RESTORATION PROJECT

GARRY OAK ECOSYSTEM
931 FOUL BAY ROAD

Restoration of Natural Systems

Selected Project ER 390

June 29, 2004
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68-7978
ABSTRACT

The restoration site, on the southern border in the eastern section of the property at 931 Foul Bay Road, in the Corporation of the District of Oak Bay, on Vancouver Island, has a Garry oak (*Quercus garryana*) - Common snowberry (*Symphoricarpos albus*) - Tall Oregon-grape (*Mahonia aquifolium*) - Licorice fern (*Polypodium glycyrrhiza*) ecosystem. The restoration site was disturbed. Invasive species such as English ivy (*Helix hederacea*), Himalayan blackberry (*Rubus discolor*), and Laurel-leaved daphne (*Daphne laureola*), which had become established in the site, were removed. Common camas (*Camassia quamash*) was planted. Common snowberry and Tall Oregon-grape are being propagated. The soil was amended by adding Garry oak leaf mulch. Different methods of controlling and removing English ivy were considered, and manual control methods were implemented.

INTRODUCTION

The restoration project is located at 931 Foul Bay Road, in the Corporation of the District of Oak Bay, Province of British Columbia. Situate on the property is a large Maclure designed house, built between 1913 and 1915. Granite for the house construction was quarried on site (Segger 1986). The eastern section of the property is terraced. In 1947, Mr. Albert de Mezey purchased 931 Foul Bay Road. He developed a garden renown for its rhododendrons, orchids and rock and alpine plants. In 1987, Oak Bay Council passed a by-law designating 931 Foul Bay Road a municipal heritage site. Presently, it is owned by the De Mezey Memorial-Abbeyfield Housing Society, the house has been converted into suites for seniors.
In the spring of 2003, the Oak Bay Heritage Society established a group of volunteers to take on the task of developing the woodland character of the garden, while preserving the existing framework of plants. From time to time, the property is open to the public.

The restoration site, consisting of two plots, is located on the south border in the eastern section of the property. The original Garry oak (Quercus garryana) ecosystem that occupies the restoration site was overgrown by invasive species such as English Ivy (Hedera helix) and Himalayan blackberry (Rubus discolor). The restoration of the Garry oak ecosystem complements the goals of the current team of gardeners, which is to maintain the woodland quality of the garden.

Immediately south of the restoration site is a moderately steep granite slope, on the neighbouring property at 925 Foul Bay Road (hereinafter called Franchetti). The slope on Franchetti was heavily overrun by the invasive species: English ivy and Himalayan blackberry. Beyond this disturbed area, there is a relatively undisturbed area, with a Garry oak - Licorice fern (Polypodium glycyrrhiza)-Common camas (Camassia quamash) ecosystem.

METHODS
The restoration site was divided into two plots, designated Plot ER 390 04 K-1 and ER 390 04 K-2 (hereinafter called K-1 and K-2 respectively). On February 14 and 17, 2004, I determined the boundaries of the restoration site, measured the two plots,
and took photographs of the site from photo points. On February 20, 2004, I received written permission from the De Mezey Memorial-Abbeyfield Housing Society to carry out the restoration project (oral permission having been given earlier).


On April 3, 2004, I attended a class in Native Plant Garden Design at the Swan-Lake Nature Centre, with instructor, Brenda Costanza, and developed a planting plan for the restoration site. On April 4 and 9, 2004, I collect data on a Site Description form for Plot K-2, collected data on Ground Inspection Forms for both plots, and took
photographs. On April 10, 2004, I collected data, took photographs and removed invasive species from both plots (primarily Common dandelions and Little western bittercress), talked to neighbours about the project, and from the areas to the west and northwest of Plot K-2, I removed three wheelbarrow loads of Laurel-leaved daphne, English ivy, Privet (Ligustrum sp.), Cotoneaster, Common hawthorne, Himalayan blackberry, Holly (Ilex aquifolium), and various grasses, including Orchard grass (Dactylis glomerata). On April 11, 2004, I collected data, took photographs, and removed invasives: Cotoneaster, Common hawthorne, Laurel-leaved daphne, and English ivy, from both plots, which equaled three wheelbarrow loads, which were disposed of at a local dump. On April 14 and 17, 2004, I removed English ivy and Himalayan blackberry from Franchetti. On April 18, 2004, I rescued Common camas (Camassia quamash) bulbs, most with leaves and flowers attached, from a development site in City of Langford, adjacent to the Mill Hill Regional Park. As a member of the Native Plant Group of the Victoria Horticultural Society, I had permission from the developer to remove native species from this location. On April 19, 2004, I collected data, removed Bluebells (Endymion sp.), and planted approximately 200 Common camas bulbs in Plot K-1. On April 20, 2004, I collected data, removed Bluebells, Lamb’s tongue (Stachys lanata), Privet, and planted approximately 85 Common camas bulbs in Plot K-1. On April 21, 2004, I watered the newly planted Common camas, and I removed English ivy and Himalayan blackberry from Franchetti. On April 22, 2004, I watered the Common camas, and top dressed parts of Plot K-1 (where the Common camas bulbs had been planted) with Garry oak leaf mulch, and removed English ivy, Bluebells and grasses, including Orchard grass.
On April 24, 2004, I removed Cotoneaster and grasses from Plot K-1, and watered the Common camas.

On May 1, 2004, I collected data, watered the Common camas bulbs on Plot K-1, and removed English ivy and Himalayan blackberry from Franchetti. On May 2, 2004, I took photographs, and I removed English ivy and Himalayan blackberry from Franchetti. On May 5, 2004, a helper and I removed English ivy and Himalayan blackberry from Franchetti, and disposed of one pickup truck full at the Oak Bay Municipal Dump. On May 9, 2004, I set up four rooting pots for Tall Oregon-grape. On May 11, 2004, I set up two rooting pots for Common snowberry. On May 11, 2004, a helper and I used maddocks, and removed English ivy and Himalayan blackberry, including the roots, from Franchetti and Plot K-1, and disposed of one pickup truck full at the Oak Bay Municipal Dump. On May 16, 2004, I collected data on Ground Inspection Forms, took photographs and drew diagrams. On May 19, 2004, a helper and I used maddocks, to remove English ivy and Himalayan blackberry (primarily the root systems), from Franchetti and Plot K-1. This produced one large load in a pickup truck, which was disposed of at the Oak Bay Municipal Dump. On May 21, 2004, I removed roots of invasive species from Plot K-1, and pulled soil left on the Franchetti rock face into excavated soil pits, which were along the fence line between Franchetti and Plot K-1.

On June 4, 5, 6, 7 and 9, 2004, I collected data, and removed invasive species from Plots K-1 and K-2. On June 6, 2004, I collected moss from the plant rescue site in

See Appendix 1 - Maps and Plans; Appendix 2 - Diagrams; Appendix 3 - Site Descriptions; Appendix 4 - Soil Descriptions; Appendix 5 - Vegetation Descriptions; Appendix 6 - Ground Inspection Forms; Appendix 7 - Plant Lists; Appendix 8 - Planting Plan; Appendix 9 - Reference Site; Appendix 10 - Photographs.

I consulted maps from Crown Publications (see Appendix 1), used information from Restoration of Natural Systems class lectures, consulted plans from the Municipality of the District of Oak Bay (see Appendix 1), spoke to people, and consulted the books and reports listed under “Reference” of this report.

RESULTS

Located in a residential area of the Municipality of the District of Oak Bay, 931 Foul Bay Road is located at 48° 25’ 20” N. latitude and 123° 19’ 5” W. longitude, in the Coastal Douglas-fir Biogeoclimatic Zone, moist marine subzone (Green 1994, Luttmerding 1990). The ecoregion and eosection as defined and mapped by Demarchi (1988) is Georgia Depression, Eastern Vancouver Island, Nanaimo Lowland (Luttmerding 1990). The physiographic subdivision as designated according to
"Landforms of British Columbia" is Coastal Trough, Georgia Depression, Nanaimo Lowland (Luttmerding 1990).

The property is part of the Wrangellia terrane. The bedrock at this location resembles Triassic or Jurassic volcanic rocks (Muller 1980, Yorath 1995). The primary historic processes that shaped Vancouver Island are glacial erosion and deposition. The glacial erosion of the Fraser Glaciation, which ended about 12,000 years ago shaped this area as evidenced by the scant amount of soil on the undisturbed slope of the Franchetti property. (Edwards 1986, Yorath 1995).

