be removed in the spring when they had emerged and were large enough to be grasped.

### **Mulching**

In areas where a large number of new plants were to be placed, mulching methods were employed to keep down non-native plants. Generally, in the cooler months a site would be prepared for later transplants by first removing existing non-native plants, followed by laying down layers of newspaper. The area was then covered in leaf mulch to help the newspaper decompose over time, provide a more aesthetically pleasing surface, and to provide a better top layer for future transplants. This method was employed in the area shown in Figures 26 and 27; however, though this method greatly reduced the number of non-native plants in the area, some persistent non-native plants were still able to find their way through the layers of newspaper, particularly bluebells which grew stalks almost two feet in length at times.

### **Deadheading**

In some cases, full-scale removal of non-native plants was not possible at the time, such as with non-native grasses. Ideally, non-native grasses would be dug out by the roots and native grasses sown in their place; however, given the size of the area needing

restoration, this would be a huge effort, requiring both a large amount of time and work. Thus, deadheading was seen as the most effective means of controlling the non-native grass population, at least for the time being. To this end, when the grasses had developed flowering heads, we went through the area and removed as many heads as possible (see Figure 28).

### **General Notes**

When possible and where applicable, any long-time effects of the non-native species were mitigated upon their removal. For example, at the top of a rock face at the west end of the walkway bluebells grew profusely for many seasons, resulting in an abundance of organic matter along the top of the rock face where it would not have naturally occurred; when the bluebells were removed, the soil they had created was also removed so as to both discourage further non-native species growth and to encourage native species which thrive in rock crevasses (such as broad-leaved stonecrop [*Sedum spathulifolium*]) (see Figure 29). The importance of the composition of soil in Garry oak ecosystems is discussed in Province of British Columbia (1993), where it is noted that the vegetation and dry climate of these ecosystems creates a soil with organically enriched upper layers that are ideal for the shallow-rooting herbaceous understory vegetation of the Garry oak ecosystem.

In other areas where invasive or non-native species were removed, native plants were planted in their place shortly after so that other non-native plants would not take advantage of the loose soil (see Figure 30). Special care was also taken in some areas where large amounts of non-native invasive species were removed to prevent re-encroachment, such as where periwinkle was taken out; several native species came out in the following months and volunteers took special care to make sure any stray periwinkle was removed from the area to give the native species the best opportunity to thrive (see Figure 21).

Some exceptions are made to the practice of removing non-native species. One example is large trees which would be very difficult and expensive to remove, or which are rooted

on a neighboring property. At the eastern end of the walkway, a large laburnum tree and a large holly tree (probably *Ilex aquifolium*) are part of the neighbor's property; these species are very profuse in dropping seeds which readily sprout into seedlings (see Figure 31). At the top of Roslyn Road, a laurustinus tree (*Viburnum tinus*) has become problematic because of the hardy suckers it sends out, extending the reach of the tree considerably (see Figure 32). Another reason for not removing a non-native species is when a native species is dependant upon it; for example, there is a non-native type of sedum which hosts naked broomrape (*Orobanche uniflora*), which is native; therefore, for the time being, the non-native sedum is not removed from the site (see Figure 33).

It should also be noted that there are two dominant invasive species which are native, namely miner's-lettuce and snowberry (*Symphoricarpos albus*); however, given the abundance of both of these species, as well as their role in the ecosystem, they are only removed when encroaching on an area where other native species are being established (see Figure 34).

### ***Native Species Planting***

#### **How Plants are Chosen**

One of the integral components of restoration work at the Brighton Walkway is the planting and propagation of native plants. Some basic principles are followed when choosing which plants to bring to the site. First, only species typically found in a Garry oak ecosystem would be considered for planting. Second, a species will only be included if it is already present at the site; considerable caution is exercised on this point, meaning that if the volunteers are not certain, the species will not be planted.

