



Best Management Practices for Garry Oak & Associated Ecosystems

Garryoak
ecosystems recovery team

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Acknowledgements

Partners

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Available online

This document can be found online at www.goert.ca/land-manager-BMPs.

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Contents

i	Acknowledgements
i	Available online
i	Partners
i	Citation
ii	Contents
1	How to Use this Document
1	Why the Need for Best Management Practices?
1	Four Parts
2	part 1
	Garry Oak & Associated Ecosystems: An Introduction
2	1.1 What Are Garry Oak Ecosystems?
2	What Are Associated Ecosystems?
2	Types of Garry Oak Ecosystems
3	When Are Garry Oaks <i>Not</i> Ecosystems?
4	Why Are They Here?
4	Worth Protecting
5	1.2 Ecosystems & Species at Risk
5	What Are Ecosystems & Species at Risk?
5	Ecosystem & Species at Risk Ranking & Tracking
6	1.3 Are There Ecosystems at Risk on Your Land?
6	Sensitive Ecosystems Inventory
6	Terrestrial Ecosystem Mapping

7	B.C. Conservation Data Centre (CDC)
7	iMap BC
7	Local Knowledge
7	Community Mapping Network
8	Local Government Mapping
8	1.4 Are There Species At Risk on Your Land?
8	Expert Surveys
10	Report New Findings
10	Survey Multiple Times
10	1.5 Vernal Pools & Seeps: A Special Kind of GOE Habitat
10	Vernal Pools
10	Vernal Seeps
11	Why Are They Important?
11	Are There Vernal Pools/Seeps on Your Land?
13	1.6 Threats to GOEs
13	Development & Destruction
13	Invasive Non-native Species
14	Fire Suppression
14	Recreational Activities
15	Grazing
16	part 2
	Best Management Practices for all
	Landowners & Land Managers
16	Overview
17	2.1 Protect Remaining GOEs
17	Checklist
17	Why Protect GOEs?
17	Inventory & Assessment
18	Survey at Different Times of the Year
19	Make a Map
19	Protect Species at Risk
20	Protect Vernal Pools & Seeps
20	Use All Available Tools
21	2.2 Plan to Manage & Restore
21	Checklist
21	Why is Restoration Needed?

21	Determine if Species at Risk are Present
22	Determine Which Invasive Species are Present
23	Determine if <u>Native Plant</u> Encroachment is a Problem
24	Invasive Plants & Vernal Pools/Seeps
24	Prepare a Management Plan
25	Make a Map
25	Communicate with Stakeholders
26	2.3 Connect Landscapes
26	Checklist
26	Why Are Connections Important?
26	Plan for Connectivity
27	Recommended Corridor Width
27	2.4 Provide Buffers
27	Checklist
27	What are Buffers?
28	Maintain Natural Features of Buffers
28	Protect Buffers
28	Recommended Buffer Widths
29	Protect Trees & Root Zones
30	2.5 Maintain Natural Water Flow Patterns
30	Checklist
30	Assess Hydrology Before Development
30	Best Management Practices for Maintaining Hydrology
31	Special Considerations for Vernal Pools & Seeps
32	Specific Practices for Maintaining Hydrology in Vernal Pools/Seeps
32	2.6 Limit Trampling
32	Checklist
33	Define Clear Paths
33	Build Sustainable Trails
34	Avoid Vernal Pools & Seeps
34	Keep Dogs on Leash
34	Limit Off-Road Vehicles
35	2.7 Plant & Maintain Native Species
35	Checklist
35	Why Use Native Plants?
36	Use the Right Native Plants

36	Grow Your Own Plants
37	Plan for Year-round Interest
37	Plant According to the Season
37	Leave Leaves
38	Care for Established Oaks
38	Don't Cut Dead & Dying Garry Oaks
39	Start New Oaks
39	Attract Wildlife
39	Protect Your Native Plants from Grazing
40	2.8 Don't Add Water, Fertilizer, or Pesticides
40	Checklist
40	Don't Add Water
40	Don't Add Fertilizer
41	2.9 Prevent the Introduction of Invasive Species
41	Checklist
42	Use Clean Gravel, Fill & Soil
42	Re-Plant Disturbed Areas Promptly
42	Use Clean Machines
42	Use Native Species for Re-Planting
43	2.10 Remove Invasive Plants
43	Checklist
43	Decide Timing of Invasive Species Removal
44	Detect Invasive Plants Early
44	Follow Best Management Practices
45	Remove Cut Material
45	Dispose of Material Off-Site
46	Special Considerations for Vernal Pools & Seeps
47	Support Volunteers & Stewardship Groups
47	2.11 Manage Meadows through Mowing
47	Checklist
47	Determine Benefits & Risks of Mowing
48	Mowing as an Alternative to Fire
49	Mow to Control Invasive Species
50	Mow for Diversity
50	Add Seeds or Plants
50	Inform Your Neighbours
50	Minimize Soil Disturbance & Compaction

52	Use the Right Equipment
52	Always Clean Equipment
52	Mow at the Right Time

53 **2.12 Monitoring**

54 **2.13 Spread the Word!**

55 **part 3**
Sector-Based Guidelines

55 **3.1 Municipal & Regional Planners**

55	Checklist
56	Assess What You Have
56	Make a Map
56	Plan to Restrict Development within GEOs
59	Include BMPs in Terms of Reference
59	Plan for Connections
60	Provide Buffers
60	Maintain Hydrologic Patterns
60	Save Native Soil & Plants
61	Limit Invasive Plant Species
62	Manage & Restore GOEs
62	Landscape with Native Plants

63 **3.2 Land Developers**

63	Checklist
63	Assess What You Have
64	Design Developments Around GOEs
65	Plan for Connections
65	Leave Buffers
66	Minimize Blasting & Grading
66	Maintain Hydrologic Patterns
66	Protect GOEs During Construction
68	Salvage Soil & Plants
69	Limit Invasive Plant Species
70	Landscape with Native Plants
70	Engage New Owners in Stewardship

71 **3.3 Park Maintenance & Grounds Staff**

71	Checklist
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71	Assess What You Have – Make a Map
72	Plan to Manage & Restore GOEs
72	Don't Add Water, Fertilizer, or Pesticides
73	Manage According to the Season
73	Mow for Diversity
73	Design & Install Trails Carefully
74	Limit Benches & Infrastructure
74	Protect GOEs During Construction
74	Manage Invasive Plants
75	Landscape with Native Plants
75	3.4 Stewardship Groups
75	Checklist
76	Assess What You Have
76	Work with the Landowner
77	Plan to Manage & Restore GOEs
78	Manage According to the Season
78	Organize Volunteers
79	Provide Training
79	Have the Right Tools
79	Insurance & Waivers
80	Treat Your Volunteers
80	Other Restoration Activities
80	Keep Records
80	3.5 Home Owners
81	Checklist
81	Assess What You Have
82	Plan to Manage & Restore GOEs
82	Limit Construction & Gardening in GOEs
83	Don't Add Water, Fertilizer, or Pesticides
83	Manage According to the Season
83	Mow for Diversity
84	Manage Invasive Plants
84	Landscape with Native Plants
84	Keep Records
85	3.6 Provincial & Federal Governments
85	The Species At Risk Act
85	Existing Provincial Legislation

86	The Conservation Framework
86	The BC Conservation Data Centre (CDC)
86	Establishing Formal Protection for GOEs
86	An Ecosystem-Based Approach for Species At Risk Protection

87 **part 4**
Resources

87	4.1 General Resources
89	4.2 Tax Incentive Programs
89	4.3 Funding Opportunities

How to Use this Document

Why the Need for Best Management Practices?

This document has been prepared to provide guidance for anyone who owns, works in, lives in, or manages a Garry Oak and associated ecosystem (GOE). This guide provides Best Management Practices for planners, developers, land managers, municipal employees, land owners, and stewardship groups when they are involved in activities in GOEs. Provincial and federal governments are also encouraged to use this guide. There are many simple precautions that can be taken to avert damage to these unique and threatened ecosystems. This document is intended to help you determine the steps that you can take to minimize your footprint and avoid inadvertent harm to GOEs.

The Garry Oak Ecosystems Recovery Team

The Garry Oak Ecosystems Recovery Team (GOERT) provides a wealth of resources on GOEs, ranging from the popular books *The Garry Oak Gardener's Handbook* and *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices*, to more technical information for those engaged in research and restoration, such as detailed information on species at risk and controlling invasive species. GOERT outreach specialists can also help you with your questions about GOEs and technical issues.

www.goert.ca | info@goert.ca | 250-383-3427

Four Parts

Part 1 provides an introduction to GOEs and their unique features, definitions and threats to species and ecosystems, and opportunities they present. Part 1 also includes advice on how to determine whether you have a GOE on your land and the importance of identifying sensitive areas, including species at risk and vernal pools that may require special protection and management.

Part 2 describes Best Management Practices for all landowners and land managers of GOEs. This section includes guidance for protecting GOEs, maintaining connections between pieces, providing buffers, and maintaining water flow patterns. Part 2 also provides management advice, including what precautions should be taken when working around species at risk, mowing guidelines, and recommendations for invasive species management and restoration.

Parts 1 and 2 should be read by all users.

Part 3 is designed as a sector-specific checklist that summarizes specific planning and management steps for different landowners and land managers. Before skipping to your specific sector, please read parts 1 and 2 which provide the necessary background information and more detailed management practices than are summarized in part 3. Some information is repeated in different sector-specific sections because the same steps apply to more than one group.

Part 4 provides a summary of additional resources that are available for use in the management of GOEs.

part 1

Garry Oak & Associated Ecosystems: An Introduction



Satinflower (Olsynium douglasii), a common rock outcrop plant in GOEs. Photo: C. Maslovat

1.1 What Are Garry Oak Ecosystems?

Garry Oak and associated Ecosystems (GOEs) are much more than Garry Oak (*Quercus garryana*) trees. GOEs have a rich diversity of wildflowers, native grasses, insects, reptiles, birds, and microorganisms that are part of the functioning ecosystem. Many of these species occur nowhere else in Canada. Due to invasions of exotic (non-native) species and land development for agricultural, industrial, and urban use, these areas are disappearing at a rapid, accelerating rate.

The Garry Oak Ecosystems Recovery Team (GOERT) defines a Garry oak ecosystem as **one with naturally occurring Garry oak trees (*Quercus garryana*) and some semblance of the ecological processes and communities that prevailed before European settlement.**

What Are Associated Ecosystems?

Although the presence of Garry Oak trees can be an indicator of a GOE, there are many places with the same community of species but with no trees at all. This is because heavy wind, salt spray, thin soils, or other factors can limit tree growth. If these areas have a similar group of associated plant and animal species they are still considered GOEs even though they lack Garry Oak trees.

Types of Garry Oak Ecosystems

GOEs include savannahs (open grasslands with widely scattered trees) as well as woodlands with many Garry Oak trees. GOEs also include areas that have very few to no trees such as coastal bluffs, maritime meadows, vernal pools and seeps, and very thin soil rock outcrops. GOEs also include forested areas with Garry Oak trees interspersed with Douglas-fir (*Pseudotsuga menziesii*) and Arbutus (*Arbutus menziesii*). Underlying soil conditions and other limiting factors will affect what each ecosystem looks like but they are all rare and ecologically valuable. The GOERT website describes the “spectrum of landscapes”

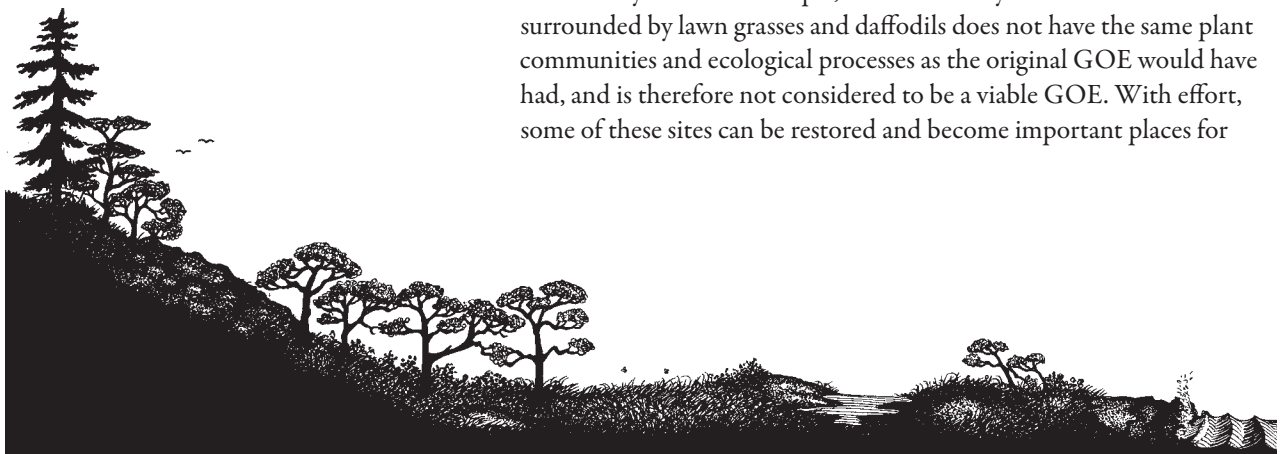


Shallow soil/bedrock outcrop Garry Oak ecosystem at Mount Wells Regional Park. Photo: C Maslovat



Deep soil Garry Oak ecosystem at Cowichan Garry Oak Preserve. Photo: S. Smith

BELOW: GOEs are a spectrum of landscapes, representing a diversity of habitat types (www.goert.ca/about). Illustration: D. McPhie



considered Garry Oak and associated ecosystems (www.goert.ca/about), and detailed descriptions of these sites are found in *Restoring British Columbia's Garry Oak Ecosystems* (www.goert.ca/restoration) in Chapter 2: Distribution and Description.

Shallow or Deep?

In Canada, Garry Oak ecosystems can be divided into two general categories: those with shallow soils and bedrock outcrops, and those with deep soil and few or no outcrops.

Shallow soil sites can be very diverse: mosses and other small plants occupy the rocky areas, while showier flowers, ferns, and shrubs occur in deeper soil areas. This wide range of habitats supports a rich species diversity.

Deep soil ecosystems are typified by lush wildflower meadows. Many of these sites were once camas (*Camassia quamash* and *C. leichtlinii*) fields, tended and harvested as a staple food by First Nations peoples for many thousands of years prior to the arrival of the Europeans. In these meadows, vast swaths of camas grew with dozens of other wildflowers. In fact, the fields of blue camas were so extensive that they were mistaken for lakes by early Europeans.

When Are Garry Oaks Not Ecosystems?

Although all GOE sites now have been affected to some degree by non-native plant species and loss of natural processes, some are in better condition than others. The presence of Garry Oak trees is a fairly reliable indicator that the area is a Garry Oak ecosystem; however, in some places the site has been so altered that it no longer represents a viable ecosystem. For example, an urban Garry Oak tree that is now surrounded by lawn grasses and daffodils does not have the same plant communities and ecological processes as the original GOE would have had, and is therefore not considered to be a viable GOE. With effort, some of these sites can be restored and become important places for



Camas bulb. Photo: C. Maslovat.



Dry grasses in mid-summer on Mount Tuam, Salt Spring Island. Photo: C. Maslovat.

re-establishing connections among healthier GOE sites. Due to their rarity, urban GOEs are just as important for conservation as suburban and rural sites.

Seasonal Patterns

Some GOE plant species, such as the annual Sea Blush (*Plectritis congesta*), germinate in the fall with the onset of the winter rains, blooming in the spring and drying out completely later in the summer. Other Garry Oak ecosystem species re-grow annually from bulbs and other underground parts. These plants, including camas (*Camassia* spp.) and Fawn Lily (*Erythronium oregonum*), flower in the late spring and produce seeds by mid-June. By mid- to late-July these plants have completed their growing cycle and their above ground parts have died.

This pattern, or phenology, is an adaptation to this region's dry summers, and has important implications for management: in the fall and winter when soils are soft and new plants are germinating, some activities in GOEs can be very damaging. By late summer and fall, before the start of the winter rains, many of these same ecosystems are durable and careful management activities can be conducted with a minimum of harm.

Why Are They Here?

In Canada, GOEs are found only on the east side of Vancouver Island, the Gulf Islands, and a few isolated patches on the mainland. They are restricted to this limited geographic area because of the unique climatic conditions found there. Both the Olympic and Vancouver Island Mountains create a rainshadow effect that significantly reduces rainfall on the east side of Vancouver Island and southern Gulf Islands. The rainshadow effect has the greatest influence in the late spring and summer when there is very little rain. For example, at Victoria's Gonzales Heights weather station, the yearly average precipitation is less than 3 cm/month from April to September. In addition, year-round air temperatures are kept mild by the influence of the Pacific Ocean, resulting in cool, wet winters and warm, dry to drought-prone summers.

Worth Protecting

Once common in coastal areas of southwestern BC, less than 5% of these ecosystems now remain in a near-natural condition. Some people value GOEs for their intrinsic worth as natural ecosystems, and love to enjoy the wildflowers, butterflies, mosses, and birds that these ecosystems support. GOEs provide places of serenity to walk and enjoy



Sea Blush (*Plectritis congesta*). Photo: C. Junck

The BC Conservation Data Centre describes the ranks used in assessing species and ecosystems (www.env.gov.bc.ca/cdc):

- ☛ *Extirpated*: no longer exist in the wild in British Columbia, but do occur elsewhere
- ☛ *Endangered*: facing imminent extirpation or extinction
- ☛ *Threatened*: likely to become endangered if limiting factors are not reversed
- ☛ *Special Concern*: particularly sensitive to human activities or natural events but not endangered or threatened

nature and are also of cultural significance to First Nations. GOEs also provide many unrecognized benefits such as habitat for insects that act as pollinators or eat aphids, or homes for Sharp-tailed Snakes that eat garden slugs. Garry Oak and associated ecosystems are high in biodiversity – in fact, they are the richest land-based ecosystems in coastal BC. They are also some of Canada’s most endangered ecosystems, and are home to more than 100 species at risk.

1.2 Ecosystems & Species at Risk

What Are Ecosystems & Species at Risk?

An ecosystem consists of a dynamic set of living organisms (plants, animals, and microorganisms) all interacting among themselves and with the environment in which they live (soil, climate, water and light).

Simply speaking, a species or ecosystem at risk is at risk of dying out or disappearing, either from a specific area (e.g., province or country) or from the world. The level of risk is determined by provincial, federal, and global authorities.

All of the remaining GOEs are considered at risk. There are currently 104 species of plants, mosses, lichens, animals, and invertebrates considered at risk in GOEs; some of these are so rare that they have been found in only one location in Canada.

Ecosystem & Species at Risk Ranking & Tracking

The B.C. Conservation Data Centre (CDC) assesses, ranks, and provides information on species and ecosystems in British Columbia. The CDC assigns a rank to each species based on its rarity and the factors that threaten it. Species that are Extirpated, Endangered, or Threatened in British Columbia are placed on the Red List and species of Special Concern are placed on the Blue List. There are currently 10 plant communities associated with GOEs that are included on BC’s Red List; six more will likely be added after assessment.

Some species which are at risk not only in British Columbia but also in Canada have also been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), an independent panel of experts. A Status Report describing what is currently known about the species provides the information to assess the species as Endangered, Threatened, or Special Concern (in decreasing order of risk). Species at risk that have been assessed by COSEWIC are also eligible for legal protection and recovery under the federal *Species at Risk Act (SARA)*.

As of 2011, there are 104 provincially-listed species at risk in Garry Oak and associated ecosystems and, of these, 55 are also listed federally. Many



This pocket grassland at Echo Heights, Chemainus, is too small to have been captured by SEI Mapping. Photo: D. Polster

A Note About the CDC

It's important to know that not every occurrence of species or ecosystems is in the CDC database. Mapped locations are limited to those for which CDC has received data and do not represent a comprehensive distribution of a species or an ecological community. Occurrences in many small areas, particularly those on private land, may not be included in the CDC database.

of these species have not yet been assessed for listing under *SARA* so the number of species listed federally is likely to grow; currently, GOE species account for >40% of all of the federally-listed species in Canada. GOERT's website (www.goert.ca) contains lists of at-risk GOE species; for more details of ranking, legislation, and special GOE site considerations where there are species at risk, see Chapter 4 of *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration).

1.3 Are There Ecosystems at Risk on Your Land?

There are two steps to finding out if you have ecosystems at risk on your land: The first is to refer to an existing mapping database. The next is to have a qualified professional visit your site. Listed below are several different mapping projects that identify sensitive ecosystems, including GOEs. These are good starting points but they lack complete information, are not always up to date, and sometimes do not identify small parcels. A ground-based survey by a qualified professional is the best way to confirm whether you have GOEs on your land.

Sensitive Ecosystems Inventory

The Sensitive Ecosystems Inventory (SEI) for East Vancouver Island and Gulf Islands (www.env.gov.bc.ca/sei/van_gulf) can be used to identify potential GOEs. Garry Oak and associated ecosystems can be found in four SEI ecosystem types: Woodland, Terrestrial Herbaceous, Coastal Bluff, and Sparsely Vegetated Ecosystems.

When the SEI mapping project was undertaken, 0.5 hectare was used as the minimum target size for non-forested ecosystems. Small areas such as pocket grasslands that occur in shallow soils were generally too small to be identified. Such areas may be only a few hundred square meters in area, but can contain species at risk. The SEI mapping used air photo analysis to identify sensitive ecosystems, and a subset of sites (~25%) were surveyed on the ground, or "ground-truthed". SEI is a high-level survey that is not intended to replace the ground surveys that are needed to determine the presence and condition of sensitive ecosystems before any land use decisions are made.

Terrestrial Ecosystem Mapping

The entire range of GOEs has been mapped using Terrestrial Ecosystem Mapping (TEM) under a variety of projects. TEM also relies on air photos to define ecosystem locations, with some ground-truthing. The provincial Ecological Reports Catalogue (www.env.gov.bc.ca/ecocat) provides access to SEI and TEM maps and data.



Emblematic GOE species such as Garry Oak trees and camas are not species at risk but may occur next to others species that are, such as this Endangered Deltoid Balsamroot (*Balsamorhiza deltoidea*).
Photo: C. Maslovat.

B.C. Conservation Data Centre (CDC)

The B.C. Conservation Data Centre (CDC) collects and distributes information on ecosystems and species at risk and maintains this information in a database. The CDC uses the term “Ecological Community” to describe ecosystems at risk. The CDC’s Species and Ecosystems Explorer “Mapped Known Locations” mapping system (www.env.gov.bc.ca/atrisk/toolintro.html) can be used to identify areas where sensitive ecosystems have been mapped. Making a direct request to the CDC will ensure you get all of the records for a property, including any which have not yet been entered into the online system but for which reports have been submitted (cdcdata@gov.bc.ca).

iMap BC

iMapBC is a Province of BC web-based mapping tool that provides access to the more than 500 natural resource datasets hosted in the BC Geographic Warehouse (<http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc>). With this tool, users can interactively visualize and query the data, combine the data with their own uploaded geographic data, and produce maps that can be printed or emailed to others.

Local Knowledge

Local naturalist club or stewardship group members can offer a wealth of knowledge about locally important GOEs, including small sites that do not show up on SEI mapping or the CDC database. Contact information for local naturalist clubs on Vancouver Island can be found on the BC Nature website (www.bcnature.ca/pages/local_clubs/local_clubs.html).

Community Mapping Network

The Community Mapping Network (www.cmnbc.ca) may also help you find information about the location of GOEs in your area. The network hosts a number of atlases, including:

- BC NGO Conservation Lands Atlas
- Comox Valley Project Watershed
- Cowichan Valley Watershed Atlas
- Invasive Species
- CRD Regional Community Atlas (formerly Natural Areas Atlas)
- Sensitive Habitat Inventory and Mapping (SHIM), which includes the Nanaimo Environmentally Sensitive Areas Atlas, Comox-Strathcona Sensitive Habitat Atlas, and Saanich Environmentally Significant Areas

Virtual Habitat Assessment

There may be other local mapping tools that can be useful for identifying rare species on your land. For example, the Salt Spring Island Conservancy has created a “Virtual Habitat Assessment” that can be used to find out whether your property has potential habitat for the Endangered Sharp-tailed Snake (*Contia tenuis*) (www.saltspringconservancy.ca/sts_assessment.html). The conservancy also has biologists that can help you look for this and other rare species on Salt Spring Island. The Galiano Conservancy Association provides similar resources (www.galianoconservancy.ca).



An Endangered Sharp-tailed Snake (Contia tenuis). Photo: L. Matthias, Salt Spring Island Conservancy.

Ground-based Surveys by Experts

Not all locations of species at risk have been recorded. Ground-based expert surveys are the best way to be sure if species at risk are on your land.