Wark gneiss is the dominant rock (Muller 1980, Yorath 1995). There is exposed rock in Plot K-1, which is subject to physical and chemical weathering.

The large Maclure house sits on the highest point of the property; its southeast steps are approximately 15.8 metres on the diagonal from the northwest corner of Plot K-2. The restoration site is bounded on the north, east and west sides by a cultivated garden of Garry oaks, conifers, rhododendrons, azaleas, and rock and alpine plants. The restoration site was bounded on the south by a heavy overgrowth of English ivy and Himalayan blackberry. The site runs from west to east, with a gentle up slope from a small artificial pond, peaking in a gentle mound, and descending a moderately steep terraced slope. Plot K-1 is rectangular, measuring 9.14 metres by 7.62 metres. Plot K-2 is a quadrangle, measuring 9.14 metres by 9.45 metres by 9.14 metres by 6.10 metres. The disturbed area on Franchetti is rectangular, measuring 9.75 metres
by 8.84 metres.

The aspect for Plot K-1 is 99°. The soils are generally shallow, with some deeper soils along the fence on the southern border, and in the lowest level of the terrace. The soils are primarily Orthic Regosols. The herb stratum dominates Plot K-1. The four dominant plants growing in Plot K-1 are: Garry oak, Cotoneaster, Licorice fern and English ivy. Notable in the vegetative cover in Plot K-1 is a continuous herb layer of Licorice fern on the north side, with a few Common snowberry in the shrub layer on the south side of the plot. The Common snowberry was engulfed by Privet. Once the Privet was removed, the Common snowberry showed improved vigour. There is one Garry oak in the tree layer, one Garry oak in the shrub layer and five regenerating Garry oaks in the herb layer of Plot K-1. There is Common canas, White fawn lily (Erythronium oregonum) and Harvest brodiaea (Brodiaea coronaria) in the herb layer. A dead Garry oak in the shrub layer is a dominant aesthetic feature of Plot K-1. There were invasive species such as: English ivy (which heavily overran the south border), Laurel-leaved daphne, and Himalayan blackberry.

The aspect for Plot K-2 is 279°. The soils range from shallow to medium depth. The soils include Orthic Regosols. There is one patch of Garry oak in the shrub layer, and one regenerating Garry oak in the herb layer of Plot K-2. There is Common snowberry in the shrub layer. Approximately 20% of the grasses in the herb layer are dead. The herb stratum dominates Plot K-2. Orchard grass is the dominant grass in the herb layer of Plot K-2. The four dominant plants growing in Plot K-2 are: English ivy,
Cotoneaster, Common snowberry and Garry oak.

There is evidence of some scorching from Jumping gall wasp (Neuroterus saltatorieus) on some leaves of the Garry oaks on Plots K-1, K-2 and Franchetti. A dirt foot path runs west to east on the south border of the restoration site. The path is primarily in Plot K-1, and its soil has been compacted by foot traffic. Water erosion is expected to take place during rainfall, and eolian erosion will occur on this path.

The slope on Franchetti was overrun with English ivy and Himalayan blackberry. The aspect is 86°. The soils are shallow. There is a patch of Licorice fern and Common camas at the southern edge of the English ivy and Himalayan blackberry growth adjacent to Plot K-1; and a single Common camas in the midst of these invasive species. A scrub Garry oak is on the rock bald approximately 3 metres south of the patch of Licorice fern.

The differences in vegetation found in Plot K-1, Plot K-2 and Franchetti, reflect the vegetative responses to the differences in the microclimate found in these sites (Noss 1994). There is some shade offered by the tree and shrub layers in Plots K-1 and K-2, but there is no tree layer in Franchetti (although the Garry oak on Plot K-1 offers some shade), and the shrub layer of English ivy and Himalayan blackberry on Franchetti creates a significant light barrier, resulting in a minimal herb layer beneath these invasives species.
A resident of 2070 Stonehewer, who lives immediately east of Franchetti, and southeast of the restoration site, remembers a time when mainly moss and some wildflowers covered the part of Franchetti that was overrun with English ivy and Himalayan blackberry (Personal communication: Carmen Burtram 10/04/04). Eolian and water erosion will impact the soil on the now cleared rock slope of Franchetti. The rhododendron in Plot K-1 lacks vigour. A Garry oak in Plot K-1 is dead; the cause and time of death is not known. The bark of the dead Garry oak has fallen off, and is lying on the ground at the base of the tree. A second Garry oak on Plot K-1 has dead upper branches, but the lower half of the tree is regenerating.

Raccoons (Procyon lotor) and Eastern grey squirrels (Sciurus carolinensis) (an introduced species) populate the properties proximate to the restoration site (Personal Observation).

During the restoration project, a male Cooper’s hawk, (Accipiter gentilis), was observed on two occasions flying over the property of 931 Foul Bay Road (Personal Observation). In 2003, a pair of Cooper’s hawks nested in a Cork bark elm (Ulmus neri), two houses north of the restoration site. After a raccoon invaded the nest, and destroyed the egg(s), the hawks established a new nest in a Grand fir (Abies grandis), at 947 Foul Bay Road (Personal Communication: Andy Stewart 2003).

A garter snake was observed in the lower terrace of Plot K-1 (Personal Observation). It is tentatively identified as a Northwestern garter snake (Thamnophis ordinoides)
Sources of disturbance in Plots K-1 and K-2 include: quarrying the bedrock, terracing the slope, cultivation of the plots and surrounding land, invasion of exotic plant species, and activities of wildlife, such as Eastern grey squirrels.

DISCUSSION AND RECOMMENDATIONS

Discussion

1. The slope on Franchetti was not included in the restoration site, because it is on private property, and cannot be restored to the same extent as Plots K-1 and K-2. However, extensive work was done on the Franchetti slope removing the invasive species, because of its close proximity to Plots K-1 and K-2.

2. The Garry oak tree, the only native oak in British Columbia, is valued for its beauty. The Garry oak ecosystems, which have a rich variety of plant and animal species, are at risk. They occupy a small part of the Coastal Douglas-fir zone, which itself makes up only 0.3% of the land area of British Columbia. Before the ice age, British Columbia had hardwood forests that included oaks (Erickson 1993). Since the glacial retreat, the maximum occurrence of Garry oak was during a dry warm era, some 5,000 to 8,000 years ago (Erickson 1993). Since then, the climate has become wetter and cooler, and the Garry oak ecosystem has become patchier. With 95% of its habitat lost, it is a small fragment of what was a much more widespread community. With the increase in global warming, it is predicted that the Douglas-fir ecosystem will retreat.

3. In addition to being of value in terms of providing flora in the face of global warming, the Garry oak habitat has other values, such as soil retention, insect pollination, climate regulation, flood control, cycling of matter and composition of the atmosphere (Dailey 1997). While these are general values that are found in any ecosystem, even the most weedy Garry oak ecosystems have more value, because they have high concentrations of rare plant species; over 150 plant species, of which 40 are rare species, are associated with Garry oak meadows (Lee 1992). Common camas and White fawn lily were identified in Plot K-1, and Common camas was identified in Franchetti. These species are rare in British Columbia and Canada (Hebda 1993). The more species an ecosystem contains, the more functions it can carry out, and the more resilient it is in the face of disturbance or change. An ecosystem is more sustainable if it has more species and larger populations of those species (Dailey 1997).

4. Aboriginals harvested camas for food, and used prescribed burning to maintain conditions favourable to camas (Hebda 1993). “Frequent fires would remove shrub species and kill small oaks and invading Douglas-fir, keeping the density of the trees low” (Hebda 1993). When fires are suppressed, the vegetative landscape changes (Kohm 1997). Prescribed burning has helped native vegetation in the Garry oak ecosystem to recover (Hebda 1993).
5. Wayne Erickson developed a classification system for Garry oak ecosystems: “Garry Oak (Quercus garryana) Plant Community and Ecosystems in southwestern British Columbia”. Within this classification system, the Garry oak ecosystem at the restoration site meets the criteria of Garry oak plant subcommunity: “c15 Oak - Holodiscus discolor - Symphoricarpos albus - Rhytidaephys triquetris (Oak - ocean spray - snowberry - licorice fern subcommunity)”. The restoration site lacks Oceanspray (Holodiscus discolor), which was found on most, but not all, of the sites that Erickson classified as c15. Introduced Scotch broom (Cytisus scopaius) was present on the sites classified as c15 by Erickson, but was not present in Plots K-1 or K-2 (see Appendix 9 - Reference Site) (Erickson 1996). The planting plan for Plot K-1 recommends planting the native species described by Erickson as forming the c15 plant subcommunity. The planting plan for Plot K-2 proposes planting these species, as well as other native species, such as Red-flowering current, to accord with the woodland character of the main garden at 931 Foul Bay Road (see Appendix 8 - Planting Plan).