Another principle is that invasive native species are generally not selected for planting, as they can potentially dominate an area, as has already happened with snowberry and miner's-lettuce. Species are also chosen based on their compatibility with other species, as well as their appearance, size, light requirements and how they would fit into the larger landscape. For example, in a large new planting bed, fuller and year-round species such

as sword fern (*Polystichum munitum*) would be chosen before small species, such as nodding onion (*Allium cernuum*), which are only visible for part of the year.

The time of year will also determine which plants are brought in or propagated. In the case of camas, seeds are gathered and spread by hand after the seed pods have dried out during the summer. The seeds are usually spread in both grassy and bare areas; if the seedlings in the bare areas are successful, they may be divided and re-planted in the spring when the soil is wet (see Figure 35).

### **How Transplants are Gathered**

As mentioned in the section above, sometimes transplants or seeds are gathered directly from the site, as in the case of camas seeds and seedlings.

Transplants are also brought from the homes of volunteers. One volunteer has abundant amounts of camas (*Camassia quamash*) in her backyard, so she is able to bring over seedlings in the spring (see Figure 36). Volunteers will also house plants that are in need of special care before they are transplanted, whether they are frail or it is not the right season for them to be planted.

Salvage sites are also an important source of plants for the walkway. After completing a training program, volunteers can go to a site where a development is being planned and remove any native species they need. As a side note, I was hoping to go through the training program, but one was not offered in the time that I was working at the Brighton site. Much of the moss and sedum that was transplanted to the Brighton site was brought from salvage sites, as well as several other species. An added benefit is that the soil brought in with salvaged plants holds a wide range of microscopic organisms which help to restore soil ecosystems at the new site (Schaefer, 2011).

Another source of transplants is the Oak Bay Native Plant Garden, where some of the Brighton Walkway volunteers also work. When appropriate plants at the Native Plant

Garden send off suckers or seedlings, the volunteers are able to bring them to the Brighton site for re-planting.

The last source of transplants is the Oak Bay Parks Department. The Municipality of Oak Bay, through the Oak Bay Parks Department, allocates a small amount of funds annually to be used for the purchasing of native plants for the Brighton Walkway. When a request for plants is put in by one of the volunteers, Oak Bay Parks will fulfill the order through a supplier in Comox, and the plants reach the Brighton site a short time later. The Parks Department further supports restoration work at the Brighton site each week by removing plant material generated by the removal of non-native species.

It should be noted that when a transplant is brought to the Brighton site, particular care is taken to inspect new transplants for invasive species which may have come along in the soil. When transplanting an oceanspray (*Holodiscus discolor*) plant last spring, one of the volunteers found an individual lesser celandine (*Ranunculus ficaria*) plant, a tiny, but highly invasive species, that had been in the soil around the oceanspray; if she had not looked carefully, this one plant could have spread and created a huge problem at the Brighton site, as it has done at so many others.

## **Results**

Over the course of my year at the site, I was able to participate in much of the work typically carried out by the volunteers at the Brighton Walkway.

### ***Planting of Native Species***

I was able to help in the planting of several native plants, using a variety of methods. These are the main native plants that I helped in seeding or transplanting at the site.

Oceanspray: planted in a new area, through a layer of newspaper and leaf mulch; hole dug in soil to an adequate depth for roots to be fully covered, oceanspray placed in hole and held up while the hole was re-filled with soil, soil was then pressed down around the base of the plant, leaf mulch was placed around the base and the plant was watered deeply (see Figure 27).

Nootka rose (*Rosa nutkana*): same placement and methods as oceanspray (see Figure 27).

Sword fern: planted in newly created areas, both directly into the soil and through a layer of newspaper and leaf mulch; hole dug in soil to an adequate depth for roots to be fully covered, fern placed in hole and held up while the hole was re-filled with soil, soil was then pressed down around the base of the fern, leaf mulch was placed around the base and the plant was watered deeply (see Figure 37).