Local Government Mapping

Many local governments have conducted their own surveys to update and expand existing mapping to get a more comprehensive idea of where sensitive ecosystems occur. For example, the District of Saanich has recently initiated a mapping project to add smaller sites to their existing sensitive ecosystems mapping (www.saanich.ca/living/natural/planning/esamapping.html). Various bylaw provisions can require that developers conduct surveys in order to provide critical site-specific information and add incrementally to mapping databases. More information can be found in this guide in *Section 3.1 Municipal & Regional Planners*.

1.4 Are There Species At Risk on Your Land?

The CDC keeps records of where species at risk have been found, the number of individuals at each site, and other factors such as the threats to the species. The CDC Species and Ecosystems Explorer provides information about rare species and links to a mapping system can be used to identify areas where there are known occurrences of rare species. The CDC may also have additional data that has not yet been entered into the on-line system; you can make a specific request for information about a specific site (cdcdata@gov.bc.ca).

A complete list of all species at risk that have been found in GOEs can be found on page 4-34 of *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices*. Chapter 4 in particular provides more details on legislation and the implications of having species at risk on your land (www.goert.ca/restoration). The CDC website can narrow your search by telling you which species at risk occur in your regional district or municipality.

Not all locations of species at risk have been recorded; the lack of a record does not mean that a rare species does not exist on your site. Although the resources listed above provide a good starting point, ground-based expert surveys are the best way to be sure if species at risk are on your land.

Expert Surveys

In areas where rare species are known to occur, it is prudent to conduct detailed ecosystem mapping to determine the extent of rare species on the property. Even at sites where species at risk have not been previously recorded, inventories are especially important if there will be land use changes, such as urban development. Careful inventories are also

Mill Hill Rare Plant Surveys

As part of an ongoing project to remove invasive species, Mill Hill Regional Park hired botanists to do annual surveys for rare plants. Since the first survey was done in 2003, there have been many new locations found for species at risk as well as new species that were not previously known to occur there. For example, prior to 2003, it was thought that there were only 10 sites with the Special Concern species White-topped Aster (*Sericocarpus rigidus*) on Mill Hill. In 2010, after 8 years of surveys, a total of 45 sites are known! These findings highlight how difficult it is to be certain that all species at risk have been found and why protection of all GOE habitat should be the first priority.



An expert botanist counts Endangered Deltoid Balsamroot (Balsamorhiza deltoidea) during rare plant surveys at Mill Hill Regional Park. Photo: C. Maslovat.

needed in parks and institutional grounds before installation of trails, benches, or other infrastructure and before starting restoration projects.

Although it is useful for land managers to become knowledgeable about species at risk that may occur on their land, in many cases these species are small and elusive and experts are needed to find them. The Garry Oak Ecosystems Recovery Team (www.goert.ca) can provide information on rare species biologists who are qualified to assess a site.

Hiring experts can be expensive, especially since there are different experts for different groups of organisms: a person qualified to survey for rare plants may not have experience with rare butterflies or may not know how to survey for Sharp-tailed Snakes. Furthermore, most surveys can only be done during a narrow time window and some surveys will require repeat visits.

Sometimes the survey costs can be shared with other partners. For example, on sites where there will be dedicated parkland and/or covenants, GOERT may be able to work with partners to distribute costs amongst the local government, the landowner, and other non-profit organizations. If a species at risk is found, the expert brought on site can identify the most effective means of protection and provide advice about appropriate site management.

Multiple Surveys

Many rare plants in Garry Oak ecosystems are detectable (or identifiable) only at certain times of the year. A summer survey, for instance, will miss many of our rare spring flowering plants, such as Threatened Macoun's Meadowfoam (*Limnanthes macounii*), which germinates in the fall and is virtually undetectable by mid-May on most sites. On the other hand, the identification of Endangered Foothill Sedge (*Carex tumulicola*) can be confirmed only in the summer when it is fruiting; at any other time of year it can be easily confused with more common related sedge species... For some particularly cryptic species it can take a very long time: there are several cases where it took over 50 surveys to detect the Endangered Sharp-tailed Snake (*Contia tenuis*).

— from *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices*, www.goert.ca/restoration



A vernal pool complex in winter. Photo: J. Miskelly



Scouler's Popcornflower (Plagiobothrys scouleri) in a drying vernal pool. Photo: J. Miskelly.



A seep with Red Thread-moss (Bryum miniatum) Photo: K. Miskelly



A vernal pool early in the process of filling with rainwater. Photo: J. Miskelly.

Report New Findings

Any new finding, whether of a previously unmapped species or a new occurrence of a known species, should be reported to the CDC (www.env.gov.bc.ca/cdc/contribute.html).

Survey Multiple Times

In addition to ensuring that surveys are conducted at appropriate time(s) of year, more than one survey per year, and more than one year of surveying, may be required to locate populations of at risk species. Some species at risk populations, especially of small annual plants, can fluctuate in numbers from one year to the next. It is very easy to miss species at risk in years of low abundance, and some species may not appear at all in certain years or at certain times. In a particularly wet or dry year, for example, the timing of germination or flowering may vary.

1.5 Vernal Pools & Seeps: A Special Kind of GOE Habitat

Vernal pools and seeps are highly specialized habitats that occur within GOEs. They are addressed separately in this document because they often have a high proportion of species at risk and, because they are aquatic ecosystems, they require specific approaches for management and protection.

Vernal Pools

Vernal pools are temporary wetlands that form in shallow depressions in impermeable substrates such as bedrock or clay. These depressions fill with rainwater in winter but dry out completely in summer. They are wet enough in winter and spring to support different plants than surrounding upland habitats, but dry enough in summer to exclude species typical of more permanent wetlands. Vernal pools therefore support a unique suite of plants not found in wetter or drier habitats. Some of the most common plants of vernal pools are Scouler's Popcornflower (*Plagiobothrys scouleri*), cudweeds (*Gnaphalium* species), and Water Chickweed (*Montia fontana*).

Places to see vernal pools include Uplands Park in Oak Bay, Christmas Hill in Saanich, Mill Hill Regional Park in Langford, and Harewood Plains in Nanaimo.

Vernal Seeps

Seeps occur on rocky slopes where a combination of impermeable substrate and shallow soil results in water trickling over the surface

through the winter. Seeps have moving water, rather than standing water like vernal pools. Another difference is that vernal pools are found in shallow depressions, while seeps are found on slopes; however, seeps are similar to vernal pools in that the soils are saturated through the winter and extremely dry in summer. Some of the most common plants found in seeps are Yellow Monkey-flower (*Mimulus guttatus*), annual clovers (*Trifolium* species), and Red Thread-moss (*Bryum miniatum*).

Places to see seeps include Eagle Heights near Shawnigan Lake, Mill Hill Regional Park in Langford, Sooke Hills Regional Park, and Harewood Plains in Nanaimo.

Why Are They Important?

The annual hydrology cycles of vernal pools and seeps create conditions that are extremely stressful to most plants. Few plants can tolerate the combination of prolonged winter flooding and severe summer drought. Because of this, vernal pools and seeps are home to many highly stress-tolerant annual plant species that are not found in other habitats. Because these species are uniquely adapted to these uncommon habitats, many species associated with vernal pools are very rare.

Almost two thirds of the rare plants that occur in Garry Oak ecosystems are found in vernal pools or seeps.

The habitats suitable for the formation of vernal pools and seeps have been disproportionately impacted by urban development. Most low-lying, level meadows that once supported vernal pools were used for agriculture by early settlers, and rocky headlands rich in rock-bound vernal pools and seeps were highly valued for residential development. Today, residential development continues to move inland and upslope, threatening remaining seeps. Many of the locations that still support vernal pools and seeps are either on private lands, where they are threatened by development, or in urban parks, where they are threatened by invasive alien plants, visitor use, and changes to hydrology.

Are There Vernal Pools/Seeps on Your Land?

A simple way to determine whether there are vernal pools or seeps on your land is to look during rainy weather in winter. Areas where water forms puddles or trickles over rocky soils should be watched through the winter. If the water remains for weeks or months after the rain has stopped, they are likely vernal pools/seeps. Vernal pools in winter may look like puddles when full of water, or just patches of mud when in the process of filling or draining. Seeps often appear red in winter and spring because of the presence of Red Thread-moss. In the summer, vernal pools may look distinctively bare, as many of the large perennial grasses that dominate the surrounding meadows will be absent from the dried pool.

Some Species Found in Vernal Pools & Seeps



Macoun's Meadowfoam (*Limnanthes macounii*) is a Threatened plant endemic to Vancouver Island and adjacent islands, meaning it occurs nowhere else in the world. It is usually found in seeps or at the edges of vernal pools. This annual species germinates in fall and flowers in early spring, which allows the plant to set seed and die before the summer dry season.

Photo: J. Miskelly



Bog Bird's-foot Lotus (*Hosackia pinnata*) is unusual for a vernal pool plant because it is large and perennial. In Canada, this Endangered plant is only found around Nanaimo, where it is the city's official flower.

Photo: J. Miskelly



Tall Woolly-heads (*Psilocarphus eliator*) is an Endangered annual plant found mainly in vernal pools, but also at the edges of wetlands. Like many vernal pool plants, it is small, plain, and easy to miss. There are only three remaining populations in Canada—two in the Victoria area and one in the Cowichan Valley.

Photo: M. Fairbarns



Dense Spike-primrose (*Epilobium densiflorum*) is an Endangered annual most often found in clay-bottomed vernal pools, but also in gravelly seeps, and at the edges of wetlands. Historic records suggest that it may have once been a common plant in the Victoria area. Today, there are only six populations known in Canada.

Photo: J. Miskelly

Isolated Fragments

Development and destruction of GOEs has left small isolated “pockets” where native plants and animals persist. Isolation of patches means that native species can’t move from one site to another. If a plant or animal species dies out in an area, it usually can’t return without human help. Smaller areas also can’t support the same diversity of species that a larger area can. Losing native plant species can lead in turn to a loss of birds, mammals, butterflies, and other insects. Small fragments are usually also surrounded by invasive exotic species.

Connecting the small fragments by restoring habitat in between them is important for providing habitat for a larger number of species and making GOEs more resilient to changing conditions.



Ecosystem map produced by Ted Lea (2002) showing the change in area of GOEs in Victoria and the Saanich Peninsula from 1800 (green) to 1997 (red). More information on what remains can be found at: www.goert.ca/about/what_remains.php

More than one year of surveys may be required to determine if there are species at risk in vernal pools and seeps. This is because the composition of a vernal pool community can change dramatically from year to year in response to variations in annual rainfall. Some species at risk populations vary considerably in size from one year to the next.

1.6 Threats to GOEs

GOEs are special places worth protecting, yet are among the most endangered ecosystems in Canada. They are threatened by development, invasion by non-native species, fire exclusion, and trampling by dogs and people. **Once common in coastal areas of southwest BC, less than 5% of GOEs remain in a near-natural condition.**

Development & Destruction

Reasonably healthy deep soil GOEs are very rare. Early European settlers were attracted to the open oak meadows, which were much easier to convert to farm land than Douglas-fir forests. They brought in grazing livestock and, in some cases, deep soil sites were cultivated, replacing the camas fields with more familiar food crops and introduced pasture grasses. In the Victoria area, less than 1% of these areas remain in natural condition.

Farming was rapidly followed by urban development, which started in the flat, deep soil sites and quickly moved up the hillsides, carving into the south-facing rocky slopes where the GOEs occur. Today, shallow soil, rocky outcrop sites are the most common remaining fragments of GOEs. The fact that these areas were largely unsuitable for farming has allowed them to survive in somewhat better condition than their deep-soil counterparts. Population growth has put extreme pressure on these remaining fragments.

Invasive Non-native Species

All GOEs now have non-native species, but some are highly invasive and do more damage than others. Habitat loss from land development and invasive non-native species are the two greatest threats to GOEs and the species they support.

Invasive non-native plant species may “jump the fence” from urban gardens to GOEs, dramatically changing ecosystem balance. For example, the non-native invasive shrub Scotch Broom (*Cytisus scoparius*) can change the structure and nutrient status of GOEs, providing a shrub layer when previously there was none, and adding nutrients which encourage the growth of non-native grasses.



A dense thicket of the invasive non-native shrub Scotch Broom (Cytisus scoparius) at Harewood Plains near Nanaimo. Photo: D. Polster



Dogs walking with their owners have created the small trail to the right of the walking path at the top of this coastal bluff ecosystem at Beacon Hill Park. Photo: D. Polster



Dirt bikes have caused erosion and other damage at Eagle Heights Grasslands. Photo: D. Polster

Invasive non-native shrubs such as Himalayan Blackberry (*Rubus armeniacus*) can shelter non-native invasive animals such as Eastern Cottontail Rabbits (*Sylvilagus floridanus*) and Roof Rats (*Rattus rattus*). Rabbits can destroy Garry Oak seedlings and meadow vegetation while the rats can spread disease and damage property. Non-native Black Slugs (*Arion rufus*) eat GOE plants. The European Starling (*Sturnus vulgaris*) and English House Sparrow (*Passer domesticus*) aggressively displace native cavity-nesting bird species from their nests, and Eastern Gray Squirrels (*Sciurus carolinensis*) eat birds' eggs and nestlings and compete with native birds for tree cavities.

Fire Suppression

Deliberate, regular burning and annual camas harvest by First Nations peoples kept some GOEs, in particular deep soil sites, from becoming Douglas-fir forests. Burning also prevented shrubs such as Common Snowberry (*Symphoricarpos albus*) and Nootka Rose (*Rosa nutkana*) from filling in the understorey and burnt the layer of dead grass on the ground, providing bare soil where native plant seeds could germinate. In the absence of both natural and deliberate fire, the structure and species diversity of many GOEs have been extensively altered.

Returning fire to these ecosystems is difficult in our modern world, both because of risk to adjacent property, and because of the presence of invasive non-native plants that grow aggressively on the bare soil left by fires. In addition, over many years without fire, GOE sites have built a heavy fuel load which will burn with different patterns and higher intensity than with the frequent fires that occurred in the past. Research is currently underway to determine what happens if fire is reintroduced into the ecosystem, and what other options (such as mowing) could be used as an alternative to this important disturbance element.

Recreational Activities

Recreational activities can also be destructive to GOEs. Even walking trails result in loss of vegetation cover and can cause erosion. People and dogs that stray off the trail can cause further damage through trampling of plants and soil compaction. Dog faeces can increase the fertility of GOEs, making soil conditions more favourable for exotic species. In some areas, the presence of a geocache has encouraged people to walk across sensitive areas, sometimes through populations of at-risk species.

Off-road vehicles can be especially damaging, causing soil compaction and erosion, plus altering the natural flow of water. All recreational activities can potentially introduce invasive species.



Feral sheep. Illustration: Briony Penn

Grazing

In many GOEs there is extreme grazing pressure by native Black-tailed Deer (*Odocoileus hemionus columbianus*). Current numbers of deer are extremely high because of declines in hunting, the eradication of predators, and the fragmentation of suitable habitat within agricultural lands and forests. Some GOEs also have non-native Eastern Cottontail Rabbits and escaped domestic European Rabbits (*Oryctolagus cuniculus*) that eat native GOE plants. GOEs on some of the Gulf Islands are grazed by feral sheep, goats, and fallow deer (*Dama dama*).

part 2

Best Management Practices for all Landowners & Land Managers



Chocolate Lily (Fritillaria affinis).
Photo: D. Polster



GOE at Mt. Tzuhalem Ecological Reserve.
Photo: D. Fizzard

Overview

Part 2 describes Best Management Practices that can be implemented by all sectors to maintain healthy GOEs and minimize impacts from the threats they face. It explains why each practice is appropriate and provides specific recommendations for how to implement each practice. Part 2 builds upon *Part 1 – Garry Oak & Associated Ecosystems: An Introduction*; both should be read before proceeding to other sections.

Best Management Practices for all sectors are:

- 1 **Protect Remaining GOEs**
- 2 **Plan to Manage & Restore GOEs**
- 3 **Connect Landscapes**
- 4 **Provide Buffers**
- 5 **Maintain Natural Water Flow Patterns**
- 6 **Limit Trampling**
- 7 **Plant & Maintain Native Species**
- 8 **Don't Add Water, Fertilizer, or Pesticides**
- 9 **Prevent the Introduction of Invasive Species**
- 10 **Remove Invasive Plants**
- 11 **Manage Meadows through Mowing**
- 12 **Monitoring**
- 13 **Spread the Word!**

2.1 Protect Remaining GOEs



Garry oak woodland, Somenos Garry Oak Protected Area, Duncan. Photo: L. Townsend



The Endangered Howell's Triteleia (Triteleia howellii). Photo: C. Maslovat

Checklist

- ✓ Inventory & Assessment
- ✓ Survey at Different Times of the Year
- ✓ Make a Map
- ✓ Protect Species at Risk
- ✓ Protect Vernal Pools and Seeps
- ✓ Use all Available Tools

Why Protect GOEs?

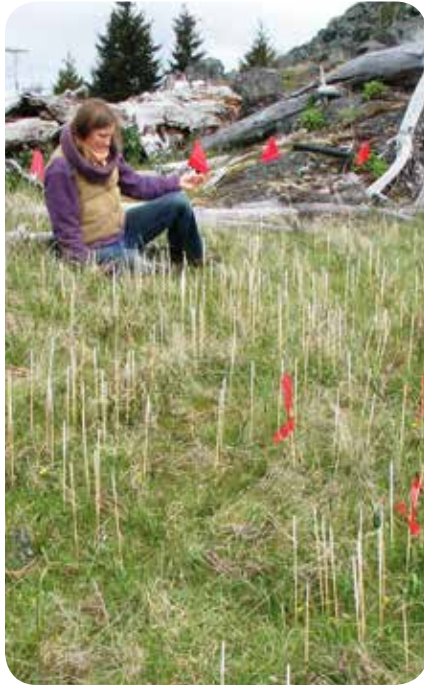
Once common in coastal areas of southwestern BC, less than 5% of the historical extent of these ecosystems now remains in a near-natural condition. Garry Oak and associated ecosystems are high in biodiversity – in fact, they are the richest land-based ecosystems in coastal BC. They are also some of Canada's most endangered ecosystems, and are home to more than 100 species at risk. GOEs are increasingly at risk due to development pressure, invasion by non-native species, and other factors. As the ecosystems disappear, so do the species they support. **Protecting the last remaining GOEs should be our first priority.** In order to protect GOEs, it is essential to know where these ecosystems occur and what they contain. Using the information from *Section 1.3 Are There Ecosystems at Risk on Your Land?*, *Section 1.4 Are There Species at Risk on Your Land?* and *Section 1.5 Are There Vernal Pools/Seeps on Your Land?* is the first step to determining what is on your site.

A healthy, functioning GOE is better able to withstand the pressures of change, including climate change. Protecting remaining GOEs from development and other land use changes is also the best way to protect species at risk.

Protecting high quality sites is a top priority but even areas that were once GOEs that are now degraded are important. For example, deep soil grasslands that have been used for agriculture, or are overgrown by conifers, can be restored. These areas are important as linkages to other ecosystems, as wildlife corridors, to maintain ecosystem processes, and potentially for large-scale restoration activities such as controlled burning.

Inventory & Assessment

Conduct a preliminary site survey. Even if GOEs or associated species at risk are not known to occur on your land, it is important to conduct a preliminary site survey with an on-the-ground look at the site and



Surveys for Endangered Yellow Montane Violet (*Viola praemorsa* spp. *praemorsa*) help inform management planning on Salt Spring Island.
Photo: C. Masson



Harvest *Brodiaea* (*Brodiaea coronaria* spp. *coronaria*) blooms late in the summer.
Photo: D. Polster

its features. The results will determine whether or not GOEs occur and if a more in-depth inventory and assessment are required. **Recall from Part 1 that although the presence of Garry Oak trees can be an indicator of a GOE, there are many places with the same community of species but with no trees at all—these are still considered GOEs, and may contain species at risk.** Once you've established that your site contains GOEs, it is important to conduct more detailed surveys so that you can plan for protection and appropriate management.

Conduct a detailed inventory and assessment. A thorough inventory and assessment are important for fully understanding the site prior to any land use changes or management activities. Assessments should describe baseline conditions including areas with native species, the locations of species at risk, and specialized habitat such as vernal seeps or pools. Baseline conditions provide a reference for measuring the success of management activities in the future. Inventory and assessment can also identify current or potential threats including invasive plants, build-up of grass litter, or visitor impacts.

During the inventory, in addition to assessing the species and ecosystems on the site, you should be looking for physical attributes, biological features or processes, and potential impacts on the site (e.g., erosion of this soils on rock outcrops because of an inappropriately placed trail). Photographs can provide a visual baseline for evaluating the success of management activities – don't forget to take photographs in different seasons, and to accurately record locations for repeat photography. Detailed descriptions of inventory methods are found in *Restoring British Columbia's Garry Oak Ecosystems* (www.goert.ca/restoration) in Chapter 7: Ecological Inventory and Monitoring.

An important component of an initial assessment is identifying hydrological patterns in GOEs (refer to *Section 2.5 Maintain Natural Water Flow Patterns*). Understanding how water moves both above and below the surface is especially important for vernal pools and seeps.

Survey at Different Times of the Year

To thoroughly survey for species at risk and specialized habitat such as vernal pools and seeps, repeat surveys during different seasons may be required. For example, some plant species are impossible to see unless they are surveyed during the narrow window when they are in flower. Other species such as butterflies only fly on sunny days during a short time of the year. Inventory and assessment of vernal pools and seeps should be conducted in winter and through an entire spring and summer so that late-flowering species can be detected, and so the pool can be observed in both the aquatic and dry phases.

It may also be necessary to survey a site for more than one year. Some plants, such as camas or rein orchids (*Piperia* spp.), may flower sparsely



Although no species at risk were harmed when this bench was installed at Mill Hill Regional Park, the shallow soils next to the bench have eroded away due to trampling. Photo: C. Maslovat

On the Ground Protection

People that work in GOEs, including developers, construction workers, park maintenance and grounds staff, and stewardship groups, need to know the exact locations of all species at risk and sensitive ecosystems. Creating hard copies of maps that show the locations of these sites helps communicate this information.

When on-site workers aren't given enough information, they can make mistakes. In one local park, a bench was installed in the middle of a patch of a Threatened plant because the construction crew did not have the same information as the park manager.

or not at all in years when weather conditions are not appropriate, making them very difficult to find.

Make a Map

Accurate maps of the extent and boundary of GOEs on your site will help to prevent inadvertent damage to these sensitive areas and the adjacent habitats that affect them. There are some special considerations when mapping vernal pools and seeps (see below). GOERT staff can help you to identify and delineate GOE boundaries, and provide a list of qualified experts to map locations of species at risk populations and the surrounding habitat that supports them.

For areas where land development is planned, local governments should ensure that they have a map from the developer that shows the location of GOEs, where species at risk occur, where the buffers will be, and how connections will be made with other GOEs and different types of adjoining habitat (refer to [Section 2.3 Connect Landscapes](#) and [Section 2.4 Provide Buffers](#)).

In areas that are protected from development, such as parks, it is very important that all persons performing work within the GOEs understand the sensitivities of the site and have up-to-date maps. The maps should clearly show species at risk locations, be periodically updated, indicate what activities are permitted in these areas, and at what time of year activities are permitted. **It is important that these maps be shared with anyone working on the site:** species at risk populations in parks have been unintentionally damaged by temporary staff or contractors who were not oriented to the sensitive areas or best management practices to avoid harm.

Protect Species at Risk

Under the *Species at Risk Act (SARA)*, listed species are protected on federal lands, and the province is required to effectively protect these species on private and provincial Crown lands. Therefore, if you have species at risk on your land you may be required to show due diligence in protecting them. As every species at risk has very specific habitat needs, it is important to do research to understand where they live, what they need to survive, and which activities might threaten them. Information in [Section 1.4 Are There Species at Risk on Your Land?](#) can help you find out whether or not species at risk occur on your land.

If species at risk do occur on lands you are responsible for, check to see if a federal Recovery Strategy or Action Plan has been written for your species. These plans will provide specific details on the biology and ecology of the species, the threats that face the species, and how many

populations there are. The plans may also delineate Critical Habitat* including necessary buffers that are required for the survival and recovery of the species. Recovery plans for GOE species can be found on the GOERT website (www.goert.ca) or on the Ministry of Environment's Recovery Planning in British Columbia website (www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm). On the GOERT website, you will also find a document, *Questions & Answers: Legislation & Policy for the Protection of Garry Oak Ecosystems* that outlines not only the legal framework that guides protection in BC, but also how species at risk legislation affects landowners (www.goert.ca/documents/QandA_Legislation_and_Policy.pdf).