6. Invasive plants have the potential to displace native species, alter the abundance of plant species, form homogeneous vegetation, alter diversity of fauna, alter mycorrhizal fungi, and change nutrient cycling. The Garry oak ecosystems in Plots K-1, K-2 and Franchetti have been altered by invasive species such as English ivy, Himalayan blackberry, and Laurel-leaved daphne, which are major competitors of the rare flora of the Garry oak ecosystem (Hebda 1993). Although the extent of the threat to native ecosystem composition, process and function is not fully understood,
invasive species have the potential to make major changes to biodiversity and ecological processes (Everett 1994, Boyce 1997). This is readily referenced in the virtual mono culture created by the progression of English ivy from Plot K-1 over the rock face on Franchetti.

7. Gray squirrels eat Garry oak acorns, and although their acorn caches may disperse the acorns, the squirrels' “habit of biting out the apical meristem at the tip of the acorn prior to caching likely limits their role as dispersers” (Fuchs 2001).

8. “The deterioration of remnant Garry oak communities on public and private lands has reached critical proportion. The cumulative effects of fire suppression, grazing, introduced species, and inappropriate management have heavily altered the species composition, vegetation structure, and ecological processes of these communities” (Hebda 1993).

9. Of the top ten invasive species threatening Garry oak ecosystems, English ivy has been ranked as number four (see Appendix 7) (Murray 2002). English ivy is sold in garden stores in Victoria (Personal Observation). It is valued by some for its aesthetic qualities, and ability to quickly create a bright green ground cover, or as an addition to planting schemes, such as in hanging baskets. However, English ivy is an aggressive plant, with properties that allow it to out compete or bully other vegetation, and create what is called an “ivy desert” (Okerman 2000).

“An ‘ivy desert’ describes a forested area that has a limited number of canopy species with entangling H. helix vine wildly climbing up tree trunks and
reaching out into the canopy. In an ivy desert, there is an absence of under story and ground cover plants as a result of the dense, thick mat of ivy ground cover (Westerbrook, 1998)” (Okerman 2000).

The property at 931 Foul Bay Road has English ivy growing along its north and south borders. The ivy extends into the neighbouring properties, both on the ground and into the trees.


11. English ivy is an evergreen vine that can photosynthesize in the winter in temperate to sub-tropical climates, allowing it “to out compete native species that are dormant in the winter” (Okerman 2000, W.S.N.W.C.B. 2001).

“The increased light that is available to H. helix by the absence of deciduous leaves allow it to grow more rapidly up the trunk of the host tree. (Thomas, 1980) The evergreen leaves of the plant also inhibit the leaves of the deciduous tree thereby suppressing the growth of the host tree (Reichard, 2000). The increased openness of the tree crown further stimulates the growth of the vine (Reichard, 2000; Thomas, 1980). As H. helix grows up a host tree to reach the canopy, the density of the vine as well as the weight of water and ice on the leaves increases the weight of trees. The added weight increases the susceptibility of tree branches to snap and break during moderate to high wind storms (Devero, 2000)” (Okerman 2000).

12. On the ground, in northeast corner of 931 Foul Bay Road, there is a large, 4.25 metre, branch, encased in dead ivy vines. This branch split off from an ivy engulfed
tree on the neighbouring property, and fell to the ground inside the property line of 931 Foul Bay Road  (Personal Observation) (see Appendix 10 - Photographs - Figures 54 and 55). “Over time, the ivy can kill an entire forest, leaving a dense blanket of ivy only broken sparsely by shrubs or trees” (W.R.P. 2004).

13. The Corporation of the District of Oak Bay sent out a brochure to home owners asking them to take care that the English ivy on their property does not damage trees, and referred to the “sail effect” that a mass of ivy in the crown of a tree can create when caught by wind (Personal Observation).

14. English ivy that grew into a tree in Olympic National Park was estimated to weigh 952.54 kilograms (W.S.N.W.C.B. 2001). In addition to weighing down the host tree, the ivy deprives the tree “bark of normal contact with air and microorganisms” (Simon 2004). English ivy’s covering mat “can accelerate rot and deteriorate structures”, as it may have done when it enveloped the wooden posts and beams of the fence on the south border of 931 Foul Bay Road (Simon 2004). English ivy provides habitat for rats, however, its dense ramble of vines and foliage, generally provides poor habitat for wildlife, and it is speculated that its berries provide minimal nutrition for birds and other animals (Simon 2004, Okerman 2000).

15. English ivy alters seral succession, out competes other vegetation for water and nutrients, and adversely affects under story regeneration by shading other plants (Simon 2004). This effect was evident on the slope of Franchetti that was thickly
overgrown with English ivy (see Appendix 10 - Photographs - Figure 27).

16. A study conducted by Terry Le and Debbie Sonu of the Environmental Sciences Program, University of California, Berkeley, suggests that “ivy has the potential to exclude indigenous plant species germination by actively releasing allelopathic chemicals, thereby maintaining dominance by changing the chemical traits of the soils” (Le 2000).

17. Different techniques are available for controlling English ivy. Some considerations for choice of control method are: (a) size of the infestation; (b) the site’s mix of native and non-native vegetation, and (c) the amount of time and labour available (Simon 2004).

18. Biological control of English ivy has not been developed. A fungus (Phoma hedericola) is causing damage to English ivy in Italy, but there is insufficient research to support this as a control method (Okerman 2000).

19. Herbicide control is difficult, because the waxy cuticle of English ivy resists herbicide uptake (Okerman 2000). Various techniques are suggested to circumvent this barrier, such as abrading the leaves before applying the herbicide, or applying a chemical, such as pelargonic acid, to destroy the leaf tissue before applying the herbicide (Okerman 2000). Common pre-emergent herbicides are tolerated by English ivy, and there are conflicting reports on the effectiveness of post-emergent
herbicides (W.S.N.W.C.B. 2001, citing Derr 1993). If herbicides are used, more than one treatment would probably be necessary (Okerman 2000). Herbicide application has the undesirable consequence of being indiscriminate, and risking the viability of proximate native and non-native flora and fauna (Swearinger 2000). Where the English ivy infestation is widespread, extensive treatment is necessary, otherwise the ivy can easily reestablish itself from untreated adjacent areas (Okerman 2000). If the herbicide is applied to ivy growing up a tree, it is possible that the herbicide will be absorbed by the host tree (Swearinger 2000).

20. Where English ivy is growing into a tree, the vines should be cut from around the trunk to an easily reached height, and the host tree monitored regularly for regrowth of ivy (W.S.N.W.C.B. 2001). The ivy above the cut line can be left to die and decay.

21. A smoother mulch may minimize regrowth of English ivy. Cardboard is laid down on the area to be mulched, then a 20 - 30 centimetre layer of wood chips is laid down. The wood chips block the light and the air, and as they break down they pull nitrogen from the soil. Any ivy that does break through the mulch must be pulled. After treatment, the chips are removed, replaced with compost, and alfalfa meal is applied to restore the soil’s nitrogen level (Lovejoy 2001).

“Another more drastic method has been to use a blow-torch to repeatedly blast the plant with a hot flame. By repeatedly exposing the plant to high heat, this method is intended to exhaust the H. hedera of its energy so that it is unable to multiply or produce berries for reproduction (Reichard, 2000)” (Okerman 2000).
22. Physical removal was chosen for this restoration project as the most prudent and effective control method. Pruners, string trimmers and hedge trimmers can be used to stripe the above ground vegetation of ground cover ivy. Vines and roots can be physically pulled out. Maddocks can be used to rip out roots (Okerman 2000). For this project, vines were pulled by hand, pruners were used to cut and remove the above ground growth, and, where possible, roots were pulled and dug out. Maddocks were effective in removing the roots of the English ivy and the Himalayan blackberry. On Franchetti, entire root balls, with soil, were removed to the dump. Where invasive species were growing in close proximity to the native species, their roots were removed as much as possible, but complete removal of the roots and surrounding soil was not possible, as that would have too heavily impacted the native species.