Dull Oregon grape (*Mahonia nervosa*): same placement and methods as sword fern (see Figure 37).

Camas: seedlings planted the year before were re-planted in existing plant beds where other plants were already established; large group of seedlings dug up gently and smaller groups of seedlings divided, small hole dug into soil in plant bed, small groups planted apart from one another, roots covered with soil and then watered (see Figure 35).

Sedum: planted on rock faces, both following the removal of non-native plants and in bare soil; soil was loosened, typically in crevasses, sedum placed on the soil, soil put over the roots and tapped down gently (see Figure 30).

Various types of moss: planted in several areas, primarily where non-native species had been removed, and typically in the shade; larger pieces of moss were broken into smaller pieces, typically placed in crevasses on a rock face or between tree roots, lightly worked into the soil (see Figure 30).

### ***Non-native Species Removal***

The majority of my work at the Brighton site was involved with non-native species removal, using a variety of methods (methods are described in more detail in the Methods section above). These are the main non-native plants that I removed from the site.

Bluebells: removed by hand from most sections of the walkway, this was the most persistent and pervasive non-native plant at the site (see Figure 18).

Periwinkle: found only in one area near a source plant in a neighboring garden, removed by hand (see Figures 19 and 22).

English ivy: removed from a large rock face along a side path branching off from the main walkway; the entire rock face was covered in ivy and took several visits to remove entirely (see Figures 23-25).

Scotch broom: individual plants removed by hand from rocky areas, pulled while they were still small and with care taken to remove their full root system.

Himalayan blackberry: isolated individuals, removed by hand.

Grasses: primarily dead-headed, though sometimes roots pulled up as well (see Figure 28).

### ***Maintenance of Existing Areas***

Besides non-native species removal, maintenance also included watering some areas (particularly newly planted beds) during the summer months, picking up trash along the walkway, cutting back dead grass near a neighbor's house where it was visible from their window, and checking on new transplants to ensure that they were doing well. Concerning new transplants, occasionally a plant did not adjust well to its new environs and special care had to be taken to ensure that it was receiving enough sunlight and water (e.g., that it was not being covered in leaf mulch when it was windy and therefore unable to get enough light). In one instance, I had helped plant a sword fern in a new bed, and over the next few months we noticed that people were stepping on it as they were going through a makeshift passage way; we moved the fern to a new location where it did much better (see Figures 38 and 39).

### ***Creating New Planting Areas***

During my time at Brighton, I was able to assist in the creation of two new planting areas, one near the large log at the eastern end of the site by Hampshire Road (see Figures 31, 37-40), and the other at the end of Roslyn Road (see Figures 26 and 27). Previously, these areas had been empty or dominated by non-native species. At Hampshire Road, I helped remove non-native species, large rocks and sticks, then planted sword fern and Dull Oregon grape plants. The area was then covered with leaf mulch and watered. At Roslyn Road, I helped remove non-native species, cover the area with layers of newspaper and then leaf mulch, and then plant native species in the soil.

## **Discussion**

In this Discussion section I would like to address two topics which arose repeatedly during my time at the Brighton Walkway. The first of these topics is volunteer restoration, and the second is public relations.

### ***Volunteer Restoration***

Restoration projects like the Brighton Walkway are dependant on the work and support of volunteers; however, volunteer work brings with it a myriad of issues to consider. I would like to note that these issues were ones of discussion at the Brighton site, and generally do not apply to the volunteers at the site.

### **Weather and the Seasonal Nature of Restoration Work**

In almost any case of outdoor restoration work, the type and amount of work done on a given day is very dependent on the weather and the season. If it is raining heavily or snowing, work generally cannot be done with very much efficiency and volunteers are not likely to come out. Even if it is too hot or too cold, volunteers are much less likely to be willing to spend time out of doors. Victoria's mild climate seems to be ideal for restoration work, but even here, the disruption of a few poor weeks can interrupt momentum at a long-term restoration site like the Brighton Walkway.