Being aware of where species at risk occur and sharing this information with all people who work on the ground is the first step to protecting the species. **No land use changes that might alter water flow, change soil structure, or increase trampling should be permitted where species at risk occur or in the adjacent buffer areas**, nor in catchment areas for vernal pools and seeps. Buffers are important so that water flow is not altered, and the invasion of non-native species is limited (Refer to *Section 2.4 Provide Buffers*).

Protect Vernal Pools & Seeps

Within Garry Oak ecosystems, vernal pools and seeps represent some of the highest priority habitats for protection, due to the abundance of rare species they support. Because of their importance and their distinct habitat requirements, specific Best Management Practices are included for vernal pools and seeps in the appropriate sections below.

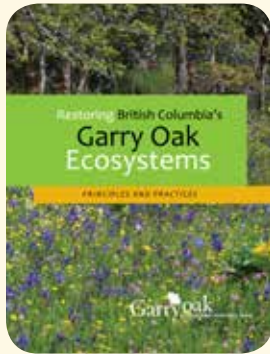
The first priority for protecting a vernal pool or seep is eliminating sources of direct harm to the species that inhabit them. Protection includes maintaining the natural flow of water (*Section 2.5 Maintain Natural Water Flow Patterns*), limiting both vehicle and foot traffic during times when the plants are growing and soils are soft (Refer to *Section 2.6 Limit Trampling*), and limiting invasion by non-native species (*Section 2.9 Prevent the Introduction of Invasive Species* and *Section 2.10 Remove Invasive Plants*). All construction, including installation of trails and benches, should avoid vernal pools and seeps as well as their catchment areas.

Use All Available Tools

There are a number of different tools available for protecting GOEs from land conversion. Specific options for each sector such as conservation covenants, development permit areas, tax incentives, etc., are included in *Part 3: Sector-based Guidelines*.

* Critical Habitat is legally designated habitat that is essential for the survival and reproduction of a species. Under the *Species at Risk Act (SARA)* it is illegal to destroy the Critical Habitat of species at risk

Restoring BC's GOEs: Principles & Practices



GOERT has compiled a compendium of GOE restoration principles and practices. This technical document brings together all of the most recent information on GOE restoration. Available at: www.goert.ca/restoration

2.2 Plan to Manage & Restore

Checklist

- ✓ Determine if Species at Risk are Present
- ✓ Determine Which Invasive Species are Present
- ✓ Determine if Native Plant Encroachment is a Problem
- ✓ Prepare a Management Plan
- ✓ Make a Map
- ✓ Communicate with Stakeholders

The complexity of management needs at GOE sites varies widely, from preventing invasion of non-native species from adjacent properties to re-establishing rare species within a regional park. **In all cases, a Management Plan is a key document to map the route to achieving these goals.** For almost all remaining GOEs, restoration will be an important component of an over-arching management plan.

Why is Restoration Needed?

Restoration is defined by the Society for Ecological Restoration as “the processes of assisting the recovery of ecosystems that have been damaged, degraded or destroyed”. All GOEs are in need of some degree of restoration. Most GOEs have become significantly degraded over the years since the arrival of Europeans. Changes in natural disturbance regimes, such as the removal of fire and invasion by non-native species, have caused substantial changes to GOE species composition and ecological processes.

Although restoration is a broad topic, GOERT has developed the compendium *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* to assist those engaged in restoring these ecosystems, and can provide further assistance to land managers wishing to undertake restoration.

Due to the extreme sensitivities of GOEs, careful planning is essential to ensure that the work has the intended outcomes. The first principle of GOE restoration should be to “do no harm”.

Determine if Species at Risk are Present

Understanding the life cycles of species at risk, as well as their habitat needs, is necessary to guide any management or restoration in GOEs. Mowing can kill certain species if done at incorrect times of year. Invasive plant removal can cause trampling of species at risk both while removing invasives and while carrying plant material away for disposal.

Coastal Vesper Sparrows & Scotch Broom

The Endangered Coastal Vesper Sparrow (*Pooecetes gramineus affinis*) is found in only one location in Canada. In the absence of native vegetation at this site, these rare birds use Scotch Broom for singing perches and to escape from predators while they forage for insects and seeds in the nearby gravelly/grassy areas. The structure of their habitat appears to be more important than whether the plants are native or not. Although removing Scotch Broom is necessary to restore the open meadow areas they require, it may be important to keep some broom plants in place until native shrubs can replace them. GOERT has been working with the landowner to cautiously remove Scotch Broom and plant native shrubs, using an adaptive management approach to restore this site.



Coastal Vesper Sparrow on nest.
Photo: T. Chatwin

Section 1.4 Are there species at risk on your land? contains information to help you identify and map populations of at-risk species.

Understanding the habitat needs and potential threats to species at risk is critical for making sure your restoration does more good than harm. More information on species at risk can be found in Status Reports, Recovery Strategies, and Action Plans available on the Species at Risk Public Registry (www.sararegistry.gc.ca/default_e.cfm) or on GOERT's website (www.goert.ca). GOERT also has a stewardship manual with information on most GOE species at risk: (www.goert.ca/publications_resources/species_at_risk.php).

Determine Which Invasive Species are Present

Non-native invasive species are one of the most important threats to at-risk plants and animals in B.C. Much of the initial restoration work in GOEs has focused on invasive plant removal. Scotch Broom (*Cytisus scoparius*) is one of the most pervasive invasive species in GOEs and its removal is often the target of the initial restoration stages. However, there are many other non-native species that have invaded GOEs and that can be as damaging as Scotch Broom.

For example, many non-native grasses have invaded GOEs. As the grass plants die back at the end of the year, they can create thick matted layers of thatch that prevent seeds of native plants from reaching the soil and germinating. Because it can be difficult to distinguish native grasses from non-native invasive grasses, especially when they are not in flower, controlling them is particularly difficult.

Inventory & understand the invasive non-native species present. The first steps in managing an invasive species include recognizing the species, mapping the extent of its infestation, and learning about its biology in order to understand how best to manage it. **It is important to identify and address the conditions on-site that have encouraged establishment of non-native species.**

Each non-native invasive species has different characteristics that will affect the type of control that will be effective. Some species such as Gorse (*Ulex europaeus*) and English Holly (*Ilex aquifolium*) will re-sprout from cut stems and will require more concerted effort than simply cutting the plants down at the soil line. Some species may be controlled by mowing at specific times whereas other species that spread by rhizomes, such as Kentucky Bluegrass (*Poa pratensis*), will form denser patches if mown.

Understanding the composition of what you have on site can help predict which restoration techniques will be successful. GOERT has produced a Stewardship Manual and Best Practices for removing the most pervasive species in GOEs, and developed a *General Decision*



The invasive non-native Rose Campion (*Lychnis coronaria*), a common garden plant with silvery leaves, competes with the greener leaved native Endangered Yellow Montane Violet (*Viola praemorsa* spp. *praemorsa*) in Mount Maxwell Ecological Reserve. Photo: C. Maslovat

Capital Region Invasive Species Partnership (CRISP)

To improve information sharing about invasive species in the Capital Regional District (CRD), CRISP (a sub-committee of the Coastal Invasive Plant Committee CIPC) was created to increase collaboration in the region and share information on disposal, staff training, research, early detection rapid response, restoration, mapping, and inventories. CRISP will also be creating a CRD-wide education campaign about invasive species.

www.saanich.ca/parkrec/parks/natural/pdf/13_CRISPPurpose.pdf

Process for Managing Invasive Plant Species in Garry Oak & Associated Ecosystems to guide GOE restoration (www.goert.ca/invasive). This tool can help decide which invasive species to target based on their impact and how easy they are to control. It can also help you decide where to start. The Invasive Species Council of BC (www.bcinvasives.ca), including our regional Coastal Invasive Plant Committee (www.coastalinvasiveplants.com), can also provide a wealth of information about identification and control of invasive species.

For invasive plant removal, work should be focused on outlying populations first, with the main population addressed once the spread has been contained. Similarly, work should only be conducted if the resources are available to continue treatments into the future. Species such as Scotch Broom create soil seed banks where viable seeds may be stored for decades. Being prepared to treat the same area for many years as new plants arise will ensure success. Starting in small areas of infestation prevents opening up a lot of bare ground that will be quickly re-colonized by invasive species (see [Section 2.9 Prevent the Introduction of Invasive Species](#)).

Determine if Native Plant Encroachment is a Problem

In addition to the many non-native species, some native species can come to dominate a site in the absence of natural and historical human processes (e.g., fire). Through the absence of predators and through natural successional processes that occur in the absence of fire, native species such as Douglas-fir (*Pseudotsuga menziesii*) can become very abundant and take on invasive characteristics in GOEs.

Prior to about 1850, intentional, short duration, cool fires were common in some GOEs, lit by First Nations as part of planned management of their resources and landscape. These regular burns prevented the growth of woody species in areas with deeper soils where camas and other food plants were harvested. Regular fires also reduced the build-up of thatch and other organic material on the ground. Since intentional burning has ceased, more Douglas-fir trees are growing in GOEs, shading out Garry Oak trees and native wildflowers. In some places Shore Pine (*Pinus contorta* var. *contorta*), Red Alder (*Alnus rubra*), and/or dense thickets of native shrubs, including Common Snowberry (*Symphoricarpos albus*) and Nootka Rose (*Rosa nutkana*), also encroach on GOEs. These other trees can achieve faster height growth and have greater shade tolerance than Garry Oak, and eventually will dominate the site. Garry Oak and Arbutus trees, and many meadow wildflowers, will decline in vigour and die out over time as conifers and shrubs increase shade and change conditions on the site. Some conifers must be removed from sites where encroachment is a concern, if Garry Oak and meadow or savannah plants are to survive there. Although this in-growth and encroachment may seem like a natural process, human activities have led to the habitat loss, fragmentation, and degradation that threaten GOEs and their

Tree Thinning

Researchers and restoration practitioners are removing in-growth and encroachment of invasive native species, such as Common Snowberry and Douglas-fir, from GOE sites throughout our region. At Mt. Tzuhalem Ecological Reserve, for example, dense stands of Douglas-fir have been thinned by either cutting the trees at ground level or by stripping a collar of bark to girdle and kill them. Thinning is done gradually so that researchers can study the effects of changed light and other environmental conditions on target species, such as Red-listed White-topped Aster (*Sericocarpus rigidus*), whose population has been steadily declining at the site. It is important not to remove too many trees and shrubs at once, as the rapid change to light and moisture levels can be damaging to target species. The work at Mt. Tzuhalem follows expert advice and a plan for target density of Douglas-fir, and is adapted over time. Management plans can allow exceptions for individual trees to be retained to create wildlife habitat (for example, tall conifers for raptor nesting).



Several firs within this dense group have been girdled. They will die slowly, providing habitat for woodpeckers and other creatures. Photo: K. Martell

at-risk species. Some intervention to simulate previous processes will likely be required to protect and maintain GOEs as part of our landscape mosaic.

Mowing has also had some limited success controlling aggressive native shrubs (refer to [Section 2.11 Manage Meadows through Mowing](#)). At Somenos Protected Area, repeated mowing over several years has reduced the cover of Common Snowberry in areas where it was once dominant. Both exotic grasses and planted native grasses have colonized the litter and bare soil in the sites previously dominated by Common Snowberry, and mowing has not stopped the growth of underground rhizomes – cover of Common Snowberry dropped substantially in 2003 when mowing began and has remained relatively constant in succeeding years. Further time and research is needed to gauge whether repeated mowing will be needed to control native shrubs.

GOERT experts can provide advice on techniques and density goals for removing in-growth and encroachment. The USDA has also produced a resource for land managers, *A Practical Guide to Oak Release*, which provides detailed information about certain types of release operations (www.fs.fed.us/pnw/pubs/pnw_gtr666.pdf).

Invasive Plants & Vernal Pools/Seeps

In the absence of fire, native and non-native trees and shrubs such as Douglas-fir and Scotch Broom can grow densely on the outer edges of vernal pools and seeps and, because these habitats are often small in area, these tall plants can block light and change moisture and temperature. Trees and shrubs also draw water out of the soil and change hydrologic patterns. An increase in tree growth next to vernal pools and seeps also increases the amount of deadfall (leaves and limbs that drop). Tree trunks or branches that fall into vernal pools or seeps can directly block light and smother vegetation. Debris can also divert or block the natural flow of water. In addition, tree branches can act like fences, capturing leaves and other debris that blows around in autumn. This debris can build up and cover important germination sites for native plants. Debris and encroaching shrubs should be removed as part of a management plan to protect these sensitive areas. Any woody plant that is shading or will eventually shade the vernal pool should be removed in August or September when native non-woody plants in the pool are dormant.

Prepare a Management Plan

All GOEs are unique; in order to be effective, management activities (including restoration) should be tailored to the species and conditions that occur at each site. Understanding past land use, geology and soils, and water flow patterns is important for guiding any management activities. The management plan will describe the values, issues, and recommended actions for the site, as well as outlining their relative

Example Map



This site map clearly shows the locations of important features and target restoration areas, as well as delineating ecosystem polygons that will receive different restoration treatments.

order or importance. For example, a management plan for a municipal natural areas park might include sections on historical and cultural uses, current vegetation communities, species and ecosystems at risk present on the site, trail and infrastructure design, interpretive signage, and define specific management and restoration activities to protect the at-risk species (e.g., invasive species removal, replanting with native species, fencing). A management plan lays out site goals, objectives, and tasks, and is based upon sound knowledge of the site and the species involved.

Restoring a GOE can be a significant undertaking and should only be carried out with careful planning to ensure that the efforts expended achieve the desired results. There is a wealth of experience in GOE restoration and talking to experts can help avoid mistakes. The plan should be tailored to the specific needs of any species at risk on site, as well as to the characteristics of target invasive plants. Creating a site-specific restoration plan includes describing project goals and objectives as well as preparing a schedule of steps to be accomplished. Ideally a restoration plan will include timelines as well as costs involved. It should account for the time for obtaining necessary permits or other essential documentation. All restoration plans should include a long-term monitoring and maintenance component.

Logistics including access routes in and out of the area should be determined as well as how cut plant material will be removed and disposed of. Good planning avoids long-term problems.

If a restoration project includes planting native species, further advance planning is necessary. Native plants are often in limited supply and nurseries often require planning at least a year in advance in order to have large quantities of the appropriate stock at the right maturity to plant out. Some restoration projects collect seed from their own site to make sure that it is well-adapted to local growing conditions. However, growing your own planting stock requires advance preparation as well as time to allow the plants to develop (see [Section 2.7](#)).

Make a Map

Before starting any project it is important to know the exact locations of species at risk. Knowing the distribution of invasive plant species as well as where different plant communities occur can also help guide management and restoration activities. **A hard copy map should be produced so that everyone on site knows where GOEs and species at risk occur.**

Communicate with Stakeholders

A solid restoration plan should include all of the stakeholders involved in the restoration process. Landowners that live next to public spaces are often interested and/or concerned about changes to “their” park. Working with existing and potential users, neighbours, and other interested



City of Victoria parks workers clearing Scotch Broom in Beacon Hill Park. Photo: D. Polster

parties will help ensure that site goals are achieved and management activities are a success. In addition, a management plan should include a communications strategy. Having information on hand explaining the restoration activities and posting work plans online can help circumvent public relations problems. Installing signs explaining the work during restoration can also help inform the public. Engaging the public can also help enlist volunteers for stewardship projects. Chapter 6 in *Restoring British Columbia's Garry Oak Ecosystems* contains extensive information on involving stakeholders and communicating restoration plans with the public.

2.3 Connect Landscapes

Checklist

- ✓ Plan for Connectivity
- ✓ Follow Recommended Corridor Width

Why Are Connections Important?

Many of the remaining GOEs are small and isolated, making it more difficult for animals, insects, and plants to move between sites. These small pockets are cut off (fragmented) from each other, and therefore may be too small to maintain viable populations of species. Small size also limits the genetic mixing that enables populations of species to stay adaptable and robust. Isolated patches leave species vulnerable to influences from outside the ecosystem such as predation by pets or invasion of non-native plant species.

Creating connections between GOEs can help reduce these problems. Connections that are natural areas are best. Connections can be created along the riparian area of creeks and marine shorelines, and, if managed properly, along power lines or pipelines. These can be used as sites for walking and bike trails connecting human communities as well as biological communities.

Plan for Connectivity

- ☛ Wherever possible, plan for connections between different GOEs.
- ☛ Create patches that are as large as possible and have the least amount of edge habitat. The boundaries between habitat types have different environmental conditions than those in the interior, creating an *edge effect* of modified conditions (changes to light, moisture, wind) that can extend well into the core area of a habitat patch. When the ratio of edge to interior in a habitat patch increases, it diminishes both the quantity and quality of the remaining interior. For example, there is increased

Butterflies & Connected Habitat

Butterfly species such as this Zerene Fritillary (*Speyeria zerene* ssp. *bremmerii*) on Mt. Tuam are especially vulnerable to habitat fragmentation. Fragmented patches may not support a wide enough range of conditions such as soil depth, moisture, and aspect to ensure food plants are at the right stage to feed emerging butterflies.



Photo: C. Maslovat



A buffer between the GOE at Mt. Tzuhalem Ecological Reserve and the development next to it would have helped to mitigate the effects of the changes. Photo: D. Polster

invasion and predation by non-native species in patches with more edge. Patches that are round in shape have better interior habitat than linear patches because they have fewer edges.

- Create connections with other natural habitats (e.g., riparian areas, forests, wetlands, etc.) in addition to other GOEs.
- Design developments and roads so they are outside of the GOE, or, if there are no other options, at the edge of GOE rather than through the middle.
- Create trails and other access routes at the edge of the GOE in buffer areas rather than through the middle.

Recommended Corridor Width

The most biologically effective connecting corridors are greater than 100 m wide with native vegetation that includes ground cover, shrubs, and trees. In urban areas, however, such large corridors may not be feasible. Parks, small corridors, and native urban landscaping can contribute to effective connections; small or narrow connectors are better than no connectors at all.

2.4 Provide Buffers

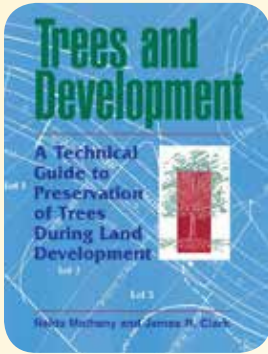
Checklist

- ✓ Maintain Natural Features of Buffers
- ✓ Protect Buffers
- ✓ Follow Recommended Buffer Widths
- ✓ Protect Trees and Root Zones

What are Buffers?

The impacts of human activity and other stressors such as invasive species tend to be greatest at the edge of an ecosystem. GOEs can be highly sensitive to changes at their edges. **Buffers can be an important part of maintaining the natural ecological conditions that support GOEs.** Buffers are areas that are left undisturbed around GOEs which can mitigate the effects of changes near the edge of the ecosystem. For example, buffers can help mitigate the spread of invasive plants and reduce predation on birds, butterflies, and snakes by pets. For any type of development that is adjacent to a GOE, a buffer should be provided to protect the core area of the GOE. Buffers should also be used to protect GOEs on neighbouring properties.

Recommended Book



The book *Trees & Development: A Technical Guide to Preservation of Trees During Land Development* by N. Matheny and J. Clark, published by ISA, is an excellent source of information on how to protect trees during development.

www.isa-arbor.com/store/product.aspx?ProductID=108

Maintain Natural Features of Buffers

Buffers should have native vegetation (trees, shrubs, and ground cover) and should be considered no-development zones. Creating a buffer to a protected GOE site that can be used by people may minimise ecosystem-degrading activities. For example, creating low impact trails for walking or biking in buffer areas can avert trampling and soil compaction in adjacent GOEs. Fencing or natural barriers can be installed in the buffer area to keep people and their pets out of sensitive GOEs. Buffer areas can also be used as fire breaks from forested areas.

Protect Buffers

Buffers should have long-term legal protection. If possible, buffers and adjacent GOEs should be on public lands so they are not compromised by the activities of private landowners. If this is not possible, buffers should be situated on the developer's land and should be considered part of the development assets. Buffers on private land should be protected by conservation covenants or other protection measures.

Recommended Buffer Widths

In many cases, the ecological effects of land clearing can have impacts on the adjacent uncleared area. There have been no studies to determine what size of buffer is required to protect GOEs. However, Table 1 offers recommended buffer widths that have been developed for other sensitive ecosystems which should serve as a minimum buffer width in GOEs. **Buffers up to 100 m in width** can provide protection from disturbances such as water flow alterations and incursion by weedy exotic species.

These buffers are based on the distance required from development and are applicable to other disturbances such as land clearing. Buffer widths around species at risk populations will vary depending on the species and should be based on guidance from Recovery Plans or a recovery expert. Buffers retained around vernal pools and seeps should include the entire catchment area. You may need help from qualified experts (botanists, hydrologists) to accurately map the extent and boundary of GOEs on your site.

Table 1. Recommended minimum buffer widths for sensitive ecosystems *

Measure buffer from	Minimum buffer width		
	Undeveloped	Rural	Urban
Outer perimeter of defined GOE boundary	100 m	60 m	30 m

Protect Trees & Root Zones

Established Garry Oak trees that can grace a site for hundreds of years are an important asset to any site. Alteration of the land can damage tree roots leading to the death of the tree. It is important to protect the roots by establishing “no go” zones during development. Remember that it may take 20 years or more for Garry Oak trees to reach a significant size, and **protect young trees as well as large ones**. Even small trees, especially in rocky areas, can be quite old and are a valuable resource.

The extent of a tree’s root system varies significantly depending on the soil conditions and the site; all Garry Oak trees begin with a strong tap root, but rock or a hard pan can arrest the vertical development, spurring more growth on the laterals. These roots may spread to exploit any suitable area. For this reason, a qualified arborist with Garry Oak expertise should be hired to define tree protection areas and protected root zones.

The **Protected Root Zone** is the area of land around the trunk of a tree where the roots are expected to occur. The Protected Root Zone is determined by creating a circle around the tree with a radius which is calculated by multiplying the diameter of the tree at breast height by 18, or by drawing a circle around the dripline of the tree. **Lateral roots of Garry Oak trees can extend beyond the dripline by as much as twice the crown radius, so it is important to protect as large an area as possible around the tree.** The Protected Root Zone is slightly different from the **Critical Root Zone** which is determined by an arborist certified by the International Society of Arboriculture who measures the root zone and makes a professional assessment.

During development, the Protected and/or Critical Root Zones should be clearly marked on all plans and protected by temporary fencing to make sure that there are no impacts within these zones. Even fill dumped temporarily in tree root zones can lead to death of the tree.

* Buffer distances taken from Table 4-2 of Section 4: Environmentally Valuable Resources of Develop with Care: Environmental Guidelines for Urban and Rural Land Development in British Columbia. www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html

Catchment Area

Both vernal pools and seeps are associated with small watersheds, or **catchment areas**, where rainfall drains towards the pool or seep. The illustration below shows a seep (in red) and its associated catchment (outlined in black). In this example, rain water that gathers in the catchment area flows in a narrow stream as it trickles down a cliff face.

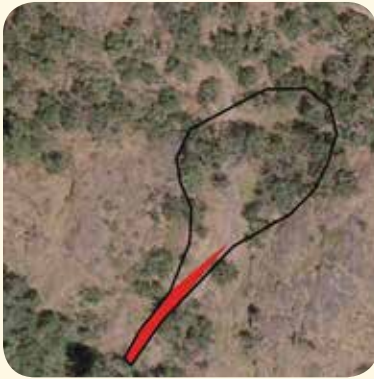


Illustration: J. Miskelly

2.5 Maintain Natural Water Flow Patterns

Checklist

- ✓ Assess Hydrology before Development
- ✓ Best Management Practices for Maintaining Hydrology
- ✓ Special Considerations for Vernal Pools and Seeps
- ✓ Specific Practices for Maintaining Hydrology in Vernal Pools/Seeps

GOEs are typically moist to wet in winter and dry in summer. Either increasing or decreasing the amount of water can have drastic implications for GOEs.

Land development, irrigation, trails, and building of infrastructure can all change the hydrology of a GOE or the adjacent area, changing the timing, amount, and flow patterns of water. Construction that includes grading or blasting will alter local topography and the flow of water will be affected over a much greater area than the actual work site. When soil surfaces change and vegetation is removed, less rainfall soaks into the soil and less water is taken up by plants, causing an increase in surface runoff. Management approaches which encourage the natural infiltration or flow of water on the site will be better for the GOEs than if the water is diverted. A qualified biologist or landscape architect can help to figure out how best to maintain natural site hydrology and minimize impacts to GOEs and species at risk.

Assess Hydrology Before Development

Maintaining hydrological patterns will be site-specific. For new land developments, a detailed hydrological assessment should be done by a qualified hydrology expert who is also familiar with GOEs.