Recommendations:

1. The observations at the restoration site were limited to a five month period. The plots should be visited each month of the year under extremes of climate to fully survey the conditions. A complete wildlife survey should be done. Vegetative surveys should be carried out throughout the year. Soil samples should be sent for analysis.

2. Some introduced plant species were left in the restoration site. These plants were planted by previous owners of the property. They are limited in number, and are not considered weedy or aggressive. These plants should not be removed, rather they should be retained for their aesthetic value (see Appendix 7: List of Retained Non-Native Species).
3. With the exception of non-native plant species that are being retained, non-native species should be removed on a routine basis throughout the year (see Appendix 7: List of Invasive Species).

4. Non-natives that are outside Plots K-1 and K-2, but in close proximity, should be identified, and those which would cause the greatest stress to the ecosystems of Plots K-1 and K-2, should be removed to the greatest extent possible.

5. Controlled burning is one way to bring back the original Garry oak habitat (Hebda 1993). Burning is not possible in this setting as it is a residential area, with housing on all sides of the site, and a municipal by-law prohibits outdoor burning:

   THE CORPORATION OF THE DISTRICT OF OAK BAY BYLAW NO. 3803 A Bylaw to deal with the suppression and prevention of fires in the Municipality of Oak Bay

   45. No person shall light, ignite or maintain any fire, or permit or cause any fire to be lit, ignited or maintained, in the open air, or in any form of container anywhere or at any time within the geographical boundaries of the Municipality.

6. Methods of controlling invasives are manual control (hand pulling and pruning), biological control (not yet developed), herbicide control (environmental consequences make this undesirable) and mechanical control (which is not feasible, because it would cause soil compaction, and is probably impractical given the degree of slope and the lack of access for heavy equipment) (Everett 1994). Manual control methods are the most desirable for ongoing control of invasive species at this restoration site. It is very important that as much of the root material of the invasive plants be removed as
possible to prevent regrowth; however, care must be taken not to damage native plant species in the process of removing the invasives.

7. The dead Garry oak in Plot K-1 should not be removed, but left to provide nesting sites for secondary cavity-nesters. “Over 15% of B.C.’s breeding birds are cavity nesters”, and those that cannot excavate cavities, rely on Pileated Woodpeckers or cavities that occur naturally (Hebda 1993). The dead Garry oak is also a dominant aesthetic feature of the restoration site and the garden.

8. Common snowberry is growing in Plots K-1 and K-2. Although it is a native species, it can become problematic if its growth shades out native herbaceous species (Murray 2002). The Common snowberry in both Plots should be monitored, to insure that it does not threaten the native species in the herbaceous layer, and pruned or pulled as necessary.

9. Plot K-1 provides habitat for a garter snake. This snake is beneficial to the garden as it eats slugs. The rock and stone in and around Plot K-1, which is an important part of the snake’s habitat, should not be disturbed. When removing invasive species, in particular grasses, care should be taken not to cause soil erosion, which could fill up the spaces in the rocks used by the snake for habitat. Before weeding or cutting in or around the restoration site, the area should be stirred with a stick to alert the snake, and give it time to move out of harms’ way (Ovaska 2003).
10. In the fall of each year, both plots should be mulched to a depth of 10 centimetres with Garry oak leaves, which can be obtained from piles on the boulevard prior to their removal by the municipality.

11. Nodding onion (*Allium cernuum*) seeds have been obtained, and should be planted by direct sowing in November 2004 (see Appendix 8 - Planting Plan).

12. Plot K-1 and Franchetti have been the focus of efforts to remove non-native species. Some non-native species have been removed from Plot K-2, but much more work needs to be done in Plot K-2, including: controlling or eliminating the non-native plant species, amending the soil with Garry oak leaf mulch, and planting native species.

13. There is no budget for this project, therefore, planting of native species will be limited to donated cuttings, or plants that are obtained through plant rescues, however, to the greatest degree possible, the planting plan should be followed (see Appendix 8 - Planting Plan).

14. Moss has been planted on the slope of Franchetti, and more moss, which is appropriate to that site, should be planted.

15. Removal of the English ivy on the property line exposed a fence, which is falling down due to rot. The fence will be replaced, and funds have been donated for this part
of the project. The fence will limit foot traffic over the restoration site. Once the new fence is built, a sign should be placed on it to educate the public about the significance of the Garry oak ecosystem.

16. Permission should be sought from the owners of Franchetti to carry out further removal of the English ivy from the southern boundary of that property, which would include cutting and removing ivy around the circumference of a Garry oak, where it has established itself well into the crown of the tree. Permission should also be sought to remove the pile of masonry and broken brick that is at the top of the slope on Franchetti.

17. A long term monitoring program should be set up to monitor the effectiveness of the restoration. It is necessary to know all features of the restoration effort so that effective means of measurement can be put in place to document how the project is progressing towards its goals. By collecting baseline data and continuing data collection, restoration techniques or goals can be adjusted as necessary (Boyce 1997).
References


Simon, B. 2004. English ivy - *Hedera Helix*. King County Noxious Weed Control Program. King County. Website: http://dnr.metrokc.gov/weeds


Appendix 2

Diagrams of Plots: ER 390 04 K-1 and ER 390 04 K-2
Diagram of Plot ER390 04 K-1

Figure 6
Diagram of Plot ER 390 04 K-2

Figure 7

Scale: 6cm = 30.48cm
0.25in = 1.0ft

Note: Artificial Pond is not to Scale
Appendix 3

Site Descriptions for Plots: ER 390 04 K-1 and ER 390 04 K-2
Appendix 3

Site Descriptions

Site Description Plot ER 390 04 K-1:

UTM Grid Zone: 10
Easting: 476 (to nearest kilometre)
Northing: 5363 (to nearest kilometre)
Latitude: 48° 25’ 20” N.
Longitude: 123° 19’ 5” W.
Aspect: 99°
Elevation of Site: 20 metres at base (approx.)
Slope: Percent slope gradient: 41.0
Terrain Texture: Sand, silt, angular fragments
Genetic material: Colluvial

Surface Expression: Moderately steep slope, terraces
Modifying Processes: Slow mass movement

Physiogeographic Subdivision:
Coastal Trough, Georgia Depression, Nanaimo Lowland

Ecoregion: NAL

Biogeoclimatic Zone: CDFmm

Vegetative Cover: Garry oak (*Quercus garryana*), Common snowberry (*Symphoricarpos albus*), Tall Oregon-grape (*Mahonia aquifolium*), Licorice fern (*Polypodium glycyrrhiza*)

Soil Classification: Orthic Regosol
Site Position Macro: Lower Slope
Site Position Meso: Upper Slope
Site Surface Shape: Straight
Micro Topography: Severely mounded
Meso Slope Length: 68 m.
Meso Slope Uplength: 48 m.
Exposure Type: Insolation
Ecological Moisture Regime: Sub-Mesic
Nutrient Regime: Submesotrophic
Soil Temperature Class: Mild
Soil Moisture Class: Xeric
Soil Drainage: Well Drained
Perviousness: Moderately pervious
Free Water: Absent
Flood Hazard: No hazard
Bedrock type: Wark gneiss
Successional Status: Maturing seral
Rate of Succession: Slow
Factors Influencing Stand Establishment:
1913 - 1915 - quarrying of granite on site property, house construction, creation of foundation terraces, cultivation, seeded trees and shrubs
Eastern grey squirrel (Sciurus carolinensis)
Fire Suppression

Signs of Jumping gall wasp infestation on Garry oak leaves

Recent glaciation - 12,000 years ago for both sites

Compaction - Plot K-1 at fence side

Plot dimensions: 9.14 metres by 7.62 metres

Plot Shape: Rectangle

Humus Form Class: Moder

Site Position Diagram: Plot K-1

Figure 8
Site Description Plot ER 390 04 K-2:

UTM Grid Zone: 10

Easting: 476 (to nearest kilometre)

Northing: 5363 (to nearest kilometre)

Latitude: 48° 25’ 20” N.