Restoration work is also very seasonal. The spring and autumn are ideal times for planting and non-native species removal, work that restoration volunteers are generally most eager to do. In the winter, the weather is often inclement and wet, too cold for planting and non-native species are often dormant below the ground. Summers are warm or hot, but little work can be done besides general maintenance and watering (which is generally seen as being tedious and time consuming). Additionally, some volunteers, such as those who were involved in the early stages of the Brighton Walkway restoration, are only interested in work that is vigorous and demanding, such as the removal of large non-native species (e.g., English ivy and Himalayan blackberry); fewer volunteers are willing to stay around for the painstaking and detailed work that comes after the large volume work is done.

Because of these issues, it can be difficult to keep continuity through the year and maintain a base of volunteers.

### **Long- and Short-term Restoration Projects and their Volunteers**

As mentioned earlier, the Brighton Walkway is a long-term restoration project which has already been in place for several years, which has a small core group of volunteers who meet and work together weekly. This approach is in contrast to short-term restoration projects where a large group of volunteers may be gathered a few times a year to carry out a large effort over the course of one or two days, or sometimes just a few hours. (It should be noted that what I am terming as short-term restoration projects may be longer term in their full approach, but this is in reference to how they conduct the physical, field-based portion of restoration).

In many cases, the short-term approach may be much more appropriate for a given restoration site, particularly if the site is large and is being threatened by one or two primary invasive non-native species. In such cases, having a large number of volunteers at all once can be a very effective way of removing non-native species, though only one or two species are generally attempted at once to avoid confusion. Also, when there are large quantities of a given invasive species, such as Himalayan blackberry, it is helpful to have many volunteers present at once to make the work easier and more efficient. Another example is when a restoration projects involves moving large objects, such as riparian restoration where large woody debris may be put into a river bed to create habitat for fish; in such cases larger numbers of volunteers are crucial.

Another advantage of the short-term approach is that the retention of volunteers over time is not a significant issue; each time work is carried out, it does not matter whether the people who come are new or the same as last time, or even if they are experienced with restoration work, as the work is generally simple and does not need a great deal of explanation.

Conversely, the long-term approach is well-suited to smaller sites where there are many types of non-native species and where planting of native species would be beneficial. At such sites, attention to detail is necessary, as well as a knowledge of restoration methods and the characteristics of the site from season to season. For these and other reasons, the volunteers at the Brighton Walkway prefer to keep their numbers small. If they were to experience an influx of new volunteers regularly, they would need to spend a great deal of time explaining their methods and then attending to the new volunteers to ensure that the work was being done correctly.

The long-term approach also allows for more efficient and consistent maintenance of the site, as volunteers can afford to do things like second sweeps of non-native species removal (i.e., after a first attempt to removal non-native species is done, a volunteer can come back a few weeks or months later to see if some individuals were missed). Public relations are also more consistent with a long-term approach, which is valuable in an urban setting; neighboring residents will not be as likely to feel “descended upon” if only a handful of people are there regularly instead of a huge group occasionally. Ideally, in an urban setting with the long-term approach local residents will get to know the volunteers better and hopefully support their work.

Overall, the choice of restoration approach will depend largely on the type of site and the availability of volunteers. The long-term approach may be considered as a much slower method, but it allows for a much more detailed and comprehensive approach to restoring a site; however, volunteers willing to commit for the long term are critical to this method.

### ***Public Relations***

There are three aspects to public relations at the Brighton Walkway that I would like to discuss here. The first concerns the wider public who use the walkway, the second is in regards to relations with neighbors who border the walkway, and the third is poor use of the walkway.

### **Community Outreach and Relations**

There are several methods which the volunteers at the Brighton Walkway have used to engage members of the public using the walkway. The most common method has been to interact with the public personally, sometimes just saying “hello”, other times entering into conversation about the walkway, its native and non-native species, or the work being done that day. These interactions are generally brief, but they have led to the development of a sense of camaraderie between the volunteers and walkway regulars.