Best Management Practices for Maintaining Hydrology

Cutting roads and associated blasting can result in groundwater seepage being exposed at the surface. Therefore, care should be taken when considering the placement and subsequent construction of roads and developments that are adjacent to GOEs. Changes to the groundwater or surface water hydrology should be minimized or avoided.

- ✓ DO ensure that local bylaws support integrated rainwater management by allowing measures such as roadside swales, reduced road widths, and use of permeable surfaces.
- ✓ DO ensure that local bylaws support the disconnection of roof downspouts from municipal storm-water systems and diversion of water into gardens. This prevents surges of storm water into natural



Gully in a hiking trail caused by soil erosion at Mill Hill Regional Park. Photo: C. Maslovat

water bodies, has less impact on natural hydrology, and reduces the likelihood of basement flooding.

- ✓ DO avoid blasting wherever possible during development design.
- ✓ DO fit the development to the landscape rather than making the landscape fit the development. Minimize grading and blasting to accommodate roads and houses.
- ✓ DO use grassy swales and/or rain gardens to maintain water flow patterns and to reduce infrastructure costs.
- ✓ DO use shared driveways to reduce impermeable surfaces.
- ✓ DO use gravel or other permeable surfaces for parking, roadways, and trails.
- ✓ DO design raised walkways in GOEs that allow light and water to penetrate to the ground beneath and to prevent soil compaction caused by trails.
- ✓ DO use native GOE plants for landscaping to minimize the need for irrigation and pest management.
- ✓ DO use micro irrigation systems to conserve water and prevent over-watering where irrigation is necessary.
- ✗ DO NOT use curbs and gutters and other hard surfaces that divert the flow and prevent infiltration of water.
- ✗ DO NOT install landscaping that will require extra water that may run off into adjacent GOEs

Special Considerations for Vernal Pools & Seeps

Vernal pools and vernal seeps are extremely sensitive to changes in water flow both above and below the surface. **An increase or decrease in the amount of water will harm these sensitive sites, so it is very important to determine the catchment area that provides water to these areas.** Determining the catchment can usually be accomplished by observing the lay of the land and visualizing which way rainfall flows. The easiest time to determine the extent of the catchment area is during wet winter weather. Typically, the catchment area of a vernal pool is very small and surrounds the pool. The catchment area of a seep is located uphill from the seep. A seep's catchment area may be large or small and may extend upslope for some distance.

Because vernal pools and seeps are so dependent on the amount of water they receive in both the winter and spring, any actions that alter the natural flow and/or percolation of water are potentially harmful. Vernal pools can be negatively impacted by even slight changes to hydrology. For example, invasive native and non-native shrubs and trees can draw water out of the soil, changing the hydrology of vernal pools and seeps. Foot traffic can compact the soil, preventing water infiltration; create



Some species such as the Blue-listed Scalepod (Idaho scapigera) require spring seepage and are extremely sensitive to changes in the movement of water. Photo: C. Maslovat



Fencing and signage is used to protect this vernal pool from trampling. Photo: J. Miskelly



Rocks outlining the edge of the trail to limit trail braiding at Mill Hill Regional Park. Photo: C. Maslovat

depressed trails that change the flow of water towards or away from pools/seeps; and deepen or reduce the depth of vernal pools, changing flood conditions (refer to [Section 2.6 Limit Trampling](#)).

Specific Practices for Maintaining Hydrology in Vernal Pools/Seeps

Vernal pools and seeps are so sensitive to changes in water flow that extra precautions should be applied to their entire catchment area.

- ✓ DO restrict access by using signs and/or fencing.
- ✓ DO remove non-native trees, shrubs, and grasses, especially from immediately around vernal pools and seeps.
- ✓ DO restrict all management activities to the dry season (July-Sept).
- ✗ DO NOT build trails, benches, or other structures within vernal pools/seeps or their catchment areas.
- ✗ DO NOT allow dogs to access vernal pools and seeps.
- ✗ DO NOT conduct management activities during the sensitive winter to summer growing season (October-June).
- ✗ DO NOT add to or reduce the supply of water.

2.6 Limit Trampling

Checklist

- ✓ Define Clear Paths
- ✓ Build Sustainable Trails
- ✓ Avoid Vernal Pools and Seeps
- ✓ Keep Dogs on Leash
- ✓ Limit Off-road Vehicles

Many people are drawn to the rocky outcrops and wildflowers found in some GOEs, and want to be in the middle of them. However, the feet of dogs and people can trample plants and compact the soil, changing the way water moves over the landscape. Foot and animal traffic also spread seeds of invasive plants. Restricting people and their pets to well-defined trails will help protect adjacent areas from trampling and its effects.

Trails can be designed to highlight areas of natural beauty while minimizing pedestrian, dog, bicycle, and off-road vehicle traffic in highly sensitive areas. ‘Staying on track’ allows sensitive areas to persist and helps preserve their biodiversity.



This park bench in a municipal park has been built directly on top of a vernal pool that supports rare plants. Note the bare soil from trampling in front of the bench. Photo: J. Miskelly



Pipe installed to allow water to flow through a trail at Mill Hill Regional Park. Photo: J. Miskelly



Signs encouraging people to stay on designated trails are available through GOERT.

Define Clear Paths

Make sure that people know where they should walk. A combination of fencing and interpretive signage helps deter people from walking in sensitive areas. Thorny vegetation such as Nootka Rose (*Rosa nutkana*) can discourage people from straying off trails. Cedar split rail fences and logs can be used as barriers. In rocky outcrop areas, placing rocks or a rope along the edge of the trail can let people know where to put their feet.

Having an accurate map is very important when installing fences or logs to make sure structures are not put near or on top of species at risk. A specialist can also mark the trail route and no-go areas in advance or be present on-site to direct workers. Fencing can also be used to deter people from entering areas with infestations of easily spread invasive plants such as Carpet Burweed (*Soliva sessilis*).

Build Sustainable Trails

Trails must be built to avoid harming GOEs and also so that they do not become mud pits that users walk around: trail braiding can be a serious problem in our wet winters. Building sustainable trails in rocky outcrop areas is very challenging. Species at risk and other sensitive elements, such as vernal pools and seeps, should be avoided when trails are installed. It is very difficult to define the edge of the trail in rocky areas because the vegetation is usually very short. The thin soils erode easily and high rainfall in the winter creates gullies and washouts on the trail bed. Trail washouts can lead to trail widening as people look for safe footing on slippery rocks. Trails can also divert the flow of water by changing surface water flow patterns.

Trails are usually part of larger systems that are the result of careful and diligent planning and collaboration. These trail systems must serve the needs of multiple user groups and take environmental and geographical factors into account.

— from International Mountain Biking Association of Canada, www.imbacanada.com

Bicycles and off-road vehicles are more destructive than foot traffic. Foot, bicycle, and vehicle traffic can crush plants or scrape off soil that the plants require. Trampling not only damages the plants themselves, but can also create trails that divert or gather water.

The appropriate trail width, location, and surfacing materials will be determined by the needs and attributes of a site. For example, in some areas it is best to use a packed gravel trail surface with a geotextile base

The Scoop on Poop

Making sure that people pick up after their pets is important for limiting the amount of dog feces in GOEs. The nutrients added to GOEs from dog droppings change the chemistry of native soils which can favour the growth of invasive plants more than native ones.

Off-road Vehicle Outreach



The Salt Spring Island Conservancy (SSIC) is making efforts to connect with local off-road vehicle drivers, including holding a public forum. During the panel discussion, the conservancy explained that GOEs are extremely sensitive to vehicle traffic. There are plans for local park planners to work with island riders to identify less sensitive areas for riding.

that allows drainage; in other areas, it may be inappropriate or impossible to bring in off-site materials.

Specialized structures can be built to carry foot traffic. At the Matson Conservation Area in Esquimalt, a steel-grate staircase was installed to allow access into a GOE and limit trampling in adjacent areas (www.goert.ca/developers_government/success_stories.php). The grating allows light and water through so that plants can thrive underneath, unlike a traditional wood plank boardwalk.

Avoid Vernal Pools & Seeps

If there are vernal pools or seeps on the site, special care is needed to ensure that they are not damaged (see *Section 2.5: Specific Practices for Maintaining Hydrology in Vernal Pools/Seeps*, and *Section 1.3: Are There Vernal Pools or Seeps on Your Land?*). Vernal pools can be inviting to hikers, since they have relatively sparse and low vegetation in the summer. Likewise, seeps may be attractive as hikers usually follow the lay of the land and may follow gullies up hill.

Trampling can compact soil so that the water cannot penetrate, and can change the duration of flooding by deepening the pools.

Construction of trails, benches, or other infrastructure should be avoided in vernal pools and seeps and their catchment areas. There are many examples of activities that have destroyed vernal pools or eliminated rare plant populations within municipal parks. **Trails and structures should be set back at least 5–10 metres beyond the limits of the catchment area.**

If trails are already established and cannot be redirected, pipes can be installed under the trail to improve the movement of water through the catchment area.

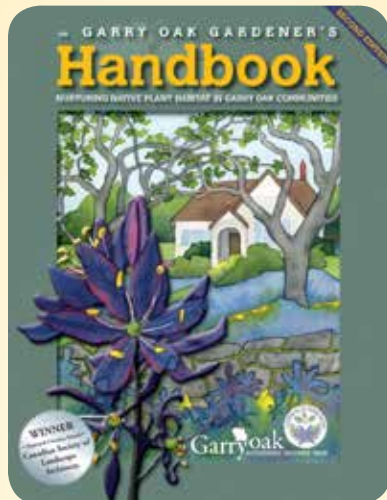
Keep Dogs on Leash

Keeping dogs on a leash and on trails can reduce soil erosion and prevent trampling off-trail. This is especially important in areas with thin soils over bedrock or with species at risk.

Limit Off-Road Vehicles

People operating off-road vehicles such as all-terrain vehicles (ATVs) and motorbikes sometimes create their own trails in rural GOEs. Motorized vehicles can cause significant damage in GOEs by disturbing soil, causing erosion, and spreading invasive plants. Vehicle traffic in remote areas can be very difficult to stop, even on private land.

Best Management Practices for Motorized Recreation on BC's Grasslands and an insert on how these guidelines apply to GOEs are available through the Mid-Island ATV club or directly from GOERT.



The *Garry Oak Gardener's Handbook: Nurturing Native Plant Habitat in Garry Oak Communities* is a comprehensive guide to using native species in landscaping and restoration to create low maintenance landscapes and provide habitat for birds and butterflies. Available online at: www.goert.ca/gardener



Native grasses for restoration projects can be difficult to find, but some progressive seed companies may carry them. In this photo, workers plant six different species of native grass seedlings at Somenos Garry Oak Preserve; grass plugs were custom grown by a nursery from seed collected locally. Photo: D. Polster

2.7 Plant & Maintain Native Species

Checklist

- ✓ Use the Right Native Plants
- ✓ Plant According to the Season
- ✓ Leave Leaves
- ✓ Care for Established Oaks
- ✓ Don't Cut Dead and Dying Garry Oaks
- ✓ Start New Oaks
- ✓ Attract Wildlife
- ✓ Protect Your Native Plants from Grazing

Why Use Native Plants?

Planting native plants can create cost-effective, low maintenance, and attractive landscaping. Native shrubs and perennials are well-adapted to the local climate and will do best without permanent irrigation systems. Similarly, as water supply becomes more critical in the years ahead, native plant species that are adapted to the summer drought will flourish while some horticultural varieties may not do as well. Using native species in landscaped areas can protect adjacent GOEs; regular gardening practices such as mowing, fertilizing, and watering can harm native plants and animals that are adapted to dry conditions and nutrient poor soils.

Using native plants is also important for restoring GOEs and for increasing the connections that allow plants and animals to move between these isolated remnants.

Developing a Garry Oak garden or restoration project can be a very fulfilling activity. However, developing a showy wildflower meadow may take many years and will never be a finished project. Many newly transplanted native plants spend the first few years putting their energy into root growth and don't appear to grow much above the ground. Many restoration projects "take off" after about three years. Considering and enjoying the process as well as the product is a good way of looking at gardens and restoration efforts in GOEs.

Plan ahead! Native plant and seed sources can be difficult to find at local nurseries, or may have only limited supplies of the plants you want;



Volunteers prepare native grass plugs for out-planting at a restoration site in Saanich. Species at risk populations have been flagged to ensure that they are not inadvertently trampled or damaged during the work party. Photo: C. Richman.

they may not have any available at the time of year you plan to plant. If you are growing your own native plants for the site, these may take several years to grow large enough to be out-planted.

Use the Right Native Plants

Choosing native plants that are suited to your site will ensure that the transplants persist, thereby saving both time and money. Using plants that have been grown from seeds or cuttings collected close to your site will generally be the best adapted to your site's conditions. Some native plants can tolerate a wide range of environmental conditions whereas others are more adapted to specialized habitats. Some native plants such as Yarrow (*Achillea millefolium*), Pearly Everlasting (*Anaphalis margaritacea*), and some native grasses grow very vigorously; in order to keep these species under control, it may be necessary to remove flower heads and thin the plants.


The Garry Oak Gardener's Handbook: Nurturing Native Plant Habitat in Garry Oak Communities provides recommended species for different types of gardens, gives detailed planting instructions, and a list of where you can buy native plants. The Invasive Species Council (ISC) of BC's *Grow Me Instead* brochure provides alternatives to "BC's Most Unwanted" horticultural plants.

In areas that currently have GOEs, especially with species at risk, it is important that planting native species does more good than harm. Make sure that new plants are grown in sterile soil so that new invasive plant seeds are not introduced. Be careful to plant in areas where there are no species at risk or other native plants that may be vulnerable to disturbance. Digging should be avoided in vernal pools, seeps, and their catchment areas since it can loosen soil and provide an outlet or diversion for rainwater that would otherwise have flowed to the pool or seep.

full sun to part shade	moderately moist to dry	well-drained
LIGHT	MOISTURE	DRAINAGE

native plants for your garden

Broad-leaved Shootingstar
Dodecatheon hendersonii



- Perennial up to 30 cm tall
- Full sun to part shade
- Pinkish-rose to deep magenta flowers touched with yellow at their base, blooming March–April
- Basal leaves 3–14 cm long, egg-shaped to triangular, lying flat on the ground
- Fruit a dry oval rust-coloured capsule
- An exceptionally bright addition to a border

By incorporating native plants into your landscaping, you are helping to re-stitch the fabric of our local endangered ecosystems

GOERT's native plant rack cards encourage gardeners to choose native plants for their landscaping.

Grow Your Own Plants

Growing your own native plants from seeds or cuttings can save money and ensure you have the plants you want when you need them. Propagation protocols for many common native plants have been developed by GOERT (www.goert.ca/propagation) and detailed instructions for growing and caring for seeds, cuttings, and growing plants are found in Chapter 10 of the *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration). Following GOERT's *Guidelines for the Collection & Use of Native Plants* (www.goert.ca/ethical_collection) for collecting seeds and cuttings will help ensure you do not harm the plants or populations you are collecting from. GOERT has also produced a table of average seed ripening times for approximately 120 common GOE species (www.goert.ca/plants), and a set of native plant rack cards (www.goert.ca/suppliers).



BC Blue-listed *Propertius Duskywing* (*Erynnis propertius*) on a *Two-coloured Lupine* (*Lupinus bicolor* ssp. *bicolor*), both GOE species.
Photo: D. Polster

Guidelines for Mulching

GOERT's *Guidelines for Mulching in Garry Oak & Associated Eco-systems* (www.goert.ca/documents/GOERT-Mulch-BMPs.pdf) provides guidelines on types of mulch and how they should be used in GOEs.

Growing your own native plants can also ensure that the plants are available for your project, since many nurseries have limited supplies. For big projects, it is best to order plants from the grower 2–3 years before anticipated delivery.

Plan for Year-round Interest

Many of our showiest native species bloom in the spring. In order for native plant landscaping to be attractive year-round, careful planning is required. Planting summer- and fall-blooming species such as native asters (*Aster* spp.) and Pearly Everlasting (*Anaphalis margaritacea*), as well as evergreen groundcovers such as Coastal Strawberry (*Fragaria chiloensis*) and Kinnikinnick (*Arctostaphylos uva-ursi*), helps provide year-round interest. Planning for structural diversity with shrubs and trees as well as physical diversity with rocks and woody debris can help create an aesthetically pleasing landscape.

Plant According to the Season

The best time for planting is in the late fall, after the onset of rains, or in winter when soils are moist and plants are dormant, although care should be taken to minimize disturbance of native winter annuals such as Sea Blush (*Plectritis congesta*). Very early spring planting will work as well; however, the root systems may not develop as well as winter plantings. The plants may require watering during summer droughts for the first one to two years until they are established.

Leave Leaves

Mulching new plants helps keep the soil moist, prevents weeds from growing, and slowly releases nutrients into the soil. A thick layer of oak leaves provides the best mulch in GOEs.

Insect species such as the Propertius Duskywing (*Erynnis propertius*) overwinter in rolled leaves of Garry Oak, so maintaining oak leaves as mulch for garden areas may also create habitat for these butterflies.

Thick mulch layers should not be added to established trees and shrubs because it can harm shallow root systems. Mulch should not be used within vernal pools and seeps or their catchment areas because it alters the surface of the soil. If mulch is applied within the pools or seeps themselves, it is likely to smother native vegetation or bury important seed germination sites. Mulch that is applied within the catchment area may block or divert the rainwater that the pool or seep relies upon.

New Source for Oak Seedlings

The Garry Oak Meadow Preservation Society (GOMPS) (www.garryoak.info) is growing Garry Oak seedlings to help meet demand and to produce the trees at an affordable price. The acorn collection site for each seedling has been recorded so that it can be matched to the best planting site. Oaks will be planted out once they are six years old and of sufficient size to withstand hardships found in the urban forest. Local governments, major landowners, and the general public are encouraged to purchase and plant the the seedlings.



The flat tops of Yarrow (Achillea millefolium), an easy species to grow in Garry Oak gardens, make excellent landing pads for large butterflies such as swallowtails. Photo: D. Polster

Care for Established Oaks

An established Garry Oak tree is a beautiful asset to any property. Garry Oak trees provide homes for cavity nesting birds, increase the diversity of native insect populations, and produce high calorie acorns that sustain Steller's Jays (*Cyanocitta stelleri*) and other wildlife. Caring for established oaks will keep them healthy for generations to come.

Caring for Garry Oak Trees

- ✓ Protect your tree from soil compaction in its root zone, as well as from stress or damage from parked cars, swimming pools or construction projects.
- ✓ Don't pave under the tree. Tree roots extend out at least as far as the branches of the tree (and further) so the ground beneath the canopy should be protected from disturbance.
- ✓ The older the tree, the more important its shallow roots are and the less able it is to adapt to change.
- ✓ Avoid sudden changes such as over-watering.
- ✓ Don't create stress by attaching things to the tree such as signs or clothes lines.
- ✓ If you have a stand of oaks on your property, you may need to find out about techniques to maintain the trees' health, such as thinning and reduction pruning to thin the canopy. Consult a certified arborist for advice.
- ✓ Protect your trees from invasive vines such as English ivy that can smother and kill the tree.

— from *Planting & Caring for Garry Oaks*:

www.goert.ca/gardeners_restoration/garryoak_trees.php

Don't Cut Dead & Dying Garry Oaks

Even dead or dying Garry Oak trees are an important part of GOEs and should be kept if they are not a safety hazard. Cavity nesting birds, such as Northern Flickers (*Colaptes auratus*), nest in holes in dead trees and will also create holes while searching for insects that can be used by other cavity nesting birds. Dead or dying oak trees also provide important perching sites for a range of bird species.

Woody debris left on the ground is important habitat for amphibians and reptiles and can provide an important structural element to a native plant garden.



Endangered Deltoid Balsamroot is protected from grazing by deer and rabbits by wire fencing at Mill Hill Regional Park. Photo: C. Maslovat

Start New Oaks

Some areas, especially in the city, have large established oaks with no smaller trees nearby. Eventually, these mature trees will die and there will be no new Garry Oaks to take their place. Garry Oaks are also being cut down for development faster than they are being replaced.

Oak seedlings that sprout up naturally in lawns will grow if protected from lawn mowers and animals that eat them such as deer and rabbits. You can use a wire mesh cage to protect oak seedlings for a few years until they are tall enough to escape deer browse and accidental mowing.

Planting acorns or small oak seedlings is easy but they take a long time to grow; patience is required for these young oaks to grow into our next generation's trees. More information on planting and caring for oak seedlings can be found on the GOERT website (www.goert.ca/gardeners_restoration/garryoak_trees.php).

Attract Wildlife

Our native birds and butterflies have evolved with GOEs, so many of our wildlife species are attracted to these ecosystems. Landscaping with Garry Oak plants is an effective way of attracting a wide range of wildlife. For example, the bright flowers of Red-flowering Currant (*Ribes sanguineum*) feed hummingbirds in our area in the early spring. In the winter, the seeds found in Oceanspray (*Holodiscus discolor*) and the fruit of Nootka Rose (*Rosa nutkana*) provide food for the hardy birds that remain in Garry Oak areas in the winter.

Avoiding pesticides encourages insect-eating birds to make your land their home as well. Keeping messy brush piles for birds, rotting logs and wood for amphibians and reptiles, and standing snags for insects and birds are all ways to encourage other creatures to be part of your land. More opportunities for attracting wildlife can be found in *The Garry Oak Gardener's Handbook: Nurturing Native Plant Habitat in Garry Oak Communities* (www.goert.ca/gardeners).

Protect Your Native Plants from Grazing

In most areas, native plantings will probably need to be protected from hyper-abundant deer populations. Some GOEs also have feral sheep or goats that will eat native plants.

An 8-foot fence that is snug to the ground will keep most grazers out. A self-closing gate with signs explaining the need for fencing can be used in public areas. Make sure there are no species at risk in the area that will be damaged by the installation of the fence.



GOERT staff member stands next to a browsed conifer on Sidney Island. Photo: D. Polster

Netting or fencing individual plants, scare tactics such as motion detector lights or aluminum pie pans that move in the wind, and odour and taste repellents may also protect native plantings from over-grazing. Some species such as Swordfern (*Polystichum munitum*) and Dull Oregon-grape (*Mahonia nervosa*) are resistant to browsing and can be planted where deer, sheep, or goats are a problem.

Invasive Eastern Cottontail Rabbits (*Sylvilagus floridanus*) and escaped domestic European Rabbits (*Oryctolagus cuniculus*) can also be very destructive in GOEs. Small mesh fencing that has been buried 6–12” in the ground may be the most effective solution for keeping out rabbits.

Dealing with non-native Black Slugs (*Arion rufus*) can be very difficult. Creating habitat for garter snakes (*Thamnophis* spp.) and other natural predators might prove effective at limiting slugs. Creating rock piles on south facing slopes can provide excellent places for snakes to warm themselves on cold days and escape from predators.

2.8 Don't Add Water, Fertilizer, or Pesticides

Checklist

- ✓ Don't Add Water
- ✓ Don't Add Fertilizer
- ✓ Avoid Pesticides

Don't Add Water

GOEs are adapted to the drought-prone climate of southeastern Vancouver Island and the southern Gulf Islands. Plants in GOEs grow when water is plentiful and become dormant when water is scarce. There is no need to water GOE species except newly installed plants during the first growing season. Watering natural areas will encourage the growth of non-native plants and over-watering will weaken the root structure of oak trees and can cause rot in dormant bulbs and rhizomes.

Don't Add Fertilizer

There is no need for fertilizer in GOEs. The natural fertility of the soils suits the plants well and too much fertility encourages invasive species. In newly planted areas, applying Garry Oak leaf mulch provides a slow release of nutrients and helps reduce the growth of weeds (more details are provided in *Section 2.7 Plant & Maintain Native Species*, above, and also in GOERT's *Guidelines for Mulching in Garry Oak & Associated Ecosystems*, available at www.goert.ca/documents/GOERT-Mulch-BMPs.pdf).



Giant Knotweed (Fallopia japonica) can be accidentally moved with soil into development sites. This plant spreads rapidly and is very difficult to control once established. Photo: D. Polster

Choose Plants Carefully

Before Uplands Park in Oak Bay was protected, Norway Maple (*Acer plantanoides*) and European Ash (*Fraxinus excelsior*) were planted in the early 19th century as boulevard trees. Both of these trees are now spreading throughout the park and have become the target of invasive species removal work.



Municipality of Oak Bay staff removing European Ash from Uplands Park. Photo: C. Maslovat

No form of fertilizer should be added to vernal pools/seeps and their catchment areas because the uniqueness of these habitats is due mainly to their very harsh environmental conditions. Anything that alters these conditions will favour different plants, often non-native plants that will displace the rare native plants.