Longitude: 123° 19’ 5” W.

Aspect: 279°

Elevation of Site: 24 metres (approx.)

Slope: Percent slope gradient: 16.0

Terrain Texture: Silt, sand, angular fragments

Genetic material: Colluvial

Surface Expression: Gentle slope

Modifying Processes: Slow mass movement

Physiogeographic Subdivision:
Coastal Trough, Georgia Depression, Nanaimo Lowland

Ecoregion: NAL

Biogeoclimatic Zone: CDFmm

Vegetative Cover: Garry oak (*Quercus garryana*), Common snowberry (*Symphoricarpos albus*), Licorice fern (*Polypodium glycyrrhiza*)

Soil Classification: Orthic Regosol

Site Position Macro: Lower Slope

Site Position Meso: Upper Slope

Site Surface Slope: Concave
Micro Topography: Strongly mounded
Meso Slope Length: 68 m.
Meso Slope Uplength: 48 m.
Exposure Type: Not applicable
Ecological Moisture Regime: Xeric to Subxeric
Nutrient Regime: Submesotrophic to Mesotrophic
Soil Temperature Class: Mild
Soil Moisture Class: Sub-mesic
Soil Drainage: Well drained
Perviousness: Moderately pervious
Free Water: Absent
Flood Hazard: Unlikely
Bedrock type: Metamorphic
Successional Status: Maturing seral
Rate of Succession: Slow
Factors Influencing Stand Establishment:

1913 - 1915 - quarrying of granite on site property, house construction and creation of foundation terraces
Cultivation
Irrigation
Planted trees
Eastern grey squirrel (Sciurus carolinensis)
Fire Suppression
Signs of Jumping gall wasp infestation on oaks

Recent glaciation - 12,000 years ago for both sites

Pond - beside Plot K - 2

Plot dimensions: 9.14 m. x 9.45 m. x 9.14 m. x 6.10 m.

Plot shape: quadrangle

Humus Form Class: Moder

Site Position Diagram: Plot K - 2:

Figure 9
Appendix 4

Soil Descriptions for Plots: ER 390 04 K-1 and ER 390 04 K-2
Appendix 4

Soil Descriptions

Pit 1  Plot ER 390 04 K-1

May 16, 2004

L Horizon:

Upper Horizon: 0.0 cm

Lower Horizon: 0.5 cm

Horizon Thickness:
   Minimum: 0.0 cm
   Maximum: 0.5 cm

Horizon Boundary:
   Distinctness: None
   Form: Broken

Course Fragment Description:
   5% by volume
   Gravel: Sub-rounded and angular

Note: Dead leaves and bits of stick litter on surface.

A Horizon:

Upper Horizon: 0.5 cm

Lower Horizon: 7.0 cm

Horizon Thickness:
   Minimum: 3.0 cm
   Maximum: 7.0 cm

Horizon Boundary:
   Distinctness: Abrupt
   Form: Wavey
Course Fragment Description:
2 % by volume
Gravel: Sub-rounded and Subangular

Soil Texture:
Silt Loam
Grade: Weak
Class: Very Fine
Kind: Sub-angular Blocky

Moisture:
Dry State
Dry Consistence: Slightly Hard
Moist Consistence: Not Measured
Wet Consistence: Slightly Sticky
Plasticity: Nonplastic

Mottles:
Abundance: None
Size: N/A
Contrast: N/A
Boundaries: N/A

Roots:
Abundance: Abundant
Size: Very Fine < 1 mm
Orientation: Random
Distribution: Matrix

Note: There is no B horizon

Pit 2 - Plot ER 390 04 K-2

May 16, 2004

L Horizon:
Upper Horizon: 0.0 cm
Lower Horizon: 1.0 cm
Horizon Thickness:
   Minimum: 0.2 cm
   Maximum: 1.0 cm

Horizon Boundary:
   Distinctness: Abrupt or None
   Form: Smooth

Course Fragment Description:
   1 % by volume
   Gravel: Sub-rounded and Subangular

Note: Layer of dead grass and dead moss.

A Horizon:

Upper Horizon: 1.0 cm

Lower Horizon: 15.0 cm

Horizon Thickness:
   Minimum: 8.0 cm
   Maximum: 15.0 cm

Horizon Boundary:
   Distinctness: Abrupt
   Form: Smooth

Course Fragment Description:
   25 % by volume
   Gravel: Sub-rounded and Subangular

Soil Texture:
   Loam
   Grade: Weak
   Class: Very Fine
   Kind: Sub-angular Blocky

Moisture:
   Dry State
   Dry Consistence: Soft
   Moist Consistence: Not Measured
Wet Consistence: Slightly Sticky
Plasticity: Nonplastic

Mottles:
Abundance: None
Size: N/A
Contrast: N/A
Boundaries: N/A

Roots:
Abundance: Plentiful
Size: Very fine < 1 mm
Orientation: Random
Distribution: Matrix

Note: There was no B horizon

Pit 3 - Plot ER 390 04 K-2

May 16, 2004

L Horizon:

Upper Horizon: 0.0 cm

Lower Horizon: 2.0 cm

Horizon Thickness:
Minimum: 0.5 cm
Maximum: 2.0 cm

Horizon Boundary:
Distinctness: Abrupt
Form: Smooth

Course Fragment Description:
1% by volume
Gravel: Sub-rounded and Subangular

Note: Dead grasses and dead plant litter on surface.
A Horizon:

Upper Horizon: 2.0 cm

Lower Horizon: 43 cm
Horizon Thickness:
  Minimum: 41 cm
  Maximum: 45 cm

Horizon Boundary:
  Distinctness: Abrupt
  Form: Smooth

Course Fragment Description:
  5% by volume
  Gravel: Sub-rounded and Subangular

Soil Texture:
  Silt Loam
  Grade: Weak
  Class: Very Fine
  Kind: Subangular Blocky

Moisture:
  Dry
  Dry Consistence: Hard
  Moist Consistence: Not Measured
  Wet Consistence: Slightly Sticky
  Plasticity: Nonplastic

Mottles:
  Abundance: Nil
  Size: N/A
  Contrast: N/A
  Boundaries: N/A

Roots:
  Abundance: Plentiful
  Size: Very Fine to Medium < 1mm to 2 - 5 mm
  Orientation: Vertical
  Distribution: Matrix

Note: There was no B Horizon to depth that was dug, which was either to bedrock or a
large rock, but given the close proximity to exposed bedrock, it was likely dug to bedrock.
Site Position Diagram - Soil Pit #1 - Plot K-1

Figure 10

Site Position Diagram - Soil Pit #2 - Plot K-2

Figure 11

Site Position Diagram - Soil Pit #3 - Plot K-2

Figure 12
Soil Pit 1
Plot ER390 04 K-1

Figure 13

Soil Pit 2
Plot ER390 04 K-2

Figure 14
Appendix 5

Vegetation Descriptions for Plots: ER 390 04 K-1 and ER 390 04 K-2 and Partial Species List for Franchetti
Appendix 5

Vegetation Description:

April 4, 2004 - June 13, 2004

Plot ER 390 04 K-1

Terraced slope with east aspect

<table>
<thead>
<tr>
<th>Name</th>
<th>PP</th>
<th>D</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tree Layer (A1)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garry oak  <em>Quercus garryana</em></td>
<td>15%</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Trees:</strong> 15%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shrub Layer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garry oak  <em>Quercus garryana</em></td>
<td>3%</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Note: Upper branches are dead, tree below is regenerating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garry oak  <em>Quercus garryana</em></td>
<td>+</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Common Hawthorne  <em>Crataegus monogyna</em></td>
<td>10%</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Shore pine  <em>Pinus contorta var. contorta</em></td>
<td>+</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Common snowberry  <em>Symphoricarpos albus</em></td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Cotoneaster  <em>Cotoneaster spp.</em></td>
<td>35%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Tall Oregon-grape  <em>Mahonia aquifolium</em></td>
<td>10%</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Western redcedar  <em>Thuja plicata</em></td>
<td>+</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Red-flowering current  <em>Ribes sanguineum</em></td>
<td>+</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Privet  <em>Ligustrum sp.</em></td>
<td>4%</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Fuschia  <em>Fuschia sp.</em></td>
<td>+</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
Sitka mountain-ash  *Sorbus sitchensis*  
This is a tentative identification.