The Brighton volunteers, as the Friends of Brighton Walkway, also participate in municipal events, such as Tree Appreciation Day. Occasionally, walk-through’s are also held at the Brighton Walkway; at a walk-through, one of the Brighton volunteers guides members of the public through the walkway, pointing out and describing native species.

The most public event held at the Brighton Walkway was its inauguration in 2006. In honor of the Oak Bay Centennial, the trail was named in the spring of 2006; the mayor attended the event and gave a short speech, and was then taken on a walk-through by volunteers. Local residents made baked goods for the public, and the Nature’s Garden Seed Company donated native plant seeds to give away.

### **Relations with Neighbors**

Volunteers at the Brighton Walkway have worked hard to maintain good relations with neighbors who border the walkway. In the majority of cases, the neighbors support the work being carried out and are helpful in a variety of ways. In the case of two of the homes, they allow volunteers to use their hoses and water to irrigate plant beds or new plantings. One neighbor has also indicated their intention to use primarily native species in their new landscaping. In return, volunteers try to maintain a certain level of neatness in areas bordering neighboring homes, particularly areas that are visible from windows; cutting back dead grasses is an example of this type of maintenance (see Figure 41).

At times, however, neighbors have been resistant to change, and in the past have put up opposition through phone calls to the Parks Department, as well as questioning and

disputing decisions with volunteers, such as the choice of plants or the removal of non-native plants or trees (such as bluebells, periwinkle and English ivy). One such case came up when English ivy was being removed from a rock face below a neighboring home; part of the ivy had climbed up their fence and when asked for permission to remove it, the homeowners said “no” because they liked the way that the ivy looked on the fence. This was frustrating because the ivy left behind will be very likely to expand and regain much of the ground it was removed from; however, the homeowners’ wish was respected and the ivy was not cut back. In a similar case, periwinkle is used as an ornamental ground cover in a garden bordering the walkway, and because the neighbor’s fence does not reach the ground completely, the periwinkle has easy access to that section of the walkway, requiring repeated efforts to remove it (see Figure 22).

### **Poor Use of the Walkway**

Unfortunately, there have been some examples of the public using the walkway badly. Some of this has been intentional, while other examples are unintentional. In the case of purposeful destructive use, it is not uncommon to find that the site has been used as a meeting place for drinking-related activities, the result of which is cans and garbage being left behind, as well as plants being damaged on occasion; in the past, broken glass was much more of a problem when people would drink at the site and break their bottles against a fence (cans are more common now). Another example is riding bikes on the large rock faces of the walkway, which was very destructive to plants, mosses and lichens on and below the rocks, as well as compacting the soil and causing trenches in the ground. Railings were installed to stop bikers, but they have since found other areas to ride their bikes on the site.

Unintentional damage has been caused by people walking on grassy areas and causing compaction of the soil; it has been suggested that a split-rail fence be put up near the Hampshire entrance to the walkway to prevent further soil compaction.

Damage is also occasionally caused by the Parks Department workers, such as one instance where a worker used a weed whacker along the walkway and cut down many

native plants. After that occasion, an agreement was reached with the Oak Bay Parks Department that the Brighton Walkway volunteers would cut back the grass along the walkway as needed; while this has preserved many native species, it also took the volunteers three weeks to cut back the grass along the walkway this spring.

Another example involving the public, most likely neighbors, is when volunteers have found piles of compost dumped along the walkway; the assumption is that whoever is doing this thinks that the city will take it away with the plant debris generated by the volunteers, though this is not part of the agreement between the Parks Department and the Brighton volunteers.

It is difficult for volunteers to curtail these examples of poor use of the site, as so much of it takes place outside of the times that restoration work happens. Signs have been posted with information and requests to stay off the planted areas, but they cannot be enforced all the time (see Figures 42 and 43). Also, it is public land, so there are limitations on what can be fenced off or what restrictions can be imposed.