In general, maintaining low soil fertility favors native plants over non-native weeds. Use of chemical fertilizers or nitrogen-based fertilizers should be avoided. Research on prairie restoration has shown that adding soil amendments rich in nitrogen favors non-native annual weeds that prevent the establishment of native forbs and grasses.

— from *Prairie Landowner Guide for Western Washington*, www.southsoundprairies.org/prairie-oak-guides

Avoid Pesticides

If used improperly, pesticides can have unintended negative impacts. Insecticides can kill beneficial as well as unwanted insects and decrease the food supply for insect-eating songbirds and reptiles, or poison them. Herbicides can not only kill invasive plants, but also kill native plants; even small spills can be extremely damaging. Many municipalities now have bylaws restricting pesticide use, and permits are required on public, government, and institutional lands.

In some cases, the careful and appropriate application of an herbicide to control invasive plants can prevent the soil disturbance associated with digging out large root systems. However, the benefits of herbicides should always be carefully weighed against the potential harm. Herbicides should only be applied under expert guidance, by workers with the proper training, and with the necessary permits where applicable.

2.9 Prevent the Introduction of Invasive Species

Checklist

- ✓ Use Clean Gravel, Fill, and Soil
- ✓ Re-plant Disturbed Areas Promptly
- ✓ Use Clean Machines
- ✓ Use Native Species for Re-planting



The invasive plant Spurge Laurel (*Daphne laureola*) contains toxic oils that can harm the skin, eyes, and lungs. Photo: C. Maslovat

The best way to manage invasive species is to prevent their introduction into new sites. Developments near GOEs have a high potential to spread invasive plants into these rare ecosystems, and these implications should be considered during the planning process. When removing invasive species from established sites, it is equally important to re-plant the disturbed area with native species to prevent re-invasion.

Use Clean Gravel, Fill & Soil

One of the most common ways that invasive non-native species arrive at a site is through seeds present in gravel, fill, and topsoil.

Using uncontaminated gravel during road construction can be a very important means of preventing species such as Scotch Broom from moving in. As Scotch Broom seeds can remain in the soil seed bank for as long as 80 years, a gravel pit infested with Scotch Broom plants will be a vector for spreading this invasive shrub wherever the gravel is placed. Any fill or topsoil brought into a site should also be free from weed contamination. Many soil vendors' sites are infested with Poison-hemlock (*Conium maculatum*), thistle (*Cirsium* spp.), various Brassicas, and even knotweeds.

There is currently no certification to ensure that gravel and soil is free from live weed seeds but the Coastal Invasive Plant Committee (www.coastalinvasiveplants.com) is trying to raise awareness of this issue.

Re-Plant Disturbed Areas Promptly

Prompt re-planting of disturbed areas is important for preventing the establishment and spread of invasive plants. Most non-native invasive plants are adapted to colonizing bare ground and easily out-compete native species. Establishing a cover of native plants promptly over bare ground will help prevent invasive plants from becoming established.

Use Clean Machines

Weed seeds and fragments can be part of the mud stuck to the tracks and tires of equipment. Equipment operators should be required to clean their machines before coming on site to prevent the spread of invasive plants.

Use Native Species for Re-Planting

Seeding with non-native agronomic grass species on road shoulders and other disturbed sites can move these species into new areas. Species such as Orchard Grass (*Dactylis glomerata*) that are common in commercially available seed mixes are becoming some of the most difficult invasive non-native species to address in GOEs. Avoiding the use of invasive



English Ivy (*Hedera helix*) can grow up the trunks of Garry Oak trees, eventually smothering them.
Photo: C. Masson

non-native species that are known to “jump the fence” when landscaping near GOEs will protect the ecosystem. Non-native invasive plants such as English Ivy (*Hedera* spp.), English Holly (*Ilex aquifolium*), and Rose Campion (*Lychnis coronaria*) are all common garden plants that have invaded GOEs and compete with native plant species.

Native GOE grasses are becoming commercially available from some seed dealers. A complete list of suppliers of native plants and seed can be found in the *Garry Oak Gardener’s Handbook* (www.goert.ca/gardener) and the most up-to-date list is on GOERT’s website. More information on planting native plants can be found in the *Section 2.7 Plant & Maintain Native Species*. The *Garry Oak Gardener’s Handbook* and *Restoring British Columbia’s Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration), as well as GOERT staff and local experts, can help you choose appropriate plants for your site.

2.10 Remove Invasive Plants

Checklist

- ✓ Decide Timing of Invasive Species Removal
- ✓ Detect Invasive Plants Early
- ✓ Follow Best Management Practices
- ✓ Remove Cut Material
- ✓ Dispose of Material Off-site
- ✓ Special Considerations for Vernal Pools and Seeps
- ✓ Support Volunteers and Stewardship Groups

Decide Timing of Invasive Species Removal

The timing of invasive plant removal will depend on which invasive plants are to be targeted and which native species are present. **If you have species at risk on your land, there may be specific time windows when any work on the site should be avoided.**

If there are few native species in the area, it is often best to remove invasive plants when they are devoting energy into flowering and are easy to find. However, this timing could result in trampling native wildflowers so a balance must be reached between removing non-native species and protecting native ones. If there are not very many invasive species and they are widely scattered, it may be most efficient to remove them when they are flowering if trampling can be minimized. In areas where there are species at risk or a lot of native plants, **it is better to wait to remove invasives until most wildflowers are dormant from late August until the rains begin in mid-October.**



A relatively new invasive species to GOEs, Carpet Burweed (*Soliva sessilis*), shown on the left, is a tiny annual plant that is very difficult to distinguish from other small annual plants including Pineapple Weed (*Matricaria discoidea*), shown on the right. Carpet Burweed has seeds with sharp spines that attach to peoples' shoes and animals' feet and are easily carried along pathways. Early detection is critical for preventing the spread of this plant. Photo: M. Lidkea

Use of Grass-specific Herbicides?

Grass-specific herbicides containing the active ingredient sethoxydim (e.g., POAST®) have been used effectively in conjunction with mowing to control invasive non-native grasses and increase wildflowers in GOEs in the United States. These herbicides will also kill native broad-leaved grasses. Also, their impacts on butterflies and other animal species are not fully understood. Herbicide application should be conducted only with extreme caution, under expert guidance, and with proper applicators' certification. Contact GOERT for more information on whether or not herbicides are appropriate at your site. Before using herbicides, contact your local municipality to see if a pesticide permit is required or if a pesticide bylaw is in place.

Most GOEs are extremely sensitive to erosion and compaction from vehicles when the soils are wet. **Vehicle use in GOEs should be avoided from the end of October until the end of June** and after any heavy rains in the summer and fall.

Plants in vernal pools and seeps are particularly vulnerable to all activities during the plant's growing season from the fall through to at least the early summer. During this time, the plants are sensitive and the soils are soft, and all disturbances should be avoided. Any activities requiring access to pools and seeps should be conducted during mid- to late summer, approximately July to September.

Table 2. Timing for invasive species removal activities*

Activity	Best time
Invasive species removal in all areas except vernal pools/seeps	Late August-early October (in most cases, since most native species are dormant)
Using vehicles to access to GOEs	July- early October (do not drive after heavy rains during this time)
All work in or around vernal pools, seeps, and their catchment areas	July-September

Detect Invasive Plants Early

Invasive plants are easiest to control when they have just started to invade an area. However, it can be difficult to find a new invasion when there aren't very many individuals of the species or very many established populations. Surveys for new invasive plants can be time consuming and expensive but catching a new invasive plant species before it spreads can save time and money in the long run.

Follow Best Management Practices

There are a number of methods that can be used for removing invasive plants. These include hand-pulling, cutting with loppers, sheet mulching, solarization, cultivation, burning, and mowing. Each of these techniques has benefits and disadvantages and careful consideration of all the factors is important in deciding which methods to use. More information on different types of equipment that can be used for cutting invasive plants can be found in [Section 2.10 Manage Meadows Through Mowing](#).

GOERT can provide assistance to land managers wishing to undertake restoration and has developed separate *Best Management Practices* for treatment of Himalayan Blackberry (*Rubus armeniacus*), English Ivy (*Hedera helix*), Scotch Broom (*Cytisus scoparius*), Spurge Laurel

* These are general timing windows and may not be appropriate if there are species at risk on your site.



Piles of invasive plants at Beacon Hill Park will be collected and disposed of properly. Photo: D. Polster

(*Daphne laureola*), and Orchard Grass (*Dactylis glomerata*), including details on timing and treatment methods, and important considerations for disposal and worker health and safety. Additional information for other invasive species is available in the field manual on *Invasive Species in Garry Oak & Associated Ecosystems in British Columbia* (www.goert.ca/invasive). Fact sheets on the control of some invasive plants are also available through the Coastal Invasive Plant Committee (www.coastalinvasiveplants.com).

Specific removal methods based on the ecology of the invasive species and the individual site where the treatment is occurring are most effective. Be aware that species such as Spurge Laurel contain oils that can harm the skin, eyes, and lungs and may require gloves, skin protection, and special considerations during transportation.

Remove Cut Material

Simply removing the biomass created by invasive plant removal from inaccessible areas can be a problem. Cut plant material should not be left on site nor dumped on roadsides or natural areas where it can potentially re-infest the area. It is important to plan your access and removal routes to avoid causing damage to the site or native species.

Driving vehicles into GOEs can compact soil and cause more soil disturbance than removing the invasives. Mill Hill Regional Park is so difficult to access for invasive plant removal that helicopters have been used to haul material to a disposal area.

Care should be taken when carrying invasive plant material to prevent the spread of seeds and small fragments of species such as Ivy (*Hedera* spp.) or Himalayan Blackberry (*Rubus armeniacus*) which can re-grow into new plants. Placing the material on tarps or plant stretchers can help keep all the cut pieces together.

Dispose of Material Off-Site

Disposal of the biomass that is generated with a major invasive plant removal program can be a major task. It is important to determine and plan for the appropriate disposal methods *before* large quantities of invasive plant biomass are generated.

Biomass from invasive plants is being used in co-generation facilities. Similarly, composting can be an effective method for disposal, although care should be taken to avoid spreading invasive species such as English Ivy (*Hedera helix*) and Japanese Knotweed (*Fallopia japonica*) that can sprout and grow from small fragments. Also, the seeds of many invasive plant species can survive composting.



A carpet knife can be used very effectively to cut out individual plants of invasive bunchgrasses such as Orchard Grass (*Dactylis glomerata*).

Photo: D. Polster



Before removal of invasive Scotch Broom from a vernal seep. Photo: D. Polster



After removal of invasive Scotch Broom from a vernal seep. Photo: D. Polster

In some cases and with some species (e.g., Scotch Broom and Gorse) burning can be an effective disposal method, although open fires add particulate matter and carbon dioxide to the air. All appropriate precautions should be taken so the fire does not spread. Burning locations should be selected to minimize damage to the ecosystem; do not burn on rock outcrops or within GOEs. Gravel parking lots, roadways, and other such areas provide good locations for burning. Burning is not an appropriate method for some invasive species, such as Spurge Laurel, which emits toxic fumes. Before deciding to burn it is important to check local bylaws to determine if and when burning is allowed.

Special Considerations for Vernal Pools & Seeps

Invasive Shrubs. The cycle of flooding and drying within vernal pools and seeps creates conditions that are usually too stressful for non-native shrubs to tolerate. However, non-native shrubs such as Scotch Broom (*Cytisus scoparius*), Himalayan Blackberry (*Rubus armeniacus*), and English Hawthorn (*Crataegus monogyna*) can establish next to vernal pools and seeps and in their catchment areas. Whenever possible, these shrubs should be removed without walking through the vernal pool or seep. If this cannot be avoided, conduct removal activities late in summer, after native plants have set seed. Even then, great care must be taken to avoid damaging or removing the thin layer of soil, especially in seeps.

Invasive Grasses. Non-native invasive grasses are a serious threat to vernal pools. Several species, including bentgrasses (*Agrostis* species), Velvetgrass (*Holcus lanatus*), and Orchard Grass (*Dactylis glomerata*) can establish in vernal pools and produce large quantities of litter. This litter smothers the bare soil that rare annual plants require for germination and establishment. In addition, the litter slowly fills vernal pools, disrupting the natural cycle of flooding and drought. In the early stages of grass invasion, it may be possible to cut out individual grasses with a carpet knife before the accumulation of litter becomes a problem.

If invasive grasses are well-established and threaten vernal pools and seeps, more intensive measures may be required. At Devonian Regional Park, vernal pools that had filled up with grass litter were restored by breaking up the litter with a weed eater and raking the material out of the pools. After the treatment, rare plants reappeared that had not been seen in the pools for several years. Little research has been done on these kinds of intensive restoration actions. If your vernal pool appears to require intensive management, get input from GOERT before activities are conducted.

Invasive Herbaceous Plants. Broad-leaved non-native herbaceous weeds, including Smooth Cat's-ear (*Hypochaeris glabra*), Hairy Hawkbit (*Leontodon saxatilis*), and Subterranean Clover (*Trifolium subterraneum*) are sometimes abundant in vernal pools and seeps. At present, no methods have been developed for controlling these weeds. If herbaceous weeds



Girl Guide volunteers, such as this Spark, have helped remove invasive species in Uplands Park since 1992. Photo: C. Maslovat

are a serious problem at your site, work with GOERT to experiment with treatment options for these species.

Invasive Native Plants. Native invasive plants harm vernal pools and seeps by blocking light, changing hydrology, and increasing woody debris. Any woody plant that is shading or will eventually shade the vernal pool should be removed in August or September. All branches and other debris that fall into vernal pools and seeps should be removed during the dry season (July–September).

Support Volunteers & Stewardship Groups

There are many opportunities for invasive plant removal in public parks and institutional facilities. Working as a volunteer connects people to their local green space and gets work done with tight budgets. More information on how different sectors can work with stewardship groups in restoration is found in [Section 3.4 Stewardship Groups](#).

2.11 Manage Meadows through Mowing

Checklist

- ✓ Determine Benefits and Risks of Mowing
- ✓ Mow to Control Invasive Species
- ✓ Mow for Diversity
- ✓ Add Seeds or Plants
- ✓ Inform Your Neighbours
- ✓ Minimize Soil Disturbance and Compaction
- ✓ Use the Right Equipment
- ✓ Always Clean Equipment
- ✓ Mow at the Right Time

Most people think of mowing as cutting grass; however, it can also mean mowing larger vegetation such as woody shrubs and small trees. Especially in areas where fires are not allowed or where burning is too high a risk, mowing can be a useful tool for managing and restoring GOEs. **For more details about mowing as a restoration tool in GOEs, refer to GOERT’s *Best Management Practices for Mowing in Garry Oak & Associated Ecosystems* (forthcoming, early 2013).**

Determine Benefits & Risks of Mowing

Mowing removes standing vegetation and allows more sunlight to reach the soil and low-growing plants. Depending on the equipment

Should You Remove the Cut Material?

Removing the cut leaves, branches, and stems from the site is often necessary for effective control of invasive species. Removing the litter prevents seeds or fragments from re-growing in the cut material, prevents smothering of remaining plants, and reduces the fuel load. Removing the cut material may also limit the addition of soil nutrients which can favour exotic species.

However, on degraded sites with few native species and hard-packed soil, such as parks that receive heavy foot traffic, it may be necessary as part of the restoration process to return organic matter to the soil. In these situations, it is preferable to mulch the mowed material onto the site, provided there are no invasive seeds or fragments that can sprout. When applied in the fall through late winter, a mulch layer can kill invasive grasses and prevent invasive seed germination.



July 2010 experimental restoration burning at Cowichan Garry Oak Preserve.
Photo: T. Munson, City of Victoria Parks

used, mowing can also reduce the layer of litter that accumulates on the ground. In GOEs, mowing has been used to control invasive species, control native shrubs, increase the number of native wildflowers, restore a disturbance regime for a particular plant species, and restore habitat. Although mowing is a useful management tool, it can do more harm than good depending on which plant species are present at the site, the time of year mowing is done, site conditions, whether or not biomass is removed, and the equipment used.

Mowing as an Alternative to Fire

GOEs are historically disturbance-dependent. For many centuries before Europeans arrived, First Nations people of this area set fires throughout the range of Garry Oak ecosystems to burn off trees and shrubs, to promote the growth of edible root crops such as camas (*Camassia quamash* and *Camassia leichtlinii*) and Bracken Fern (*Pteridium aquilinum*), and to create openings for hunting ungulates such as deer and Roosevelt Elk (*Cervus canadensis roosevelti*). European settlers eventually halted this burning by the First Nations people. The suppression of both human- and naturally-induced low-intensity periodic fires over the last 150 years has led to significant changes within these ecosystems. Many Garry Oak woodland ecosystems depend on fire to maintain an open canopy and understorey, and remove thatch accumulation. Fire suppression also changes hydrological and nutrient regimes, which could negatively affect the species within these ecosystems.

Along with habitat destruction and invasive species, fire suppression is considered a primary threat to the persistence of GOEs. Burning as a management tool is increasingly difficult as human populations grow, wildland/urban interface issues mount, and air pollution issues increase. In addition, many invasive species grow quickly in the disturbed soils created by fire. Although there have been some small-scale burns for restoration, intentional fires may not be possible in most sites.

Mowing is often adopted as a surrogate where prescribed burning is not allowed and/or where prescribed burning is considered too high-risk. Mowing can mimic some, but not all, of the ecological functions of fire in the landscape. Like fire, mowing removes biomass and, in some cases, litter, opening areas to increased sunlight. However, mowing does not reproduce all of the effects of periodic burning: it does not remove sub-surface matter or affect near-surface perennial buds, and does not affect the established seed bank as burning can. Moreover, in many restoration areas, bagging mowers are not practical nor is hand-bagging and removing debris; cut material is mulched onto the site. Therefore, although mowing may be the only alternative for reducing fuel loads in urban areas, it should be considered, at best, a partial replacement for pre-contact burning regimes.

Mow to Control Invasive Species



Mowing to control shrubs and grasses at Somenos Garry Oak Protected Area. Photo: I. Banman

Different native and non-native invasive plants respond differently to mowing. Before deciding whether or not to mow as part of your invasive plant control, find out as much information as you can about what species you have on your site (both native and non-native) and how they might respond. Resources for where to find more information are given in *Section 2.2 Plan to Manage & Restore GOEs* and *Section 2.10 Remove Invasive Plants*.

Although mowing will control some invasive plant species, mowing will also encourage the growth of other invasive plants. For example, invasive perennial grasses that spread by rhizomes*, especially lawn grasses, thrive following mowing. For other species, mowing may be effective at controlling vertical growth, but it cannot stop horizontal growth below the mower height or below ground. For example, when mowed repeatedly, Scotch Broom is particularly good at growing and even reproducing at less than 10 cm in height.

Which plant species are present (both native and exotic), the size or age of the exotic species, the limitations of the site (e.g., terrain, hydrology, soil depth, access restrictions), and equipment available will affect your options for mowing (see Table 3). GOERT's *Best Management Practices* for individual species contain more details of techniques and equipment to use in different situations (www.goert.ca/invasive).

* Rhizomes are underground stems that can spread and develop into new plants.

Table 3. Types of Invasive Plants and Effectiveness of Mowing †

Type of Invasive Plant	Example	Response to Mowing
Shrubs and trees that resprout from cut stems after mowing	<ul style="list-style-type: none"> ▪ Gorse (<i>Ulex europaeus</i>) ▪ European Hawthorn (<i>Crateagus monogyna</i>) 	Repeated mowing may help control re-sprouting shrubs and trees but will not eliminate them. Cut stem treatment with herbicides is required to kill most species with only one mowing. Mowing limits spread over large areas with few native species present. Cut material should be removed.
Forbs	<ul style="list-style-type: none"> ▪ Hairy Cat's-ear (<i>Hypochaeris radicata</i>) 	Mixed results. Mowing may spread some invasive forbs.
Annual grasses	<ul style="list-style-type: none"> ▪ Hedgehog Dogtail (<i>Cynosurus echinatus</i>) 	Can be useful if mowing can be done before seed set. There may be a very narrow window for control if there are native GOE species present. Litter should be removed.
Perennial bunch grasses	<ul style="list-style-type: none"> ▪ Orchard Grass (<i>Dactylis glomerata</i>) 	Mowing can be useful to prevent seeding if done before seed set. Mowing when the flower buds are swelling is most effective although this overlaps with native GOE species seed set. Mowing once will not get rid of plants. Mowing 4-5 times through the season may be effective.
Perennial rhizomatous grasses	<ul style="list-style-type: none"> ▪ Kentucky Bluegrass (<i>Poa pratensis</i>) 	Ineffective. Increases rhizome spread.

† Species-specific responses to mowing are included in GOERT's Best Practices for controlling invasive species in GOEs (www.goert.ca/invasive)

Mow for Diversity

Mowing is often used in GOE restoration projects to increase the abundance of native plant species at a site. Mowing and removing the cut plant material have been found to decrease the proportion of grasses and increase the number of both native and non-native wildflowers (forbs*) by increasing the amount of sunlight reaching the ground level. The site conditions (e.g., deep vs. shallow soil), timing of mowing, and plant species present have a huge influence on how the species at the site will change with mowing. As with all restoration activities, it is important to record the conditions before and after treatment in order to gauge the effectiveness of mowing. Refer to [Section 2.12 Monitoring](#) for more information.

Very few studies have been done on the impact of mowing on other wildlife such as butterflies and songbirds. **Leaving large unmown areas containing native species** that alternate with mown areas will help provide habitat for the widest range of animals and insects.

Add Seeds or Plants

Planting native seeds or plants after mowing is more effective than mowing alone for increasing the abundance of native species. For many native plant species, the seeds are not naturally spread very far from the parent plant, so planting seeds after mowing helps disperse them to new sites. After an area has been mown, there is less competition and it is easier for the seeds and plants to establish. Seeds or plants should be collected from the same site or nearby to make sure that they are genetically adapted to your site. Refer to [Section 2.7 Plant & Maintain Native Plants](#) for more information.

Inform Your Neighbours

Unmown grass can be an eyesore and source of anxiety to some people. If your neighbours understand that long grasses and weeds are going to be mowed in the future, and that the land is not being left unmanaged, they may be more patient. A simple sign can inform passers-by of what to expect, and decrease their concerns. It is also important to discuss your plans with your municipality in case there are maintenance bylaws for which you require an exemption if you're not mowing.

Minimize Soil Disturbance & Compaction

When mowing, it is important to prevent compacting soils and creating bare soil where new weed species can establish. It can be difficult to

* Forbs are defined as herbaceous (i.e., not woody) flowering plant that is not a grass or grass-like (i.e., a sedge or rush)

Table 4. Examples of equipment used in GOE restoration projects.