Rhododendron  *Rhododenron sp.*  
Over 50% of branches are dead; plant is regenerating.

Laurel-leaved daphne  *Daphne laureola*  
2%  2  3

English ivy  *Helix hederacea*  
15%  3  3

Laburnum  *Laburnum sp.*  
+ 4  3

**Total Shrubs:**  
60%  7  3

**Herb Layer**

Licorice fern  *Polypodium glycyrrhiza*  
20%  3  3

Sword fern  *Polystichum munitum*  
+ 2  3

Sword fern  *Polystichum munitum*  
+ 2  0

Garry oak  *Quercus garryana*  
+ 2  3

Lamb’s tongue  *Stachys lanata*  
+ 4  3

Dovefoot geranium  *Geranium molle*  
+ 4  3

Bitter root  *Lewisia spp.*  
+ 2  3

Garry oak  *Quercus garryana*  
+ 2  3

White fawn lily  *Erythronium oregonum*  
+ 5  3

Scilla  *Scilla sp.*  
3%  5  3

Grape hyacinth  *Muscari sp.*  
+ 5  3

Cyclamen  *Cyclamen coum*  
+ 5  3

Hens and chicks  *Sempervivum soboliferum*  
3%  4  3

Bluebells  *Endymion sp.*  
5%  5  3
<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Percentage</th>
<th>Rank</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vetch</td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Common dandelion</td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Common camas</td>
<td>2%</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Harvest brodiaea</td>
<td>+</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Spreading stonecrop</td>
<td>3%</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Iris</td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Himalayan blackberry</td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Little western bitter-cress</td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Common harebell</td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Orchard grass</td>
<td>+</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Kentucky bluegrass</td>
<td>+</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Grasses</td>
<td>10%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Dead grasses</td>
<td>15%</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Total Herb Cover:</td>
<td>80%</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

**Moss & Lichen Layer**

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Percentage</th>
<th>Rank</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>False pixie cup</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow moss</td>
<td>10%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>False-polytrichum</td>
<td>5%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Oregon beaked moss</td>
<td>5%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Electrified cat’s-tail</td>
<td>5%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Broom moss</td>
<td>+</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>
Douglas’ Neckera  Neckera douglasii  +  7  3
On west side of Garry oak trunk.

Total Moss & Lichen Cover:  35%  7  3

Note: The species list with respect to the Moss and Lichen Layer is partial due primarily to time limitations. It is recommended that a more thorough list be prepared as work continues on the restoration site.
<table>
<thead>
<tr>
<th>Name</th>
<th>PP</th>
<th>D</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shrub Layer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garry oak <em>Quercus garryana</em></td>
<td>5%</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Common Hawthorne <em>Crataegus monogyna</em></td>
<td>3%</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Shore pine <em>Pinus contorta var. contorta</em></td>
<td>2%</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Common snowberry <em>Symphoricarpos albus</em></td>
<td>7%</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Tall Oregon-grape <em>Mahonia aquifolium</em></td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Cotoneaster <em>Cotoneaster spp.</em></td>
<td>10%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Laurel-leaved daphne <em>Daphne laureola</em></td>
<td>3%</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Sitka mountain-ash <em>Sorbus sitchensis</em></td>
<td>+</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>This is a tentative identification.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Privet <em>Ligustrum sp.</em></td>
<td>2%</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>English ivy <em>Helix heder</em></td>
<td>5%</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total Shrubs:</strong></td>
<td>30%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td><strong>Herb Layer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Licorice fern <em>Polypodium glycyrrhiza</em></td>
<td>3%</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Tall Oregon-grape <em>Mahonia aquifolium</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Bluebells <em>Endymion sp.</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Lamb’s tongue <em>Stachys lanata</em></td>
<td>3%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Cotoneaster <em>Cotoneaster spp.</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Plant</td>
<td>Percentage</td>
<td>Size 1</td>
<td>Size 2</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Grape hyacinth   <em>Muscari sp.</em></td>
<td>5%</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Hens and chicks <em>Sempervivum soboliferum</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Dovefoot geranium <em>Geranium molle</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Vetch <em>Vetch sp.</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Spreading stonecrop <em>Sedum divengens</em></td>
<td>3%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Little western bitter-cress <em>Cardamine oligosperma</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Common dandelion <em>Taraxacum officinale</em></td>
<td>+</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Thyme <em>Thymus sp.</em></td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>St. Johnswort <em>Hypericum sp.</em></td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Snow-in-Summer <em>Cerastium tomentosum</em></td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Common harebell <em>Campanula rotundifolia</em></td>
<td>+</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fleabane <em>Erigeron glaucus</em></td>
<td>+</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Foxglove <em>Digistalis purpurea</em></td>
<td>+</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Orchard grass <em>Dactylis glomerata</em></td>
<td>10%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Kentucky bluegrass <em>Poa pratensis</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Barren Brome <em>Bromus Sterilis</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Rattlesnake Grass <em>Bromus brizaeformis</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Grasses</td>
<td>30%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Dead Grasses</td>
<td>20%</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Herb Cover:</strong></td>
<td>80%</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Grass was mowed from time to time making it difficult to estimate percentage of cover.
Moss & Lichen Layer

<table>
<thead>
<tr>
<th>Species</th>
<th>Percentage</th>
<th>Cover</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>False pixie cup  <em>Cladonia chlorophaea</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Yellow moss  <em>Homalothecium fulgescens</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Oregon beaked moss  <em>Kindbergia oregana</em></td>
<td>4%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Waxpaper lichen  <em>Parmelia sulcata</em></td>
<td>+</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>False-polytrichum  <em>Timmia austriaca</em></td>
<td>3%</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Electrified cat’s-tail  <em>Rhytidiadelphus triquetrus</em></td>
<td>4%</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Moss & Lichen Cover:** 30% 7 3

Note: The species list with respect to the Moss and Lichen Layer is partial due primarily to time limitations. It is recommended that a more thorough list be prepared as work continues on the restoration site.
Partial Species list for Franchetti

Garry oak  *Quercus garryana*

Licorice fern  *Polypodium glycyrrhiza*

English ivy  *Helix hederacea*

Himalayan blackberry  *Rubus discolor*

Common camas  *Camassia quamash*

Bluebells  *Endymion sp*

Rattlesnake Grass  *Bromus brizaeformis*

Note: There is no tree layer on Franchetti. The moss and lichen layer were not included, but it is recommended that a survey be done.
Appendix 6

Ground Inspection Forms for Plots: ER 390 04 K-1 and ER 390 04 K-2
### Ground Inspection Form

- **Project Id:** 931 Foul Bay Road  
- **Surv.:** M. McNeely  
- **Map Sheet:** 92 B. 044  
- **Plot ER 590 04 K-1 Poly.**  
- **UTM Zone:** 10  
- **Lat./North:** 48° 25' 20" N  
- **Long./East:** 123° 19' 5" W  
- **Aspect:** 99°  
- **Elevation:** 20 m. (approx.)

<table>
<thead>
<tr>
<th>Slope</th>
<th>41.0 %</th>
<th>SMR</th>
<th>3</th>
<th>SNR</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meso Slope</td>
<td>Crest</td>
<td>Mid slope</td>
<td>Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper slope</td>
<td>Lower slope</td>
<td>Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage - Mineral Soils</td>
<td>Very rapidly</td>
<td>Well</td>
<td>Poorly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapidly</td>
<td>Mod. well</td>
<td>Very poor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imperfectly</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Subclasses - Organic Soils</td>
<td>Aquous</td>
<td>Aquic</td>
<td>Perhumid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subaquic</td>
<td>Humid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mineral Soil Texture</td>
<td>Sandy (LS, S)</td>
<td>Silty (SIL, Si)</td>
<td>40-40 cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loamy (SL, SCL, SFL)</td>
<td>Clayey (SICL, CL, SC, SIC, C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organic Soil Texture</td>
<td>Fibric</td>
<td>Mesic</td>
<td>Humic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Humus Form:** Mor  
  - Moder  
  - Mull

- **Coarse Fragment Content:** <20%  
  - 20-35%  
  - 35-70%  
  - >70%

- **Terrain Component:** TC1  
- **TC2**  
- **TC3**

- **Surface Expression:**  
  - GEO

- **Geomorph Process:**  
  - 1

- **ECOSYSTEM Component:** EC1  
- **EC2**  
- **EC3**

- **BGC Unit:** CDF mm  
- **Ecosection:** NAL  
- **Site Series:** 02 (GO)  
- **Site Modifiers:** K+T  
- **Structural Stage:** 4Bh  
- **Crown Closure:** 15 %