## **Proposals for the Brighton Walkway**

There are few recommendations that I could offer for the Brighton site, as so much excellent work has already been done. Thus, my main comments will be for one area primarily, namely the open grassy areas in the central section of the walkway which are currently dominated by non-native grasses.

### ***Prescribed Burning***

Frequent fire is a natural part of the Garry oak ecosystem, whether naturally occurring because of lightning or intentionally started, as was practiced by First Nations traditionally (Capital Regional District, 2011a; Province of British Columbia, 1993).

In theory, prescribed burning would be the most efficient method of removing non-native grasses at the Brighton site; however, burning would probably need to be carried out several times, as there are likely to be deep seed banks from non-native grasses in the

soil. Seeding with native grasses following a burn would also be necessary, as the soil would be bare and open to invasive non-native grasses from other areas of the site.

In practice, it is unlikely that a prescribed burn would ever be permitted in such a densely urban area. The walkway's proximity to homes would be much too close to allow for any sanctioned burning, even at a very small scale. Despite its many benefits, prescribed burning where there is a risk of property damage is a very difficult idea for the public to support (Costanza & Moody, 2011; Capital Regional District, 2011a). The Province of British Columbia (1993) suggests that when prescribed fire is not an option in a Garry oak ecosystem, we should try to simulate its effects, which takes us to our next suggestion.

### ***Solarization***

A similar effect to that of prescribed burning could be achieved by solarizing the grassy areas of the Brighton Walkway. Solarization could be achieved by using a heavy material, such as carpet, or something dark, like black plastic, to cover the area, preventing sun from reaching the plants and soil, thus killing off the non-native grasses. Solarization can be effective in killing seeds in seed banks (Moyes et al., 2005), so re-seeding with native grasses would be necessary. This approach is effective, but highly labor-intensive (Moyes et al., 2005), and it could also be deemed as unsightly by members of the public and neighbors.

### ***Split-rail Fence along Hampshire Road***

As mentioned earlier, soil compaction is a problem for the grassy area near the Hampshire Road entrance to the walkway. A split-rail fence would deter people from walking on the grass, as well as giving the main entrance to the walkway a stronger sense of place.

### ***Neighbor and Public Outreach***

My last suggestion is to expand efforts for public outreach, particularly with neighbors of the walkway. Concerning neighbors, they may appreciate receiving updates about the walkway in the form of a short newsletter or pamphlet in their mailbox; this may spur

more conflict when people do not agree on what is being done, but it may also engender more support and a sense of ownership if neighbors feel involved in the walkway. Newsletters could also be put out for members of the public to take when they walk through the walkway. In light of the nearing end of major restoration work being done at the site, it may be timely to reach out to the public in a more focused manner with the hope that they will eventually be willing to take on maintenance work at the walkway.

Regarding the general public, when work at the site is complete a Brighton Walkway Day would be a great opportunity to both celebrate and introduce people to the walkway; activities could include giving tours, offering demonstrations of non-native species and how to remove them, as well as giving information about native species and how to incorporate them into an urban landscape, such as how to collect and plant Garry oak acorns or camas seeds; having such a day around the time that the camas blooms would be a wonderful way to share the walkway and its native plants with the greater public.

## **Conclusion**

Coming away from a year's time at the Brighton site, the strongest impression that I have is of the amazing restoration work that has been done by the Brighton volunteers and their dauntless commitment to seeing the project through despite the many challenges of long-term restoration work. Their attention to detail is evident in each part of the walkway, and having spent time with them, I have come to appreciate how they have held consistently close to the philosophies behind the site.

The Brighton Walkway is not only a testament to the fortitude of its volunteers, but it is also a demonstration of the many benefits of urban restoration. The walkway acts not only as a safe haven for native species, but also as an important place for the public to be in direct contact with nature and to learn about the diversity and plants of the Garry oak ecosystem. In these pressing times, it is encouraging to have shining examples of biodiversity conservation and education like the Brighton Walkway, and we hope that areas like it will be used as templates for future sites of urban restoration.