Tool	Description	Considerations	Advantages	Example of Use
Hand tools				
<i>Hand saw</i>	A saw with a curved, serrated blade, for trimming shrubs and branches.	<ul style="list-style-type: none"> Best for small stems (<15 cm diameter) Labour intensive 	<ul style="list-style-type: none"> Can be used by volunteers Inexpensive Highly selective 	Used by stewardship groups to cut large Scotch Broom
<i>Hedge shears</i>	A type of scissors with long, flat blades and relatively short handles; can have serrated blade for difficult jobs.	<ul style="list-style-type: none"> Not for use on larger woody branches Labour intensive 	<ul style="list-style-type: none"> Can be used under dense shrubs Does not disturb duff layer 	Used to cut stems of Spurge Laurel seedlings in medium to large patches (produces less toxic vapour than a weed-eater)
<i>Grass whip</i>	Scythe-like hand tool with a double-edged, serrated blade.	<ul style="list-style-type: none"> Labour intensive 	<ul style="list-style-type: none"> Best for cutting grass or small seedlings 	Can be used to cut small Spurge Laurel seedlings
<i>Loppers</i>	A type of scissors used for pruning twigs and small branches.	<ul style="list-style-type: none"> Best for small stems (<5 cm diameter) Labour intensive 	<ul style="list-style-type: none"> Can be used by volunteers Inexpensive Highly selective 	Used to cut moderate sized Scotch Broom
Power tools				
<i>Hedge trimmer</i>	A small hand-held mower with long, thin, toothed power cutting blade.	<ul style="list-style-type: none"> Not for use on larger woody branches 	<ul style="list-style-type: none"> Limited use in GOEs 	
<i>String trimmer (aka weed whip, whipper snipper)</i>	A powered hand-held device that uses a flexible monofilament line for cutting. Some string trimmers have accessories that convert them into other mowing tools such as brush saws, pole saws, weed whackers or hedge trimmers.	<ul style="list-style-type: none"> Cuts grass or small shrubs Does not remove biomass Not efficient for larger areas 	<ul style="list-style-type: none"> Light-weight, easy to operate More efficient than hand tools Can be used more selectively than large mowers 	Can be used to cut mostly non-woody vegetation in small areas.
<i>Weed whacker (aka Weed Eater®)</i>	A powered hand-held device with metal or plastic blades at the end of a long shaft.	<ul style="list-style-type: none"> Cuts grass or small shrubs Does not remove biomass Not efficient for larger areas 	<ul style="list-style-type: none"> Light-weight, easy to operate More efficient than hand tools Can be used more selectively than large mowers 	Can be used to cut mostly non-woody vegetation in small areas
<i>Brush cutter</i>	A hand-held device with a heavy-duty brush cutting blade at the end of a long shaft. The term brush cutter may also refer to a heavy duty mower that mounts on a grader or excavator that is used to cut and mulch shrubs.	<ul style="list-style-type: none"> Less selective than hand tools 	<ul style="list-style-type: none"> Can be used on sites with rough terrain or obstacles Can remove cut material from the site Highly efficient 	Can be used to cut woody and non-woody vegetation over a large area
<i>Pole saw</i>	A chainsaw mounted at the end of an extension pole.	<ul style="list-style-type: none"> Operators must have safety training 	<ul style="list-style-type: none"> Effective for removing high branches 	Can be used to trim branches from Douglas-fir trees to increase light
<i>Lawn Mower</i>	A machine that uses a revolving blade or blades to cut non-woody vegetation at an even length (includes standard push mower, ride-on mower, or tractor mower attachment).	<ul style="list-style-type: none"> Not selective Ground must be relatively level with no obstacles 	<ul style="list-style-type: none"> Highly efficient 	Can be used to cut non-woody vegetation from large areas
<i>Mulching mower</i>	Mower designed to leave finely-shredded clippings behind that do not clump.	<ul style="list-style-type: none"> Not selective Ground must be relatively level with no obstacles 	<ul style="list-style-type: none"> Highly efficient 	Can be used to cut non-woody vegetation from large areas that require mulching
<i>Flail (aka flail mower)</i>	Rows of blades or knives (flails) attached on a rotating drum, attached to a tractor, HydroAX, or excavator. Some flail mowers can cut small trees.	<ul style="list-style-type: none"> Not selective Ground must be relatively level with few or no obstacles Does not collect cut material Heavy equipment will compact soil if wet 	<ul style="list-style-type: none"> Highly efficient Flails will bounce off of objects instead of throwing them Can cut vegetation at different heights 	Can be used to cut woody and non-woody vegetation from large areas that require mulching

Case Study: When to Mow?

At Beacon Hill Park, the natural areas are usually mown at the end of summer. The Natural Areas crew checks for the release of seeds from native plants and, as it is complete in each area, mowing begins. Special places such as sites where insects are known to use plants for egg laying (e.g., Anise Swallowtails laying on Barestem Desert-parsley) are left unmown. In areas with lots of very late-blooming plants such as Douglas' Aster (*Symphotrichum subspicatum*) or Gairdner's Yampah (*Perideridia gairdneri*), mowing may not occur if seed set doesn't happen before the fall rains begin and the soils become too sensitive.



Barestem Desert-parsley (*Lomatium nudicaule*) is a host plant for *Anise Swallowtail* larvae.

prevent disturbance in uneven terrain with many rock outcrops. Minimizing disturbance and compaction should be a primary consideration in deciding the type of equipment to use for mowing.

Use the Right Equipment

The type of mowing equipment that should be used will depend on the terrain, the type of vegetation that will be cut, timing of mowing, and the equipment available. Each type of equipment has its advantages and disadvantages as detailed in the table below. Always check with the land owner before using powered tools at a site. Some municipalities limit the use of powered or motorized equipment on public land to staff or authorized contractors.

Always Clean Equipment

Equipment and gear sanitation is a very important step in limiting the spread of invasive plants to other sites. **Before and after mowing, all clothing, boots, and equipment should be cleaned of seeds and plant fragments.** Gently rinse with water, spray with air, or physically wipe. Do not use herbicides to clean equipment.

Mow at the Right Time

When soils are wet, GOEs are extremely sensitive to compaction and erosion from vehicle tires. **Vehicles should be kept off GOEs from late October until the end of June.** In GOEs where there are no native species, this time window can be expanded slightly as long as the soil is dry enough to prevent compaction and erosion. All equipment should be kept away from vernal pools and seeps (described in Part 1) from July to September.

Mowing in GOEs should never be done during the peak flowering season for most native plant species (February–June). In areas where no native species occur, mowing can occur earlier as long as the soils are dry. Mowing to increase native plants and to limit invasive grasses therefore must be done during a very narrow window. In order to control invasive grasses, annual mowing and removal of cut plant material should be done **before** the invasive grasses set seed (this will be in high summer during the dry season), but **after** the native wildflowers have set seed (generally in late July to early August). This timing should be carefully tailored to accommodate the specific site and changing weather patterns from year to year. Mowing in late July or August, when most of the native plants are dormant, causes the least damage, however, this may be too late to control invasive grasses, which may have started to set seed.



The Endangered Coastal Scouler's Catchfly (*Silene scouleri* ssp. *grandis*) seeds from September to November. Photo: C. Maslovat

Some plants in GOEs, including some species at risk, mature and set seed at the end of summer or early fall; mowing prior to seed set may harm these species. For example, Endangered Coastal Scouler's Catchfly (*Silene scouleri* ssp. *grandis*) blooms in August or September and seeds disperse from September to November. Many native grasses may also flower and seed later than native wildflowers.

Before deciding to mow, you need to consider all of the species at your site. The decision of if and when to mow should consider ground-nesting songbirds such as Savannah Sparrows (*Passerculus sandwichensis*), slow-moving Sharp-tailed Snakes, and insects at different stages of their lifecycles.

Fall mowing and plant biomass removal may also control some invasive grasses depending on the timing of flowering and seed set, the growth form, and the response to disturbance. Fall mowing may be effective for some invasive shrubs as well.

A summary of best times and times to avoid for certain mowing activities in GOEs is given in Table 5.

Table 5. Summary of Timing Windows for Mowing Activities

Activity	Best time	Time to Avoid
Using vehicles to access or mow GOEs	July to early-October	Mid-October to June and after heavy rains during the dry season
Using vehicles to access or mow GOEs with no native species	Late-May to mid-October	Late-October to early-May and after heavy rains in late spring or during the dry season
Mowing to avoid peak flowering time for most native species	July to August	February to June
Mowing to control invasive grasses – may require multiple mowing	Late June to July (requires on-site observations)	February to June
All activities next to vernal pools or seeps and their catchment areas	July to September	October to June
Mowing to avoid damaging at-risk species	Will depend on the species	Will depend on the species

2.12 Monitoring

Regular monitoring of GOEs is essential for understanding the impacts from land use changes. Monitoring is needed to decide whether or not management is required, what type of management will be most effective, and how management impacts GOEs. More information on monitoring methods and case studies can be found in GOERT's *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration).

Monitoring can vary greatly in complexity and effort required, depending on the goals and resources available. A simple monitoring program might consist of regular observation or repeat photography. Such a program would require little effort, and would likely detect larger scale, coarse changes. A more complex program could involve statistical analysis of measures of vegetative cover. Such a program may be used to track fine-scale changes in the abundance of different species.

Regardless of complexity, the most important elements to monitor are species at risk and invasive plant populations. The population sizes of some species at risk, for example annual plants in vernal pools, may vary greatly from year to year. This is not necessarily a cause for concern. However, if numbers suggest the population is declining, management actions such as those described above may be required. Monitoring can also guide invasive species removal efforts and management such as mowing. If the number of invasive species is declining, monitoring can provide evidence that the work is accomplishing the intended objectives. On the other hand, if numbers indicate that invasive grasses or other herbaceous species are increasing, the management approach should be revised.

2.13 Spread the Word!

Sharing success stories and recognizing what you have achieved are important for maintaining the momentum of projects and sharing effective approaches. Information sharing can take the form of posters featuring Garry Oak and associated ecosystems, brochures explaining invasive species, environmental awards, or participation in GOERT's annual Research & Restoration Colloquium.

The District of Saanich, GOERT, the CRD, and other organizations present awards to individuals, groups, and businesses in recognition of their positive contributions to the environment.

part 3

Sector-Based Guidelines



Garry Oak ecosystem at Brown Ridge, Saturna Island. Photo: C. Maslovat

This part summarizes the steps each sector can follow to protect and manage Garry Oak and associated ecosystems. There is some repetition between sections where the same information applies to different sectors. The more comprehensive specific recommendations of each Best Management Practice in Part 2 should be read prior to this section. Important background material can be found in Part 1.

3.1 Municipal & Regional Planners

There are many things municipal and regional government planners can do to help protect GOEs. Urban expansion is one of the greatest threats to these ecosystems and the plants and animals that live there. This section describes measures that planners can take to protect GOEs and minimize the impacts of development.

Checklist

- ✓ Assess What You Have
- ✓ Make a Map
- ✓ Plan to Restrict Development within GOEs
- ✓ Include BMPs in Terms of Reference
- ✓ Plan for Connections
- ✓ Provide Buffers
- ✓ Maintain Hydrologic Patterns
- ✓ Save Native Soil and Plants
- ✓ Limit Invasive Plant Species
- ✓ Manage and Restore GOEs
- ✓ Landscape with Native Plants

The Conservation Data Centre's BC Species & Ecosystems Explorer is now easier to use!

You can now find a complete list of known species at risk in your municipality or regional district by searching by distribution under “Additional Search Criteria” (a100.gov.bc.ca/pub/eswp). Knowing which species at risk occur in your area can be used to guide surveys and can be incorporated into which searches should be included into the terms of reference for land developers.

From many perspectives, local governments control the lion's share of legislative, planning and management mechanisms to protect and restore ecosystems and SAR. Although local governments may not experience, perceive or even desire this level of control, they have an extensive toolkit, a broad social network and numerous opportunities to work with the agencies, organizations and individuals who influence or may be influenced by the state of Garry Oak and Associated Ecosystems.... Since stakeholders participating in planning processes will not support what they do not understand, Model Bylaw Provisions for the Protection of Garry Oak and Associated Species and Ecosystems has been designed to provide clear direction, defensible rationale, and a range of incentives to offer traditional naysayers.

— from *Model Bylaw Provisions for the Protection of Garry Oak & Associated Species & Ecosystems*

Assess What You Have

The first step in protecting GOEs is to determine where they occur and what they contain. Detailed information on site assessment can be found in *Section 1.2 Ecosystems & Species at Risk*.

Tools such as the Sensitive Ecosystems Inventory (SEI) for East Vancouver Island and Gulf Islands (www.env.gov.bc.ca/sei/index.html) and the Conservation Data Centre's (CDC) Species and Ecosystems Explorer (www.env.gov.bc.ca/atrisk/toolintro.html) mapping system provide the first step to identify the locations of GOEs and species at risk. Some local governments have updated and expanded the SEI information by conducting their own inventories and soliciting public input. GOERT's Priority Sites project may be able to provide detailed information, including maps, about important GOE sites in your area.

Make a Map

Identifying where species at risk and GOEs occur in your region before development applications are submitted is the first critical step for protecting these special sites. Producing a hard copy map or online map layer for staff to access showing where GOEs and species at risk occur in your area is an essential tool for planning for their protection. This map should be updated periodically with new data and should be part of any mapping attached to a City's Official Community Plan (OCP) and Parks Master Plans.

Plan to Restrict Development within GEOs

The most effective way to retain the values associated with GOEs is to protect them from development. There are many ways to do this. The Green Bylaws Toolkit (www.greenbylaws.ca) and the new addendum *Model Bylaws for the Protection of Garry Oak & Associated Species & Ecosystems* provide comprehensive information on the different protection measures that can be used by all levels of local government. Some specific examples of ways to restrict development in GOEs are listed below.

“Front end” planning. “Front end” planning as early as possible during a subdivision application or development permit process can minimize the time that local governments spend in conflict with developers and environmental groups at later stages of development. In order to be successful, local government needs to understand the ecosystem values and threats and incorporate their protection into Regional Growth Strategies (RGS) and Official Community Plans (OCPs).

OCPs lay the ground work for the creation and implementation of a wide range of tools that can be used by local governments to protect GOEs. They also express the community's desire to protect and preserve

Priority Site Subdivision

“Front end” planning can help prevent the destruction of species at risk. Municipal planners in Nanaimo were aware of a high concentration of rare plants on a property which the owner was interested in subdividing. The subdivision application triggered an effort to create additional lots for park dedication and for a conservation purchase. Although it is still early in the process, the proposed subdivision would include land set aside using the required 5% park dedication, plus parkland provided through a density transfer and through an Ecological Gift to the City.



The Endangered Bog Bird's-foot Trefoil (Lotus pinnatus) is one of the rare species in the proposed subdivision. Photo: D. Polster

Garry Oak and associated ecosystems. Within OCPs, policies can be included that require preservation of green space during the development and subdivision of land. OCPs can state the intent to require development applications to contain sustainability statements, trigger Environmental Inventory Assessments (EIAs) and incorporate Best Management Practices into developer's terms of reference. Specific restrictions such as buffer zones or setback requirements can be integrated into a development permit area contained within an OCP along with maps that identify where GOEs are located.

Know which permits and processes impact GOEs. There is a wide range of municipal processes and permits that may impact GOEs. These include:

- subdivision
- rezoning
- development permits
- variances
- blasting permits
- filling or soil removal permits
- driveway permits
- boulevard permits
- building permits
- tree cutting permits
- pesticide permits
- boulevard tree planting requirements
- underground services

Understanding how these different activities may impact GOEs is important for protection planning.

Use development restrictions. Some municipalities have established Environmental Development Permit Areas (DPAs) as an effective tool for regulating development. Mapping of DPA's can allow guidelines to protect the areas and establish buffers. Ensuring that a developer provides local governments with information about species at risk, location of buffers, corridor linkages, and measures for mitigating changes to hydrology can minimize damage to GOEs.

Effective zoning is the most straightforward way of protecting GOEs from development; however, changing existing zoning can be a long, complicated, and unpopular process. Zoning bylaws can specify the density and placement of buildings on the land, identify protected

Protection Incentives

Incentives to direct development away from GOEs include density transfer, home clustering, and density bonusing.

Amenity zoning allows a land developer to increase the density of a development (i.e., create additional lots), in return for dedicating green space. For example, a rezoning application on North Pender Island allowed an additional 4 lots in return for donating approximately 40 hectares of land to the Islands Trust Fund. The City of Nanaimo allows for a density bonus for developers who meet the minimum required points on a sustainability checklist that includes the protection of environmentally sensitive land.

The developer benefits from the sale of additional lots, and the community benefits from the protected land.

areas (e.g., watercourse setbacks), determine the connections between protected areas, and outline rules for landscaping.

Setbacks from sensitive areas, density transfer, tree retention, alternate development standards, and covenant requirements are all specific ways that zoning bylaws can protect a wide variety of natural features. Zoning can also be used to create “building envelopes” that will minimize alteration to GOEs during construction.

DPAs as a Tool for Protecting GOEs

The City of Nanaimo has updated and expanded its mapping of sensitive ecosystems and species at risk. Sensitive sites have been incorporated into the OCP and have been zoned Environmentally Sensitive Areas (ESA) Development Permit Areas (DPA₂) (www.nanaimo.ca/EN/main/departments/Community-Planning/OfficialCommunityPlan.html).

As part of the development permit process developers are required to conduct surveys to identify environmentally significant habitat including rare plants and the habitat needed to sustain them. Appropriate non-disturbance and buffer areas around this habitat need to be identified. The developer also needs to determine the impact of the proposed development on all non-disturbance and buffer areas, on water flow and quality, and needs to provide a development pattern and servicing recommendations to minimize impact on these areas.

Give tax incentives. Landowners can be encouraged to protect natural features of their land with incentives such as the Natural Area Protection Tax Exemption Program (NAPTEP). This program, which is currently available only on the Gulf Islands, allows a significant reduction in property tax for landowners with conservation values on their property.

Other tax incentives include Ecological Gifts, revitalization tax exemptions, conservation covenants, transfer of development credits, or environmental mitigation and offsetting. More information on these measures can be found in the *Model Bylaws for the Protection of Garry Oak & Associated Species & Ecosystems*.

Use covenants. Establishing conservation covenants is an effective approach to protecting GOEs both on private and public lands. Where possible, acquisition to protect the GOEs on public land is more effective protection than putting a covenant on someone’s back yard where ongoing monitoring may be required to ensure compliance. However, there have been many successful restrictive covenants on private land even without the capacity for on-going monitoring.

Covenants in the ALR

In 2010/2011, the Municipality of Saanich established a groundbreaking conservation covenant to protect GOEs on a parcel within the Agricultural Land Reserve (ALR). The property had 3 GOE areas and was being subdivided to separate 2 existing residences between family members. Although the ALR does not usually approve of land being taken out of agricultural production, the Saanich planner contacted the ALR and because of the families' commitment to protecting 2 of the GOEs, a covenant agreement was reached. The owners received an award from Saanich in recognition of their contribution to conservation.



Photo: A. Pollard, District of Saanich

Create parks. Lands with GOEs could also be listed for potential acquisition within Parks Master Plans and within neighbourhood plans. Directing parkland dedication to protecting Garry Oak areas, instead of creating playgrounds that will require ongoing maintenance dollars to maintain, can be an effective way of reducing costs borne by municipalities. Candidate GOE sites should be assessed for restoration viability by GOERT staff or other qualified individuals.

Regional conservation funds are an innovative approach for raising funds to purchase these special areas. Partnering with local land trusts may also help acquire parkland.

Include BMPs in Terms of Reference

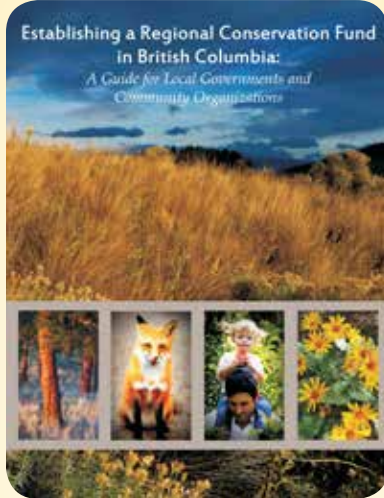
The District of Saanich provides developers with a *Blasting near Trees* pamphlet, and attaches a blasting clause to all tree bylaw permits:

“Blasting Best Management Practices: Garry oak roots are especially vulnerable to damage by blast gases. Where blasting is required, we recommend drilling a pre-shear with 4” holes spaced 10” apart (centre-to-centre) and leaving these holes un-loaded. Use dynamite instead of ANFO in the adjacent 2 rows of blasting holes. The project arborist must supervise blasting. Any roots damaged by blasting must be cut cleanly by the project arborist and the cut edges treated as per Appendix C [excerpt from Tree Preservation bylaw #7632] specification until backfilling is complete.”

Regional and municipal governments are in a unique position to have a direct effect on how land is developed. Including these GOE Best Management Practices into a development permit's terms of reference for land developers can increase the protection of GOEs during construction. **Requiring pre-development environmental impact studies, in particular surveys for species at risk, is a powerful tool for finding and protecting rare species and the ecosystems that support them.** Defining specific limits to development such as buffer zones or setbacks, and measures to minimize invasive species, and maintain hydrology, are just some examples of important information to include in terms of reference.

Plan for Connections

Creating connections between remaining sites with GOEs can help native species move among isolated areas and increase the genetic diversity within remaining patches. Connections can be created along riparian areas, power lines, and other areas that are not necessarily Garry



A conservation fund provides the means for local governments and conservation organizations to secure ecologically significant lands, protect natural ecosystems, enhance liveability within the region, and create a legacy that will benefit future generations.

— from *Establishing a Regional Conservation Fund in British Columbia: A Guide for Local Governments & Community Organizations*

Oak ecosystems, but which can connect remnant GOEs. Restoration of degraded habitat and using native plants in landscaped areas will also build connectivity.

Thinking about connection corridors for Garry Oak species can be incorporated into municipal and regional planning for walkways and bike trails for connecting human communities as well as biological communities. Creating a hard copy map is important for visualizing where GOEs and species at risk occur, how they fit into the texture of the community, and creating linkages. More information can be found in *Section 2.3 Connect Landscapes*.

Provide Buffers

Buffers should be incorporated into any construction or development next to GOEs. Buffers should be situated on public land or on the developer's land and considered part of the development assets. More information on buffers including recommended buffer widths can be found in *Section 2.4 Provide Buffers*.

Maintain Hydrologic Patterns

Maintaining the flow of surface and ground water is very important for GOEs. Changing the conditions even slightly can have damaging effects. More information on how to maintain hydrologic patterns can be found in *Section 2.5 Maintain Natural Water Flow Patterns*.

For all new developments in GOEs, the terms of reference should include a detailed hydrological assessment done by a qualified expert who is familiar with GOEs as well as hydrology. **Measures to ensure there are no changes to either surface or groundwater flows should be a stipulation of any new project.**

In some cases, there may be multiple sensitive sites (e.g., a wetland and a GOE) that hinder development. In these cases, creative solutions such as going over the wetland with a bridge or ramp may be the best options.

Save Native Soil & Plants

If there is no alternative to developing a site, then the existing soils and native plant material should be treated as a valuable resource and saved. Saving soil and plants should be included in the Development Permit Area terms of reference.

- ☛ The native organic matter that must be cleared for development can be kept separate to be used as mulch later in planting areas. This native organic matter will help to retain soil moisture, reduce weed growth, and build-up nutrients in the soil.



Broad-leaved Shooting-star (*Dodecatheon hendersonii*). Photo: D. Polster

Native Plant Salvage

Some native plants can be expensive to buy and time-consuming to grow. For example, the average nursery charges \$4.00 for a single Broad-leaved Shooting-star (*Dodecatheon hendersonii* ssp. *hendersonii*) plant in a 10cm pot, which takes about 3 years to flower from seed. Opportunities to salvage plants such as these from areas slated for development should be explored, as salvage can be an economical alternative that also avoids destruction of a valuable resource.



Photo: C. Maslovat

- Native topsoil can also be kept separate from the subsoil for later use in planting areas; native topsoils are well suited for growing native plant species. Using native soils also minimizes the soil that must be brought in from other areas that may be contaminated with weed seeds. Be aware that salvaged material may contain many invasive plant seeds and will require maintenance, including weeding and watering, especially in the first few years.
- Native plant species can be salvaged, stored, and replanted in adjacent landscaped areas. Native plants should be planted in the appropriate location for the species and at the optimal time of year for transplanting.
- If it is not possible to use native soils and plants in adjacent disturbed areas, they can also be made available for restoration in other similar sites that need to be restored.
- Be aware that plant salvage can be very time-consuming and not all salvaged plants survive when re-planted. Salvage should occur at the optimal time of year and for the best success this is usually when the plants are dormant in the late fall or early winter. Salvaged plants can be potted up and stored until the proceeding fall or early winter when replanting can be done on site.

There are knowledgeable people available to assist with this work. GOERT can help locate suitable crews for salvage of native plants and bulbs and to direct soil salvage to minimize impacts on adjacent areas where the soil is stored.

Native Plant Salvage Programs

The Municipality of Saanich, the Native Plant Study Group, and other qualified community groups rescue native plants from sites that would otherwise be destroyed by development. These plants are used in public and private restoration projects and are not allowed to be sold. See www.saanich.ca/living/natural/npsp.html & www.npsg.ca.

Limit Invasive Plant Species

Development near GOEs has a high potential to spread invasive plant species into these rare ecosystems, and these implications should be considered during the planning process. More information on how to limit non-native species is included in [Section 2.9 Prevent the Introduction of Invasive Species](#).

Local or municipal governments can include measures to prevent the spread of invasive species in development permits, including stipulating the use of weed-free gravel or topsoil and timely re-vegetation with native plants. For example, specifying in development permits that only native Garry Oak grasses be used for any seeding that is to occur can



Fawn Lilies (Erythronium oregonum) and Coastal Strawberry (Fragaria chiloensis) in a native plant garden. Photo: C. Maslovat

Work with Volunteers

Although most local governments do not have the resources to restore GOEs and manage invasive plants by themselves, there are many examples of how municipal or regional governments can benefit from volunteer labour. The District of Saanich’s “Pulling Together Volunteer Program” provides start-up training, ecological restoration guidance, staff and equipment, plant debris removal, and annual training and recognition events for volunteers. Pulling Together actively stewards 34 sites including the Garry Oak Restoration Project (GORP) sites and has 15 active stewardship groups that organize regular work parties.

help to reduce the introduction of non-native species. Local governments can also use legislative tools such as noxious weed bylaws which require that landowners remove bylaw-listed weed species from their properties.