### ECOSYSTEM Polygon Summary

<table>
<thead>
<tr>
<th>SS</th>
<th>SM</th>
<th>ST</th>
<th>TC1</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TERRAIN Polygon Summary

<table>
<thead>
<tr>
<th>EC1</th>
<th>TC1</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC2</td>
<td>TC2</td>
</tr>
<tr>
<td>EC3</td>
<td>TC3</td>
</tr>
</tbody>
</table>
### Dominant / Indicator Plant Species

<table>
<thead>
<tr>
<th>Total %</th>
<th>A: 15</th>
<th>B: 60</th>
<th>C: 80</th>
<th>D: 35</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Species</td>
<td>%</td>
<td>L</td>
<td>Species</td>
</tr>
<tr>
<td>A</td>
<td>Quercus gar.</td>
<td>15</td>
<td>B</td>
<td>Rhododendron +</td>
</tr>
<tr>
<td>B</td>
<td>Quercus gar.</td>
<td>10</td>
<td>B</td>
<td>Daphne lan.</td>
</tr>
<tr>
<td>C</td>
<td>Crataegus sp.</td>
<td>10</td>
<td>B</td>
<td>Hydr. sp.</td>
</tr>
<tr>
<td>D</td>
<td>Pinus contorta +</td>
<td>20</td>
<td>C</td>
<td>Polypodium sc.</td>
</tr>
<tr>
<td>E</td>
<td>Symph. el. +</td>
<td>10</td>
<td>C</td>
<td>Polyg. sp.</td>
</tr>
<tr>
<td>F</td>
<td>Cotoneaster sp.</td>
<td>10</td>
<td>C</td>
<td>Quercus gar.</td>
</tr>
<tr>
<td>G</td>
<td>Mahonia aqu.</td>
<td>10</td>
<td>C</td>
<td>Stachys lan.</td>
</tr>
<tr>
<td>H</td>
<td>Thuya p.</td>
<td>10</td>
<td>C</td>
<td>Beranulmm MDL</td>
</tr>
<tr>
<td>I</td>
<td>Ribes san. +</td>
<td>10</td>
<td>C</td>
<td>Lewis sp.</td>
</tr>
<tr>
<td>J</td>
<td>L. ligustrum</td>
<td>10</td>
<td>C</td>
<td>Eryth. ionous +</td>
</tr>
<tr>
<td>K</td>
<td>Fuchsia sp.</td>
<td>10</td>
<td>C</td>
<td>Salvia sp.</td>
</tr>
<tr>
<td>L</td>
<td>Sorbus sp.</td>
<td>10</td>
<td>C</td>
<td>Muscari sp.</td>
</tr>
</tbody>
</table>

### Tree Measurement

<table>
<thead>
<tr>
<th>Spp.</th>
<th>DEH</th>
<th>Top</th>
<th>Bot</th>
<th>SD</th>
<th>SL</th>
<th>HD</th>
<th>HT</th>
<th>Ht. to DEH</th>
<th>Total</th>
<th>BH</th>
<th>Age</th>
<th>Path</th>
</tr>
</thead>
</table>

### Notes (site diagram, exposure, gleying, etc.)

- Some gall wasp damage to Garry oak.
- 15% grasses dead
- One dead Garry oak
- Pinus contorta lacks vigour.
- Recommend that the partial mass and lichen survey be made as complete as possible.
- Regenerating Garry oak.
**GROUND INSPECTION FORM**

**Project Id:** 931 Foul Bay Road  
**Map Sheet:** 92 B 044  
**UTM Zone:** 10  
**Aspect:** 279°  
**Slope:** 16.0%  
**Elevation:** 24 m (approx.)

**Meso Scale:**  
- **Crest**  
- **Upper slope**  
- **Mid slope**  
- **Lower slope**  
- **Depression**  
- **Level**  
- **Toe**

**Drainage:**  
- **Well**  
- **Mod. well**  
- **Poorly**  
- **Very poorly**  
- **Imperfectly**

**Position:**
- **Very rapidly**  
- **Rapidly**

**Moisture:**
- **Aqueous**  
- **Aric**  
- **Perhumid**

**Subclasses:**
- **Paraquic**  
- **Subaquic**  
- **Humid**

**Mineral Soils:**
- **Sandy (LS,S)**  
- **Loamy (SL,L,SCL,FSL)**  
- **Silty (SIL,SL)**  
- **Clayey (SICL,CL,SC,SIC,C)**

**Texture:**
- **Fibric**  
- **Mesic**  
- **Humic**

**Organic Soils:**
- **Sandy (LS,S)**  
- **Loamy (SL,L,SCL,FSL)**  
- **Silty (SIL,SL)**  
- **Clayey (SICL,CL,SC,SIC,C)**

**Surf. Organic Horizon Thickness:**
- **0-40 cm**  
- **> 40 cm**

**Humus Form:**
- **Mor**  
- **Moder**  
- **Mull**

**Root Restricting Layer:**
- **Depth:** 15 cm  
- **Type:** Bedrock

**Terrain Component:**
- **TC1**  
- **TC2**  
- **TC3**

**Surface Expression:**
- **1 C**  
- **1 i**  
- **1 FA**

**Geomorphic Process:**
- **1**  
- **2**  
- **2**

**ECOSYSTEM Component:**
- **EC1**  
- **EC2**  
- **EC3**

**BGC Unit:**
- **Camass**

**Site Series:**
- **02 (G0)**

**Structural Stage:**
- **3b Bl**

**Crown Closure:**
- **8%**

**ECOSYSTEM POLYGON SUMMARY**

<table>
<thead>
<tr>
<th>%</th>
<th>SS</th>
<th>SM</th>
<th>ST</th>
<th>TC1</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC3</td>
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<td></td>
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**TERRAIN POLYGON SUMMARY**

<table>
<thead>
<tr>
<th>%</th>
<th>Classification</th>
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<tbody>
<tr>
<td>EC1</td>
<td>TC1</td>
</tr>
<tr>
<td>EC2</td>
<td>TC2</td>
</tr>
<tr>
<td>EC3</td>
<td>TC3</td>
</tr>
</tbody>
</table>
### DOMINANT / INDICATOR PLANT SPECIES

<table>
<thead>
<tr>
<th>Total %</th>
<th>A: 0</th>
<th>B: 30</th>
<th>C: 60</th>
<th>D: 20</th>
</tr>
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<tbody>
<tr>
<td>L</td>
<td>Species</td>
<td>%</td>
<td>Species</td>
<td>%</td>
</tr>
<tr>
<td>B</td>
<td>Quercus gar</td>
<td>C</td>
<td>Erythrospermum</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Crataegus mo</td>
<td>B</td>
<td>Stachys laevis</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Pinus contorta</td>
<td>B</td>
<td>Ceanothus</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Symphoricarpos albus</td>
<td>C</td>
<td>Muscari sp</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>Mahonia aquifolium</td>
<td>B</td>
<td>Semprevivum</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Cotoneaster sp</td>
<td>10</td>
<td>Geranium</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Daphne laureola</td>
<td>3</td>
<td>Vetch sp</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Sorbus</td>
<td>1</td>
<td>Sedum</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Higuerastrum</td>
<td>B</td>
<td>Cardamine</td>
<td>+</td>
</tr>
<tr>
<td>B</td>
<td>Helix hederacea</td>
<td>5</td>
<td>Taraxacum</td>
<td>+</td>
</tr>
<tr>
<td>C</td>
<td>Polygala</td>
<td>3</td>
<td>Thymus</td>
<td>+</td>
</tr>
<tr>
<td>C</td>
<td>Mahonia aquifolium</td>
<td>B</td>
<td>Hypericum</td>
<td>+</td>
</tr>
</tbody>
</table>

**Tree Mensuration**

<table>
<thead>
<tr>
<th>Spp.</th>
<th>DBH</th>
<th>Ht. Calculation to DBH</th>
<th>Ht. to DBH</th>
<th>Total HT</th>
<th>BH Age</th>
<th>Path Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES (site diagram, exposure, gleying, etc.)**