## **Acknowledgements**

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**Brighton Walkway with early camas**

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## **Appendix A – List of Native and Non-native Plants found at the Brighton Walkway**

### **Native Species**

Garry oak – *Quercus garryana*  
Arbutus – *Arbutus menziesii*  
Bigleaf maple – *Acer macrophyllum*  
Oceanspray – *Holodiscus discolor*  
Nootka rose – *Rosa nutkana*  
Baldhip rose – *Rosa gymnocarpa*  
Red-flowering currant – *Ribes sanguineum*  
Tall Oregon grape – *Mahonia aquifolium*  
Dull Oregon grape – *Mahonia nervosa*  
Common snowberry – *Symphoricarpos albus*  
Common camas – *Camassia quamash*  
Great camas – *Camassia leichtlinii*  
Meadow death-camas – *Zygadenus venenosus*  
Sword fern – *Polystichum munitum*  
Licorice fern -- *Polypodium glycyrrhiza*  
White fawn lily – *Erythronium oregonum*  
Hooker's onion – *Allium acuminatum*  
Nodding onion – *Allium cernuum*  
Fool's onion – *Brodiaea hyacinthina*  
Siberian miner's-lettuce – *Claytonia sibirica*  
Miner's-lettuce – *Claytonia perfoliata*  
Broad-leaved stonecrop – *Sedum spathulifolium*  
Spring-gold – *Lomatium utriculatum*  
Yarrow – *Achillea millefolium*  
Few-flowered shootingstar – *Dodecatheon pulchellum*  
Western buttercup – *Ranunculus occidentalis*  
Naked broomrape – *Orobanche uniflora*  
False pixie cup – *Cladonia chlorophaea*  
Gumweed – *Grindelia squarrosa*  
False lily of the valley – *Maianthemum dilatatum*  
Sheep sorrel – *Rumex acetosella*  
Pearly everlasting – *Anaphalis*  
Grasses – Various  
Mosses – Various  
Lichens – Various  
Mushrooms – Various

### **Non-native Species**

Himalayan blackberry – *Rubus discolor*  
Scotch broom – *Cytisus scoparius*  
English ivy – *Hedera helix*

Spanish bluebell – *Hyacinthoides hispanica*  
Periwinkle – *Vinca minor*  
Daphne laurel – *Dephne laureola*  
Glory of the snow – *Chionodoxa luciliae*  
Holly – *Ilex aquifolium*  
Woolly Blue Curls – *Trichostemma lanatum*  
Quackgrass – *Agropyron repens*  
Feverfew – *Tanacetum parthenium*  
Laurustinus – *Viburnum tinus*

## **Appendix B – Dominant Invasive Species with Notes**

### **Non-native Invasive Species**

#### Bluebells

Very prolific, can grow between rocks, preventing removal, can grow deep, very resilient, long stems that are easily separated from the bulb and then the bulb is lost in the soil, will grow up from below newspaper, underground stems found that were nearly two feet long.

#### Periwinkle

Extensive root systems, spreads easily, covers the ground and keeps other plants out, roots go deep and can regenerate with a small piece left behind.  
Once removed in one area, nodding onion and hookers onion came up.

#### Non-native grasses

Cover a large area of the site  
Removal of clumps difficult and labour-intensive  
Dead-heading in the fall as a means of curtailing further spreading

#### Scotch broom

Highly invasive, will grow anywhere, difficult to see when grasses are tall, deep tap root makes removal difficult after the plant is established, must be removed when small

### **Native Invasive Species**

#### Snowberry

Encroaches on open areas quickly, shades out other native plants

#### Miner's-lettuce

Dominates areas if allowed, spreads easily, will grow in many areas (rocky areas particularly, shallow soil)