Manage & Restore GOEs

Regional and municipal governments have the opportunity to be role models for the public, managing GOEs and removing invasive plant species along right-of-ways and in public parks. More guidance for on-the-ground management and restoration can be found in [Section 3.3 Park Maintenance & Grounds Staff](#). Although funds are often limited, working with volunteer groups can help get the job done. Some local and regional governments have volunteer co-ordinators to manage stewardship activities. More information can be found in [Section 3.4 Stewardship Groups](#).

Landscape with Native Plants

The use of native species for landscaping reduces water use and can create beautiful landscapes requiring minimal maintenance. Using native GOE species in public spaces that require landscaping is a great way to encourage members of the public to do the same. Landscape plans should be checked to make sure no invasive species are being proposed. Building a network of GOE sites increases the connectivity of the landscape and helps build stronger ecosystems. More information can be found in [Section 2.7 Plant & Maintain Native Species](#).

It is important for local governments to support efforts made by home owners to restore private land. This involves ensuring that all relevant municipal departments are aware of where restoration is occurring and what the restoration looks like, since restored sites may look different than typical landscapes. For example, in one municipality that encouraged naturoscaping and planting native species, a gardener actively restoring a backyard Garry Oak meadow was served with a by-law ordinance to mow “unkempt grass”.

There are several options for supporting home owners to restore their own property. Residents can register their native plant gardens to ensure that bylaw officers know where they are. Small signs can be installed in these gardens to let the public know why they look the way they do. Education programs, community newsletters, and garden tours can feature native plant gardening and showcase good examples.

Enhanced Marketability

Beautiful native flower meadows, such as this one at Mt. Tzuhalem Ecological Reserve, are attractive features for home buyers. Flowers shown here are Common Camas (*Camassia quamash*), Western Buttercup (*Ranunculus occidentalis*) and Sea Blush (*Plectritis congesta*). Contrast this photo with the one included in [Section 2.4 Provide Buffers](#).



Photo: D. Polster



Native plant landscaping at Dockside Green in Victoria. Photo: C. Masson

3.2 Land Developers

Development within Garry Oak and associated ecosystems (GOEs) should be done carefully and responsibly because these special ecosystems are sensitive and fragile. However, there are significant opportunities to enhance the value and marketability of properties by incorporating existing GOEs into development proposals. Housing developments adjacent to natural areas have been shown to be more appealing to purchasers, who are often willing to pay a higher price for natural views and green space. There are also opportunities for clustering buildings and maximizing density on a site that will minimize negative impact to the GOE and lower infrastructure costs. The following information will help ensure that degradation of habitat is minimized while maximum profits are derived from working in these beautiful ecosystems.

Some of the information in this section is summarised from GOERT's publication, *Protecting Garry Oak Areas During Land Development*, which provides more details about financial and other benefits to developers and property owners from protecting GOEs, success stories, and specific examples of alternative designs that minimize habitat degradation (www.goert.ca/industry).

Checklist

- ✓ Assess What You Have
- ✓ Design Developments around GOEs
- ✓ Plan for Connections
- ✓ Leave Buffers
- ✓ Minimize Blasting and Grading
- ✓ Maintain Hydrologic Patterns
- ✓ Protect GOEs During Construction
- ✓ Salvage Soil and Plants
- ✓ Limit Invasive Plant Species
- ✓ Landscape with Native Plants
- ✓ Engage New Owners in Stewardship

Assess What You Have

The first step in protecting GOEs is to determine where they occur and what they contain. Detailed information on site assessment can be found in [Section 1.2 Ecosystems & Species at Risk](#). Tools such as the Sensitive Ecosystems Inventory (SEI) for East Vancouver Island and Gulf Islands (www.env.gov.bc.ca/sei/index.html) and the Conservation

Ecological Gifts & Tax Incentives

There may be significant financial value to protecting GOEs within a development. Environment Canada's Ecological Gifts Program (www.ec.gc.ca/pde-egp) offers tax incentives for the protection of ecologically sensitive land. An Ecological Gift is a donation of land or an interest in land (e.g., conservation easement, covenant, or servitude) in exchange for a tax credit or deduction as well as a reduction in the taxable capital gain. Some development lands may qualify for Ecological Gifts benefits although donations of inventory land may not be subject to the same tax benefits as donations of capital property.

Developers interested in Ecological Gifts should contact a tax professional for advice.

Data Centre's (CDC) Species and Ecosystems Explorer (www.env.gov.bc.ca/atrisk/toolintro.html) mapping system provide the first step to identify the locations of GOEs and species at risk. Contact the CDC directly to request data that may not yet be available through online tools (cdcddata@gov.bc.ca). The Garry Oak Ecosystems Recovery Team (GOERT) staff can help with on-site evaluation and provide the names of experts who can do site inventories, impact assessment, and assist with development planning. Producing a hard copy map showing where species at risk and GOEs are found on your site is an essential tool for planning your development and easing the approval process.

Design Developments Around GOEs

GOEs are part of the natural landscape of southeastern Vancouver Island and the Gulf Islands and if they are preserved they provide an opportunity for enjoyment by adjacent neighbours. Designing around GOEs can improve the value of houses located next to these ecosystems. Research in other locations has shown that properties next to green space and properties with trees are worth 5–15% more and sell more quickly than properties without these assets. Many home buyers are looking for ecologically-appropriate housing set carefully within beautiful natural locations. Developers can capitalize on this by providing small, well-built homes next to a stunning natural landscape area.

It may also be possible to sell properties containing GOEs to local land trusts or community groups if the price is favourable. If the land is sold for less than market value, there may be significant tax advantages.

When you look at a newly completed home that was built using nature's envelope, it is often difficult to tell that the home is, in fact, new. Instead of a broad, cleared band of earth surrounding the foundation, native vegetation grows in close proximity to the structure. Trees, many decades old, can be just a few feet away. The landscape looks established and mature—because it is.

— from *Building Inside Nature's Envelope: How New Construction & Land Preservation Can Work Together*, Andy Wasowski

Choose Building Sites Carefully. Construction in and around GOEs must be done delicately if the value inherent in these ecosystems is to be retained. Some options for creating a low impact design are listed below:

- ✓ Design developments carefully so that roads and house sites minimize disturbance to GOEs.
- ✓ Create “building envelopes” and limit construction to these restricted areas to protect adjacent areas.

Protection of existing ecosystems is **much** cheaper and more effective than ecosystem enhancement and restoration. In many cases, it is not technically possible to restore ecosystems to their original functioning state.

— from *Develop with Care: Environmental Guidelines for Urban & Rural Land Development in British Columbia*,

www.env.gov.bc.ca/wld/documents/bmp/devwithcare2006/develop_with_care_intro.html

- ✓ Keep developments limited to one small area of the property and provide the remainder of the property as parkland where the GOEs can be enjoyed by the neighbourhood.
- ✓ Cluster buildings to minimize impact and lower costs for land clearing and development of roads, sewers, and other infrastructure.
- ✓ Create large lots with small homes outside of GOEs.
- ✓ Avoid constructing homes on the highest point of land, where GOEs usually occur.
- ✓ Hire an arborist to map out the critical root zones of trees near the proposed development.

In some cases, there may be multiple sensitive sites (e.g., a wetland and a GOE) that constrain development. In these cases, creative solutions such as going over the wetland with a bridge or ramp will be the best options.

Plan for Connections

Creating connections between remnant patches of GOEs can help native species move among these fragmented areas and also increase the genetic diversity in remaining patches. Connections can be created along riparian areas, power lines, and other areas that are not necessarily GOEs, but which link-up these ecosystems. Development planning should account for connections between natural areas wherever possible and should attempt to keep natural areas as intact as possible by designing developments and roads at the edges of GOEs rather than through the middle. Connecting natural areas with walkways or bicycle paths can also be a positive selling feature. Paths should be incorporated into buffer areas and not directly through GOEs. More information, including corridor widths, can be found in [Section 2.3 Connect Landscapes](#).

Leave Buffers

GOEs are highly sensitive to land development and therefore buffers are important for maintaining the health of these ecosystems. Buffers protect GOEs from non-native plant invasion from adjacent lands, reduce the impacts of changes to hydrology, light, and moisture levels, and help maintain the ecological conditions that support GOEs. Buffers should be left in a natural state with native vegetation in order to insulate the GOE from houses and roads. More information on buffers, including recommended buffer widths, can be found in [Section 2.4 Provide Buffers](#).

Trails for walking or biking can be incorporated into buffer areas and they can also act as fire breaks. **Buffers, along with the GOE they protect, should have long-term legal protection.**



Seepage zone intersected in rock cut is draining the ephemeral pool in an adjacent GOE at Mt. Tzuhalem Ecological Reserve. Designing the development with minimal blasting would have prevented this problem. Photo: D. Polster

Blasting & Trees

Blasting is one of the most damaging construction activities to trees. Blasting creates hot gasses which can vent into the root zone through rock fissures, poisoning the roots of trees and other vegetation several dozens of meters away from the blasting site. Blasting also creates strong vibrations and changes water flow under the surface which can kill sensitive trees. Blasting around Garry Oaks will require a tree permit in many municipalities.

Some alternative methods that may cause less impact include using a jackhammer with a hoe ram or using techniques such as non-explosive rock fracturing. Damage can also be minimized by using the least toxic class of explosive that is permissible for underground use.

For more information, consult an International Society of Arboriculture (ISA) certified arborist (or equivalent) with specific experience in tree-friendly construction and blasting.

Minimize Blasting & Grading

Care should be taken to minimize the amount of blasting and grading that is done within GOEs as these activities destroy the ecosystems and change waterflow. Keeping roads narrow, using shared driveways, and constructing houses closer to access roads are good options for minimizing the footprint of built surfaces. All development activities should avoid vernal pools and seeps to prevent hydrological changes. Where foundations are being constructed, keep blasting to a minimum by building up from the rock, not drilling down into it. This can provide unique features for family rooms or wine cellars where a rock outcrop is part of the home.

The native vegetation that is established on rock outcrops is likely old and difficult to restore if disturbed. Where blasting is required, creating pockets of soil that can be revegetated by planting native species after construction is one way of ensuring the vegetation is replaced. This also allows the blasted rock area to look less bare and disturbed. These details are aspects that potential home buyers look for and which will increase the value of the home.

Maintain Hydrologic Patterns

If changes to either surface and/or underground water flow occur on the site, this will affect GOEs, and may result in the loss of both species and signature features. Minimizing blasting and grading helps maintain the natural flow of water both on and through the site. Allowing water to flow into the ground by using permeable surfaces is a good on-site rainwater management practice. Creating narrow roads not only slows traffic, but also uses less land and creates fewer hard surfaces that prevent water absorption. Narrower roads use less material which can save on development costs. Installing green roofs, using swales and rain gardens instead of curbs and gutters, or bedding roads on coarse rock allow the water flow to move naturally across the land. A checklist and more information on best management practices to maintain hydrologic patterns can be found in [Section 2.5 Maintain Natural Water Flow Patterns](#).

Protect GOEs During Construction

Defining a building envelope where construction activities occur will limit damage to native vegetation outside of the construction zone. Protected areas should include wide buffers from any trees or shrubs to help prevent damage to the root systems.

The following measures will help protect GOEs during the construction phase:

- ✓ Use a qualified environmental monitor during construction to ensure that regulatory requirements are met. Some local governments require environmental monitors to be on site during construction.
- ✓ Ensure that all site workers are aware of sensitive areas and how to protect them.
 - ☛ Create a site map showing the location of species at risk, GOEs, buffers, and corridors and make sure that all contractors and workers are familiar with it.
 - ☛ Delineate GOEs in the field by installing clearly visible temporary fencing around GOEs and adjacent buffers. Signs indicating “Habitat Protection Area” should be installed on the fences.
 - ☛ Mark important trees including their required Protected Root Zone^{*}
 - ☛ Use on-site signs to explain any required protection measures and activities that should be avoided.
- ✓ Protect all GOEs and buffers during construction.
 - ☛ To protect vegetation and root zones, do not allow equipment or machinery next to the protected areas and buffers.
 - ☛ Do not allow any dumping of fill or other construction waste material in the protected areas.
 - ☛ Do not allow unauthorized access to GOEs.
- ✓ Protect the habitat within the GOE.
 - ☛ Keep all dead standing trees (snags that are assessed as safe) and try to work outside the danger zone of any wildlife trees that have been declared a hazard.
 - ☛ Keep all downed large woody debris on site; rotting wood provides important habitat for a wide range of GOE species.
 - ☛ Do not disturb the vegetation in the GOE.
 - ☛ Do not allow felled trees to be moved through the GOE.
 - ☛ Do not clear vegetation during nesting season.
- ✓ Dispose of construction waste and other garbage, including concrete wash, far away from GOEs.
- ✓ Keep all fuelling equipments and fuelling stations at least 30 m from GOEs.

* Protected Root Zone is defined as is the area of land around the trunk of a tree where the roots are expected to occur. More information can be found in Section 2.4 Provide Buffers.



Nodding Onion (Allium cernuum).
Photo: L. Goulet

Native Plant Salvage

Native plants are expensive to buy and time consuming to grow. The average nursery charges \$4.00 for a single Broad-leaved Shooting-star (*Dodecatheon hendersonii* ssp. *hendersonii*) plant in a 10cm pot, which takes about 3 years to flower from seed. These plants are easy to salvage from areas slated for development and should be treated as a valuable resource, not destroyed.



Photo: C. Maslovat

- ✓ If species at risk are present, schedule construction activities to avoid sensitive time windows (e.g., most bird species are particularly sensitive from April 1 to July 31st whereas most native plants flower from February to June).
- ✓ Use techniques to control erosion and minimize sediment movement.

Salvage Soil & Plants

Green Construction

Greenrock Industrial Business Park (www.greenrockindustrial.ca/home) in Nanaimo has developed 24 lots with green construction principles. Native soils were saved and mixed with compost and sand as a base for planting native species including Douglas-fir and Garry Oak. The soils were tested in a laboratory to make sure they had the necessary nutrients and micro-nutrients and physical properties to support plant growth. The organic layer was also saved and used as mulch in planting areas. Part of this development also protected a sizeable GOE.

There will be situations during development where grading or blasting is required. As a last resort, salvage of native plant materials and native soils can greatly aid in the restoration of the area once the construction is complete. For instance, if a road is being built across a slope and there is a fill on the downhill side, the fill material can be covered with the topsoil that was removed from under the road. The same is true for house sites. Native plants, mosses, and bulbs, as well as native soils with all the appropriate soil organisms, can be salvaged from development areas and used for restoration once construction is complete.

If there is no alternative to developing a portion of the GOE area, then the existing soils and native plant material should be treated as a valuable resource and saved.

- ☛ The native organic matter that must be cleared for development can be kept separate to be used as mulch later in planting areas. This native organic matter will help to retain soil moisture, reduce weed growth, and build-up nutrients in the soil.
- ☛ Native topsoil can also be kept separate from the subsoil for later use in planting areas; native topsoils are well suited for growing native plant species. Using native soils also minimizes the soil that must be brought in from other areas that may be contaminated with weed seeds. It makes sense to reuse the soil rather than pay to have it taken off site, and then pay to have soil brought back. Note that even salvaged material may contain



Kinnikinnick (Arctostaphylos uva-ursi) is an excellent native ground cover. Photo: D. Polster



The invasive English Ivy (Hedera helix), a commonly used groundcover, has been carried by birds to this remote rock outcrop on Trial Island, where it is threatening populations of species at risk. Photo: C. Maslovat

many invasive plant seeds and will require maintenance, including weeding and watering, especially in the first few years.

- Native plant species can be salvaged and replanted in adjacent landscaped areas. Native plants should be planted in the appropriate location for the species and at the optimal time of year for transplanting.
- If it is not possible to use native soils and plants in adjacent disturbed areas, they can also be made available for restoration in other similar sites that need to be restored.

Be aware that plant salvage can be very time-consuming and not all salvaged plants survive when re-planted. Salvage should occur at the optimal time of year and for the best success this is usually when the plants are dormant in the late fall or early winter. Salvaged plants can be potted up and stored until the proceeding fall or early winter when replanting can be done on site.

There are knowledgeable people available to assist with this work. GOERT can help locate suitable crews for salvage of native plants and bulbs, and to direct soil salvage to minimize impacts on adjacent soil storage areas.

Limit Invasive Plant Species

Invasive species are usually the first to move into recently developed areas. Minimize the amount of disturbed soil by reducing blasting and grading to limit the establishment of invasive plants. Avoid the use of contaminated soils and gravels to eliminate one of the major vectors for the movement of invasive plants into new areas. Prompt re-vegetation with native plants will limit the amount of bare soil that can be colonized by invasive plants.

Care should be taken to address the occurrence of invasive plants immediately. It is much easier to deal with a small patch of unwanted plants than to wait until they are covering an entire site. Some local governments may have noxious weed bylaws that require all bylaw-listed weed species to be removed. More information on how to limit non-native species is included in *Section 2.9 Prevent the Introduction of Invasive Species*.

Developers should also ensure that landscape plans do not include invasive plants. Some common garden plants, including English Holly and English Ivy, are invasive and have berries that are eaten by birds and are then dispersed from yards and landscaping areas into GOEs. For this reason, care should be taken to avoid the use of potentially invasive plants in landscaping. Refer to GOERT's Native Plant Rack Cards (www.goert.ca/suppliers) and the Invasive Species Council of BC's

Success Story

At the Swallow's Landing development in Esquimalt, Mandalay Developments worked in partnership with the Friends of Matson Lands, Habitat Acquisition Trust (HAT), the Nature Conservancy of Canada (NCC), and the Township of Esquimalt to create a win-win scenario. Mandalay donated a 1-ha parcel of rare Garry Oak habitat to NCC and received modified zoning to permit a multi-storey development on the upper portion of the site.

The project was approved with community support, and the Swallow's Landing development sold quickly at premium prices. Mandalay built a low-impact walkway and encouraged new owners to become volunteer stewards of the new Matson Conservation Area, which is managed by HAT and features a demonstration native plant garden along with the stunning wildflowers of the GOE.



(ISC) (www.bcinvasives.ca) *Grow Me Instead* booklets that recommend alternatives to “BC’s most unwanted” horticultural plants.

Landscape with Native Plants

Restoring development sites with native plants allows new housing or commercial developments to look more established and blend into the landscape. The use of native species for landscaping reduces water demand and creates beautiful landscapes with minimal maintenance, lowering long-term costs. Also, using native species in landscaping can protect adjacent GOEs. Regular gardening practices such as mowing, fertilizing, and watering can harm native plants and animals that are adapted to dry conditions and nutrient poor soils. Further information can be found in [Section 2.7 Plant & Maintain Native Species](#).

Native species such as Kinnikinnick (*Arctostaphylos uva-ursi*) can be an effective ground cover for sunny roadsides and in other communal areas, avoiding invasive plants such as Cotoneaster (*Cotoneaster* spp.) and St. John's Wort (*Hypericum* spp.). Garry Oak trees could be used as boulevard trees with an underplanting of camas (*Camassia* spp.), Fawn Lilies (*Erythronium oregonum*), and Shootingstars (*Dodecatheon hendersonii*). Native grasses that are naturally compact and do not need mowing, such as Roemer's Fescue (*Festuca roemeri*) and California Oatgrass (*Danthonia californica*), could also be used between the flowers. Native species can also be used for landscaping around newly-constructed homes. Showy species such as Red-flowering Currant (*Ribes sanguineum*) can provide accents in sunny locations, while species such as Western Trillium (*Trillium ovatum*) can illuminate shady areas.

Native grasses are sometimes available commercially from progressive seed dealers while native forbs, trees, and shrubs can be purchased from local nurseries. A complete list of suppliers of native plants and seed as well as information about planning, building, and caring for native plant gardens can be found in the *Garry Oak Gardener's Handbook* (www.goert.ca/gardener).

Engage New Owners in Stewardship

People who purchase homes near natural areas will not always be familiar with the best ways to steward and protect those areas. For example, they may not understand how damaging it can be to dump compost and other garden waste in the adjacent GOE, that they should avoid using certain landscaping plants that are invasive into natural areas, or that their property can form an important connection or buffer to enhance and protect habitat for native species. It is important for these neighbours to understand the value of buffers, natural areas, and native plantings, so that they can help protect them – not inadvertently damage them.



A field of native clovers: Few-flowered Clover (*Trifolium oliganthum*) and the Blue-listed Poverty Clover (*Trifolium depauperatum* var. *depauperatum*). Photo: C. Maslovat

Developers are uniquely placed to encourage good management of new properties by providing stewardship information to new owners. You can work with organizations with established landowner contact programs, such as Habitat Acquisition Trust (HAT, www.hat.bc.ca) or GOERT, to put together packages of suitable information. This also provides an opportunity to highlight how the development has been designed to minimize habitat degradation or to protect GOE areas. A typical new landowner package could include relevant portions of these *Best Management Practices*; information on invasive species and how to control them; an introduction to Garry Oak and associated ecosystems; and suggested native species for their properties (the *Garry Oak Gardener's Handbook* would be an excellent resource to provide).

3.3 Park Maintenance & Grounds Staff

Many of the remaining GOEs are within parks, on government-owned properties, and on institutional grounds. Although this land ownership serves to protect these areas from development, land management activities can sometimes result in the degradation of these rare ecosystems. Restoring health to GOEs in our parks and institutional areas can reduce maintenance costs and minimize water usage. This section provides advice on how to create healthy GOEs on public, government, and institutional lands, and details some pitfalls to avoid.

Checklist

- ✓ Assess What You Have – Make a Map
- ✓ Plan to Manage and Restore GOEs
- ✓ Don't Add Water, Fertilizer, or Pesticides
- ✓ Manage According to the Season
- ✓ Mow for Diversity
- ✓ Design and Install Trails Carefully
- ✓ Limit Benches and Infrastructure
- ✓ Protect GOEs During Construction
- ✓ Manage Invasive Plants
- ✓ Landscape with Native Plants

Assess What You Have – Make a Map

The first step in protecting GOEs is to determine where they occur and what they contain. Detailed information on site assessment can be found in *Section 1.2 Ecosystems & Species at Risk*. Tools such as the Sensitive Ecosystems Inventory (SEI) for East Vancouver Island and Gulf Islands (www.env.gov.bc.ca/sei/index.html) and the Conservation



Hooker's Onion (*Allium acuminatum*), a very drought tolerant native flower. Photo: D. Polster

Data Centre's (CDC) Species and Ecosystems Explorer (www.env.gov.bc.ca/atrisk/toolintro.html) mapping system provide the first step to identify the locations of GOEs and species at risk. Contact the CDC directly to request data that may be missing from online tools (cdccdata@gov.bc.ca). The Garry Oak Ecosystems Recovery Team (GOERT) staff can help with on-site evaluation and recommend experts who can do more detailed inventories.

Once you've identified species at risk and GOEs occur on your site, the next step is to identify which invasive plant species occur and whether or not native invasive species are a problem. Producing a hard copy map with species at risk and invasive plant species locations is an essential tool for planning for management and restoration. Update this map regularly as new information and species are found, and make it available to the relevant people. **Anyone working on the site, including staff and contractors, should have a copy of the map and be aware of locations of species at risk and sensitive areas, particularly vernal pools and seeps.**

Plan to Manage & Restore GOEs

In all cases, a **Management Plan is a key document to map the route to achieving site goals.** For almost all remaining GOEs, restoration will be an important component of an over-arching management plan. If a management plan has been prepared for your site, all maintenance and grounds staff should be aware of relevant details – for example, the appropriate timing of activities such as mowing, to avoid impacts to species at risk. *Section 2.2 Plan to Manage & Restore GOEs* contains more information on GOE management planning.

Don't Add Water, Fertilizer, or Pesticides

GOEs are well adapted to our local climate, with most plants growing when the soils are wet and becoming dormant during summer droughts. Watering GOEs encourages the growth of invasive species, can rot dormant plants, and weakens the root systems of Garry Oak trees.

There is also no need for fertilizer in GOEs. The plants are adapted to the natural fertility of the native soils, and too much fertility encourages invasive species.

Pesticides can harm GOE species and should be avoided wherever possible, although in some cases, careful use of pesticides may be the best means of controlling invasive plants. Many municipalities now have bylaws banning pesticide use, and permits are required on public, government, and institutional lands. For more information, refer to *Section 2.8 Don't Add Water, Fertilizer, or Pesticides*.

Long-term Damage

Maintenance activities conducted at the wrong time of year can cause long-term damage. This sequence of photos shows the lasting impacts of soil compaction in Uplands Park. The original damage occurred in October 2003, when a large truck drove through a camas field to take replacement chips to the central playground.



The damage a month after the heavy truck compacted soils in the meadow (Nov 2003).



April 28, 2004: Six months later, the extensive damage is evident. Camas and other wildflowers did not grow in the tracks.



May 11, 2005: Native wildflowers had not recovered even after 18 months.