Some gall wasp damage to Garry oak.
One Garry oak in "C" layer.
Recommend that the partial survey of the moss and lichen layer be made as complete as possible.
Appendix 7

List of Invasive Species in Restoration Site

List of Native Species in Restoration Site

List of Retained Non-Native Species in Restoration Site

List of Top 10 Invasive Plant Species Threatening Garry Oak Ecosystems in B.C.
Appendix 7

List of Invasive Species in Restoration Site

Ongoing monitoring and removal will be required for the following species:

English ivy  *Helix hederacea*

Laurel-leaved daphne  *Daphne laureola*

Himalayan blackberry  *Rubus discolor*

Common Hawthorne  *Crataegus monogyna*

Cotoneaster  *Cotoneaster spp.*

Privet  *Ligustrum sp.*

Lamb’s tongue  *Stachys lanata*

Dovefoot geranium  *Geranium molle*

Bluebells  *Endymion sp.*

Vetch  *Vetch sp.*

Common dandelion  *Taraxacum officinale*

Little western bitter-cress  *Cardamine oligosperma*

Orchard grass  *Dactylis glomerata*

Kentucky bluegrass  *Poa pratensis*

Barren Brome  *Bromus Sterilis*

Rattlesnake Grass  *Bromus brizaefornis*

Thyme  *Thymus sp.*

St. Johnswort  *Hypericum sp.*
Laburnum  *Laburnum sp.*

Snow-in-Summer  *Cerastium tomentosum*

Fleabane  *Erigeron glaucus*

Foxglove  *Digitalis purpurea*
List of Native Species in Restoration Site

Garry oak  Quercus garryana
Shore pine  *Pinus contorta* var. *contorta*
Tall Oregon-grape  *Mahonia aquifolium*
Common snowberry  *Symphoricarpos albus*
Red-flowering current  *Ribes sanguineum*
Licorice fern  *Polypodium glycyrrhiza*
Sword fern  *Polystichum munitum*
Sitka mountain-ash  *Sorbus sitchensis*
White fawn lily  *Erythronium oregonum*
Hens and chicks  *Sempervivum soboliferum*
Common camas  *Camassia quamash*
Spreading stonecrop  *Sedum divergens*
Harvest brodiaea  *Brodiaea coronaria*
Common harebell  *Campanula rotundifolia*
False pixie cup  *Cladonia chlorophaea*
Yellow moss  *Homalothecium fulgescens*
False-polytrichum  *Timmia austriaca*
Oregon beaked moss  *Kindbergia oregana*
Electrified cat’s-tail  *Rhytidiadelphus triquetrus*
Broom moss  *Dicranum scoparium*
Douglas’ Neckera  *Neckera douglasii*

Waxpaper lichen  *Parmelia sulcata*
List of Non-Native Species in Restoration Site

The following species are not native to the Garry oak ecosystem, but are not aggressive or weedy, and will be retained in the restoration site.

Fuschia  *Fuschia sp.*

Rhododendron  *Rhododendron*  *sp.*

Bitter root  *Lewisia spp.*

Scilla  *Scilla sp.*

Grape hyacinth  *Muscari sp.*

Cyclamen  *Cyclamen coum*

Iris  *Iris sp.*
List of Top 10 Invasive Plant Species Threatening Garry Oak Ecosystems in B.C.

Top 10 invasive plant species currently threatening Garry oak ecosystems in British Columbia, ranked according to following criteria:

i) significance of impact  
ii) difficulty of control or management, and  
iii) urgency of control or management.

The following list, places the worst in number one position.

<table>
<thead>
<tr>
<th>Relative Ranking</th>
<th>Species:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orchard grass (<em>Dactylis glomerata</em>)</td>
</tr>
<tr>
<td>2</td>
<td>Scotch broom (<em>Cytisus scoparius</em>)</td>
</tr>
<tr>
<td>3</td>
<td>Gorse (<em>Ulex europaeus</em>)</td>
</tr>
<tr>
<td>4*</td>
<td>English ivy (<em>Hedera helix</em>)</td>
</tr>
<tr>
<td>4*</td>
<td>Velvet-grass (<em>Holcus lanatus</em>)</td>
</tr>
<tr>
<td>6</td>
<td>Laurel-leaved daphne (<em>Daphne laureola</em>)</td>
</tr>
<tr>
<td>7</td>
<td>Common hawthorn (<em>Crataegus monogyna</em>)</td>
</tr>
<tr>
<td>8</td>
<td>Sweet vernalgrass (<em>Anthoxanthum odoratum</em>)</td>
</tr>
<tr>
<td>9</td>
<td>Himalayan blackberry (<em>Rubus proserus/discolor/armeniacus</em>)</td>
</tr>
<tr>
<td>10</td>
<td>Hedgehog dogtail grass (<em>Cynosurus echinatus</em>)</td>
</tr>
</tbody>
</table>

* There was a tie for fourth place.

Also of concern are: Hairy cat's ear (*Hypocharis radicata*), because of its significance of impact, and Common vetch (*Vicia sativa*), Kentucky bluegrass (*Poa pratensis*), and Quackgrass (*Elymus repens*), because of their difficulty to control or manage. (Murray, 2002)
Appendix 9

Reference Site
Ecosystem description of c15 Oak - *Holodiscus discolor* - *Symphoricarpos albus* - *Polypodium glycyrrhiza* plant subcommunity. Reproduced directly from: Classification and Interpretation of Garry Oak (*Quercus garryana*), pages 41-42 (Erickson 1996)

“c15 Oak - *Holodiscus discolor* - *Symphoricarpos albus* - *Polypodium glycyrrhiza*

Ecosystem Description:
Frequency of Occurrence: 9 plots, frequent
Distribution: From Plots: Duncan: Priest Pt.; Saanich Peninsula: Bear Hill, Mt. Doug., Summit
Pk., Gonzales Hill, Saxe Pt., Knockan Hill. From Notes: Saanich Peninsula: North Hill, Uplands,
Walbran Pk., Songhees-Craigflower; western shore: Pedder Bay.
Plant Community Description: Holodiscus discolor (oceanspray) thrives on most sites in the low
shrub (B2) layer, and on some sites in the tall shrub (B1) layer. Cover averages class 2
and 2 to 3, respectively. Polypodium glycyrrhiza (licorice fern) occupies on all sites and averages
class 4
cover. Elymus glaucus (blue wildrye) grows on all sites, averaging class 2 cover. The remaining
species are present on most sites. Camassia leichtlinii (great camas) averages class 2 to
3 cover.
Cytisus scoparius (introduced broom), Galium aparine (cleavers), and Dicranum
scoparium
(broom moss) average cover class 2.
Tree Canopy/ Landscape Expression: primarily tree canopy (A) layer (6)
Oak Characteristics: Diameters: generally smaller diameter, 3 are medium or large;
Regeneration: Regeneration is occurring on most sites for both saplings and seedlings.
Average stocking is moderate for saplings and light for seedlings.

42
Physiognomic Type: usually Oak - Fern - Rockland and Shrub Oak - Rock Outcrop (3).
Elevation: various Slope: usually moderate to moderately steep
Aspect: west (north) to east Surface Shape: various
Moisture Regime: usually xeric to very xeric, some are submesic (2) or permesic (2)
Exposure: none Bedrock Geology: usually granitic (7)
Surface Substrate Features: all plots have either moderate to very high (class 3 to 6)
bedrock
exposure (6) or moderate to high (class 3 or 4) surface rocks (4)
Soil Classification: chiefly Orthic Regosols Humus Classification: mainly Orthi Rhizomulls
Depth of Ah Horizon: primarily shallow (4 to 14 cm)
Colour of Ah Horizon: generally dark, 10YR2/1 (6) Depth to Bedrock: normally shallow, 4 to 18 cm
Surface Soil Texture: usually silt loam (6)
Percent Coarse Fragments: various
Comments: Polypodium glycyrrhiza (licorice fern) dies back in the late spring and resumes growth again in the late summer. This type was not detected out on the Gulf Islands. One distinguishing factor is the absence of c15 from the Gulf Islands. This may be controlled by greater deer grazing pressure. Other factors are the soil classification as Orthic Regosols, reflecting the shallow Ah horizons and shallow soil over bedrock; the high surface exposure of granitic bedrock and the occurrence on northerly-facing slopes.”