Photos: J. Ringuette

Manage According to the Season

Our climate, with mild wet winters and warm dry summers, creates very seasonal patterns of growth, flowering, setting seed, and dormancy for the plants in GOEs. This seasonality makes it necessary for management activities in these ecosystems to be conducted at appropriate times of the year in order to maximize success and avoid causing damage. Most management activities (e.g., mowing, invasive plant management, vehicle access) should be avoided when the soils are wet from late October until the end of June. Refer to timing window tables in [Section 2.10 Remove Invasive Plants](#) and [Section 2.11 Manage Meadows Through Mowing](#).

However, the late fall and early winter are excellent times for planting native plants. Their roots will grow all winter and they will require less water the following summer than spring plantings. Refer to [Section 2.7 Plant & Maintain Native Species](#).

Mow for Diversity

Mowing is an important tool for managing GOEs. Mowing can be used to control invasive species, to limit the encroachment of native shrubs, and to help shift dominant meadow plants from non-native grasses to native wildflowers. However, careful observation is required to make sure that mowing is done at an appropriate time to avoid mowing while wildflowers are in bloom or setting seed, and to avoid harming species at risk. A good understanding of both the native and non-native species present at the site, the site conditions, and the different types of equipment required for any work to be done, will help determine if mowing is an appropriate management technique at your site. For more information refer to [Section 2.11 Manage Meadows Through Mowing](#).

Design & Install Trails Carefully

The feet of people and their pets can cause significant damage in GOEs. For some people, the idea that dogs can damage GOEs is difficult to comprehend. Managing this impact can be accomplished by gently guiding people to do the right thing with their feet and pets. Providing bags for people to collect their dog faeces prevents the deposit of extra nutrients in GOEs. For more information refer to [Section 2.6 Limit Trampling](#).

Trail design should be done by those who have experience creating trails in natural areas, as poor trail design is a common problem that can result in ongoing management issues. The International Mountain Biking Association (IMBA) provides excellent BMPs for building trails in sensitive areas. IMBA standards have been adopted by Parks Canada even for back-country trails. See www.imba.com/catalog/book-trail-solutions.



Defining the edge of a trail can be as simple as installing rope edges as shown at Mount Wells Regional Park. Photo: C. Maslovat



The low impact walkway leading visitors from the Swallow's Landing development in Esquimalt through the GOE at Matson Conservation Area. Photo: T. Carnahan

The most important issue for directing traffic is making sure that people know exactly where they should walk. It can often be very challenging to define paths in open areas, particularly rocky outcrops. Cedar split rail fences, logs, lines of rocks or rope laid on the ground can help people know where to put their feet. Having an accurate map is very important when installing fences or logs to make sure that these structures are not put near or on top of species at risk. Providing access to a GOE using specialized structures such as steel-grate staircases can allow light and water through so that plants can thrive underneath, unlike a traditional solid wood boardwalk.

Limit Benches & Infrastructure

Installing infrastructure such as benches, buildings, water pumps, or trails can be damaging to GOEs. Even small installations are associated with some soil disturbance and can change the flow of water both at the surface and underground. Before starting any project, it is essential to understand the small-scale drainage patterns so that you understand how water flow might change. It is critical to know where species at risk occur and avoid these locations.

Protect GOEs During Construction

If you're doing any construction, please see "Protect GOEs During Construction" in [Section 3.2 Land Developers](#).

Manage Invasive Plants

Controlling invasive plants in public areas can be rewarding and challenging. Invasive plant management should be carefully planned to make sure it is doing more good than harm. Controlling the spread of new invasions is an important consideration. Some invasive plant species such as Carpet Burweed (*Soliva sessilis*) have seeds that are spread on the soles of shoes and on dogs' feet. Fencing areas that have Carpet Burweed keeps people out of areas with infestations, and can help prevent their spread. For more information refer to [Section 2.10 Remove Invasive Plants](#).

There is funding available from a range of sources that can be used to hire crews to remove invasive plants (see [Part 4 Resources](#) section). Funding is much easier to get if there are species at risk on your land.

A good communications strategy is essential for making sure the public knows why the work is being done. Enlisting public support can also help encourage volunteers through stewardship groups which are willing to help organize activities (refer to [Section 3.4 Stewardship Groups](#)).



Scotch Broom infested Garry Oak meadow in Mt. Tzuhalem Ecological Reserve in 1994. Photos above & below: D. Polster



The broom-infested Garry Oak site shown above looked like this in 2010 after it was cleared by a dedicated crew from the Cowichan Valley Naturalists' Society led by Syd Watts.



Native plant landscaping in Point Ellice Park near Docksider Green in Victoria. Photo: C. Masson

Landscape with Native Plants

The use of native plant species for landscaping reduces water demand and creates beautiful landscapes that require minimal maintenance. In public areas where landscaping is required, using native plants increases the connection between protected GOEs and can help inspire the public to use native plants, too. A complete list of suppliers of native plants and seed can be found in the *Garry Oak Gardener's Handbook* (www.goert.ca/gardener) and on GOERT's website (www.goert.ca/suppliers). More information can be found in *Section 2.7 Plant & Maintain Native Species*.

Some municipal parks departments have their own nursery facilities which may be well-equipped to grow native species for restoration or landscaping. Growing plants for restoration not only saves money but collecting local material for propagation also ensures that the plants are well adapted to the specific site. It also ensures that the plants that are required are available, as nurseries do not always have the selection or the availability of species needed. GOERT has developed *Ethical Guidelines for the Collection & Use of Native Plants* (www.goert.ca/ethical_collection) and *Native Plant Propagation Guidelines* (www.goert.ca/propagation) to guide your work. See also Chapter 10 in *Restoring British Columbia's Garry Oak Ecosystems* (www.goert.ca/restoration).

In many cases, newly planted areas may need to be fenced in order to protect them from deer, rabbits, and pets. Many native plants will be eaten by deer and will need to be protected at least until they become well established. Fencing can also help protect established GOEs and species at risk from grazing.

3.4 Stewardship Groups

Stewardship groups offer the best hope for providing the nurturing care that Garry Oak and associated Ecosystems (GOEs) require to thrive. Stewardship groups often recognize the values that may be hidden in a broom-infested Garry Oak habitat. In addition, stewardship groups can often provide the dedicated work that is required over the long-term to restore these ecosystems to a healthy condition. This section provides some suggestions for stewardship groups to make their work more effective and to help avoid problems. *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration) also provides detailed information for stewardship groups undertaking restoration and management of GOEs.

Checklist

- ✓ Assess What You Have
- ✓ Work with the Landowner

- ✓ Plan to Manage and Restore GOEs
- ✓ Manage According to the Season
- ✓ Organize Volunteers
- ✓ Provide Training
- ✓ Have the Right Tools
- ✓ Insurance and Waivers
- ✓ Treat Your Volunteers
- ✓ Other Restoration Activities
- ✓ Keep Records

Assess What You Have

The first step when working in GOEs is to identify what you have. In some cases, the landowner can help by providing information on GOEs and species at risk locations. Landowners may also be able to help you create base maps.

If the landowner does not have this information, you will need to find the information yourself. Detailed information on site assessment can be found in *Section 1.2 Ecosystems & Species at Risk*. Start with tools such as the Sensitive Ecosystems Inventory (SEI) for East Vancouver Island and Gulf Islands (www.env.gov.bc.ca/sei/index.html) and the Conservation Data Centre's (CDC) Species and Ecosystems Explorer (www.env.gov.bc.ca/atrisk/toolintro.html) mapping systems to identify mapped occurrences of rare ecosystems and species. Contact the CDC directly to request data that may be missing from online tools (cdcdata@gov.bc.ca). The Garry Oak Ecosystems Recovery Team (GOERT) staff is also ready to help you with every stage of your work in these unique ecosystems. There may be opportunities to go on site with other local experts to talk about what you have and how you might approach restoring your site.

Work with the Landowner

Most of the time stewardship groups will be working on lands owned by municipalities, other levels of government, or conservation groups. It is essential to work with the land owners/managers to ensure everyone is working towards the same ends and that activities are authorized. There may be special regulations that need to be followed when working on public lands such as ensuring the safety of others using the site. Posting signs can inform people of the stewardship activities that are being undertaken.

Some local governments can provide start-up training, ecological restoration guidance, staff and equipment, and annual training and

recognition events for volunteers. They may also have information on past management activities and historical use of the site.

There may be opportunities to obtain the assistance of the land owner/manager to haul and dispose of cut invasive species. In many cases, if contacted ahead of time, municipalities will send crews to pick up and dispose of piles of invasive plants. In some cases land owners will sponsor a BBQ for volunteer workers in exchange for working on invasive species removal.

Plan to Manage & Restore GOEs

Before you start, some planning is important to determine where GOEs occur and whether or not there are species at risk at the site. It is essential to have an accurate map that shows all GOEs and any species at risk. The CRD Natural Areas Atlas (www.crdatlas.ca) can be used to create an airphoto base on which to overlay management plans. It is useful to keep your map updated so that new information can be added and data can be updated as new things are found.

Producing a hard copy map with species at risk and invasive plant species locations is an essential tool for planning for management and restoration. Update this map regularly as new information and species are found, and make it available to the relevant people. **Anyone working on the site should have a copy of the map and be aware of locations of species at risk and sensitive areas, particularly vernal pools and seeps.**

If species at risk are found at your site it is very important to make sure your restoration plan will not cause any harm. A poorly planned restoration can be a major threat to GOEs and species at risk, especially if cut plant material is piled on rare plants or if wildflowers are trampled. Soil disturbance from removing invasive plants can also lead to more invasive plant species becoming established as they quickly colonize bare soil. Seeds of invasive species such as broom or gorse that may be laying dormant in the soil can be stimulated to germinate by soil disturbance.

It is important to plan any restoration project carefully. First, decide which specific area to focus on and plan how to avoid impacting any GOEs. Decide how volunteers will access and leave the area and where cut invasive species will be piled. Ensure you have a strategy for dealing with the cut plant materials. Give volunteers an orientation to make sure they are doing the job safely and correctly. For more information refer to *Section 2.2 Plan to Manage & Restore GOEs*.



Tools for cutting woody invasive species include loppers, pruning saws, secateurs and a file for keeping everything sharp. Photo: D. Polster

Avoid Weed Pullers

For many years, restoration practitioners hosted “broom pulls” and there are several varieties of broom pullers and mechanical weed pullers on the market. However, the most important consideration in managing broom is to minimize soil disturbance – only broom plants smaller than a pencil width should be removed by pulling; **do not use a mechanical weed puller** other than a ‘mini’ one; and, **if the first plant tried did not come out easily, use a different method.**

Manage According to the Season

Our climate, with mild wet winters and warm dry summers, creates very seasonal patterns of growth, dormancy, flowering, and setting seed for the plants in GOEs. This seasonality makes it necessary for management activities in these ecosystems be conducted at appropriate times of the year in order to maximize success and avoid causing damage. Most management activities (e.g., mowing, invasive plant management, vehicle access) should be avoided when the soils are wet from late October until the end of June. Refer to timing window tables in [Section 2.10 Remove Invasive Plants](#) and [Section 2.11 Manage Meadows Through Mowing](#).

However, the late fall and early winter are excellent times for planting native plants. Their roots will grow all winter and they will require less water the following summer than spring plantings. Refer to [Section 2.7 Plant & Maintain Native Species](#).

Organize Volunteers

Some municipal and local governments have a volunteer co-ordinator position to co-ordinate volunteer programs. These co-ordinators provide training, co-ordination of work parties, ecological advice, removal of cut material, and annual recognition events. These activities also help actively engage the public in restoration activities and educate people about the sensitivity and value of GOEs.

Organizing natural history groups, friends, and neighbours to help remove invasive species is a good way to get a lot of work done as well as to connect people to their local green space. Boy Scouts, Girl Guides, and local football or rugby clubs may be looking for volunteer opportunities, and removing invasive plants from a local Garry Oak site can be just the thing they are looking for. Interpretive signs in public places can also help recruit volunteers. Being well organized for the event is the key to success.

Working with youth groups. Young people can be a wonderful source of enthusiastic workers. In addition, there may be opportunities to have young people be part of the planning process, getting them engaged in the whole suite of activities around caring for and restoring GOEs. Opening the eyes of young people to the magic of these special ecosystems can be a very rewarding undertaking.

Working with young people has the same considerations as working with adults, but with young people it’s even more important to not tire them out and to keep it fun. Cookies and hot chocolate can be important ingredients!



*A volunteer invasive species crew works in a sensitive area to remove Hairy Cat's Ear (Hypochaeris radicata) at Eagle Heights.
Photo: D. Polster*

Provide Training

Volunteers are usually enthusiastic but they may not have had experience with the kind of work you want them to do. It is very important to take the time to explain why the restoration is being done and show volunteers exactly how the work should be done. A volunteer lead steward may be able to provide training for other volunteers.

Volunteers should work in pairs and wear high visibility vests when working next to traffic. Wearing vests also lets others know that volunteers are participating in an organized activity, and may encourage them to ask about the work that you're doing, providing a great opportunity to recruit new volunteers.

Have the Right Tools

Be sure you have enough of the right tools for the job. In many cases loppers and other tools can be borrowed from non-profit groups engaged in GOE restoration. There may also be funding available for the purchase of tools for restoration. When buying tools, always buy the best quality tools you can afford. It is better to have one set of high quality loppers than 5 sets of cheap loppers that will break when they meet a tough Scotch Broom stem. Keep tools in good condition. They should be sharp and well-oiled so that they function properly. If you treat your tools with respect, then others will as well.

Keep safety in mind, particularly when children are involved. Many of the tools used for dealing with invasive species are sharp and can cause serious injuries if not properly used. Be sure everyone knows how to properly operate the tools they are using and how to prevent repetitive strain injuries. Keep people with sharp tools away from each other and be aware of the specific hazards of the area where the work will be undertaken. Always have a first aid kit on hand and someone who is trained in first aid. Be prepared for emergencies with a safe evacuation and transportation plan in case someone is injured. A cell phone and appropriate emergency numbers should be available in the group.

Visitors to public areas are often curious about restoration activities. Using temporary signs describing the work being done can help inform the public and may help recruit future volunteers. Flagging or cones can be used to outline work areas to keep volunteers away from hazards such as dangerous trees or wasp nests and out of sensitive areas.

Insurance & Waivers

Some public areas may require volunteers to sign a waiver. Having liability insurance to cover accidents and injuries is also an important consideration. Some areas may require a safety policy and an annual hazard tree assessment prior to having volunteers in the area. More



Broad-leaved Stonecrop (Sedum spathulifolium).
Photo: D. Polster

Local Conservancy Groups

Local conservancy groups are a great resource for home owners. They can often tell you what you have on your land and how best to protect it. Some local conservancy groups can help you with your restoration project.

Local conservancy groups may even be able to save you money by setting up incentives such as the Natural Areas Protection Tax Exemption Plan (NAPTEP) (www.islandstrust-fund.bc.ca/naptep.cfm).

A list of Land Trusts and Conservancy Groups is available on the Land Trust Alliance BC website (www.ltabc.ca).

information can be found in Chapter 6 of GOERT's *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration).

Treat Your Volunteers

Always stop work before people become overly tired. Volunteering for invasive plant removal should be enjoyable, so it is important to stop while folks are still having fun. Then when the next event is scheduled, they are still keen to join in. Also, take breaks and have refreshments and goodies available for your crew - juice and cookies are always appreciated. Invite workers back for a spring flower tour so they can see that their efforts have paid off (take photos!). Getting people engaged in GOE recovery can have a multitude of benefits, including building a sense of community and re-acquainting people with the natural world.

Other Restoration Activities

Restoration in GOEs is not limited to just removing invasive plants. Stewardship groups are involved in hauling Garry Oak leaf mulch, planting native species in meadows, and planning outreach and educational activities. There are as many opportunities as the enthusiasm of the group will allow.

Keep Records

When looking at Garry Oak sites, keep in mind that it is useful to visit at different times of the year, since a species that might be visible one month may be gone by the next month. Keep track of what you see, when, and where you see it. Detailed inventories can help you plan your management activities. Take photographs with dates that can be used to compare before and after treatments. Record the number of person hours that were dedicated to each event since this information can help with securing funding from some agencies. All of this information will also contribute to our knowledge base about controlling invasive species and other restoration activities – helping all of us better protect and restore these endangered ecosystems.

3.5 Home Owners

Home owners in Garry Oak and associated Ecosystems (GOEs) have a unique opportunity to conserve, recreate, or restore one of the most endangered natural landscapes in British Columbia. These ecosystems provide beauty throughout the year and require little water or maintenance. This section provides some suggestions for how home owners can get the most out of GOEs on their properties and in their neighbourhoods.



A few scattered old oak trees in the neighbourhood may be all that is left of a former GOE. These houses are in the TimberCrest development near the Somenos Garry Oak Preserve. Photo: D. Polster

Checklist

- ✓ Assess What You Have
- ✓ Plan to Manage and Restore GOEs
- ✓ Limit Construction and Gardening in GOEs
- ✓ Don't Add Water, Fertilizer, or Pesticides
- ✓ Manage According to the Season
- ✓ Mow for Diversity
- ✓ Manage Invasive Plants
- ✓ Landscape with Native Plants
- ✓ Keep Records



Lorquin's Admiral butterfly (*Limenitis lorquini*) on a Garry Oak leaf. Photo: D. Polster

Assess What You Have

The first step in protecting GOEs is to determine whether you have one on your land and what it contains. Detailed information on site assessment can be found in *Section 1.2 Ecosystems & Species at Risk*. Tools such as the Sensitive Ecosystems Inventory (SEI) for East Vancouver Island and Gulf Islands (www.env.gov.bc.ca/sei/index.html) and the Conservation Data Centre's (CDC) Species and Ecosystems Explorer (www.env.gov.bc.ca/atrisk/toolintro.html) mapping system can be used to identify mapped occurrences of rare ecosystems and species. Contact the CDC directly to request data that may be missing from online tools (cdcdata@gov.bc.ca). The Garry Oak Ecosystems Recovery Team (GOERT) staff can help with on-site evaluation.

Some landowners, especially those in rural areas, may be lucky enough to have an intact GOE on their property. However, for most urban landowners, **it may be hard to tell that you have a GOE on your property**. Due to the development process or years of neglect, there may be only a few remaining native plants associated with GOEs such as a few clumps of Broad-leaved Stonecrop (*Sedum spathulifolium*) on a rocky outcrop. There may be older Garry Oak trees in the neighbourhood that indicate that once this was once a GOE. Taking clues from the surrounding neighbourhood can help identify the potential to develop a beautiful Garry Oak garden.



Stonecrop and moss on a rock outcrop. Photo: C. Junck

The conditions that exist in the neighbourhood can help identify what kind of GOE can be developed (e.g., woodland, meadow, rocky outcrop). If the area is rocky and steep, a shallow soil GOE is the most suitable kind to recreate. If the area is gently sloping with deep soils, a rich camas meadow may be more appropriate. Developing a Garry Oak garden in such a site can be a very fulfilling activity. However,



Louise Goulet's native plant garden in Oak Bay.
Photo: S. Smith



Native shrub hedgerow along a fence.
Photo: K. Dunster



Camas and White Fawn Lilies in bloom at Woodlands at Government House, Victoria.
Photo: C. Junck

developing a showy flower meadow may take many years. Considering and enjoying the *process* of garden development as well as the product is a good way of looking at GOE garden development.

There are a variety of ways to go about developing Garry Oak gardens. GOERT's *The Garry Oak Gardener's Handbook* (www.goert.ca/gardeners) provides excellent information on what needs to be done to develop a successful native garden.

Plan to Manage & Restore GOEs

Before you start, some planning is important to determine where GOEs occur and whether or not there are species at risk at the site. It is essential to have an accurate map that shows all GOEs and any species at risk. The CRD Natural Areas Atlas (www.crdatlas.ca) can be used to create an airphoto base on which to overlay management plans. It is useful to keep your map updated so that new information can be added and data can be updated as new things are found.

Producing a hard copy map with species at risk and invasive plant species locations is an essential tool for planning for management and restoration. Update this map regularly as new information and species are found, and make it available to the relevant people. **Anyone working on the site should have a copy of the map and be aware of locations of species at risk and sensitive areas, particularly vernal pools and seeps.**

If species at risk are found at your site, it is very important to make sure your restoration plan will not cause any harm. A poorly planned restoration can be a major threat to GOEs and species at risk, especially if cut plant material is piled on rare plants or if wildflowers are trampled. Soil disturbance from removing invasive plants can also lead to more invasive plant species becoming established as they quickly colonize bare soil. Seeds of invasive species such as broom or gorse that may be lying dormant in the soil can be stimulated to germinate by soil disturbance.

It is important to plan any restoration project carefully. For more information refer to *Section 2.2 Plan to Manage & Restore GOEs*.

Limit Construction & Gardening in GOEs

The most effective way to retain the values associated with GOEs is to protect them from change. Do not construct buildings or vegetable gardens within GOEs. Even building benches or installing trails can compact the soil and change the way water flows both at the surface and underground. Limiting construction in GOEs maintains hydrologic patterns and prevents the introduction of invasive plants. If you do plan

Inform Your Local Government & Neighbours

Some municipalities are very supportive of naturescaping and encourage landowners to plant native plants. In municipalities that are not as understanding, you may need to explain your garden by talking to neighbours and putting up small signs that explain what you are doing.

In all cases, speak to your municipality to ensure that they are aware of your efforts, to gain their support if possible, and to prevent misunderstandings (for example, problems with bylaws requiring residents to mow “unkempt grass”).

Some land trusts and conservancies offer signs, such as the one below, for home owners who are caring for their land.



Habitat Acquisition Trust (HAT) welcomes inquiries from the public about voluntary land care agreements and “Habitat Steward” signs. The land trust has more than 500 Habitat Stewards throughout the CRD, with dozens of new agreements signed each year. Call 250-995-2428.

to do any construction, please read “Protect GOEs During Construction” in [Section 3.2 Land Developers](#).

Don't Add Water, Fertilizer, or Pesticides

GOEs are well adapted to our local climate, with most plants growing when the soils are wet and becoming dormant during summer droughts. Watering GOEs encourages the growth of invasive species, can rot dormant plants, and weakens the root systems of Garry Oak trees.

There is also no need for fertilizer in GOEs. The plants are adapted to the natural fertility of the native soils, and too much fertility encourages invasive species.

Herbicides and pesticides can harm GOE species and should be avoided wherever possible. Many municipalities now have bylaws restricting pesticide and herbicide use, and permits are required on public, government, and institutional lands. For more information, refer to [Section 2.8 Don't Add Water, Fertilizer, or Pesticides](#).

Manage According to the Season

Our climate, with mild wet winters and warm dry summers, creates very seasonal patterns of growth, dormancy, flowering, and setting seed for the plants in GOEs. This seasonality makes it necessary for management activities in these ecosystems be conducted at appropriate times of the year in order to maximize success and avoid causing damage. Most management activities (e.g., mowing, invasive plant management, vehicle access) should be avoided when the soils are wet from late October until the end of June. Refer to timing window tables in [Section 2.10 Remove Invasive Plants](#) and [Section 2.11 Manage Meadows Through Mowing](#).

However, the late fall and early winter are excellent times for planting native plants. Their roots will grow all winter and they will require less water the following summer than spring plantings. See [Section 2.7 Plant & Maintain Native Species](#).

Mow for Diversity

Mowing is an important tool for managing GOEs. Mowing can be used to control invasive species, limit the encroachment of native shrubs and help shift meadow communities from non-native grasses to native wildflowers. However, careful observation is required to make sure that mowing is done at an appropriate time to avoid mowing while wildflowers are in bloom or setting seed and to avoid harming species at risk. A good understanding of both the native and non-native species present at the site, the site conditions, and the different types of equipment required for any work to be done, will help determine if mowing is an



Shrubby Penstemon (purple) and other native plants in a sunny area of Louise Goulet's Oak Bay garden. Photo: L. Goulet



Western Trillium in a shady area of Louise Goulet's garden. Photo: L. Goulet

appropriate management technique at your site. For more information refer to [Section 2.11 Manage Meadows Through Mowing](#).

Manage Invasive Plants

Controlling invasive plants can be rewarding and challenging. Invasive plant management should be carefully planned to make sure it is doing more good than harm. Depending on your site, the sheer number of invasive plants may be overwhelming. It is important to start in a small manageable area at the edge of the invasion. By working with a manageable task it will make it easier to remain motivated to complete the work. For more information refer to [Section 2.10 Remove Invasive Plants](#) and to the *Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices* (www.goert.ca/restoration).

If you have species at risk on your land, there may be funding available to help you control your invasive plants. Talk to the Garry Oak Ecosystems Recovery Team (www.goert.ca) or your local conservancy group to see if funding is available or refer to the funding sources in [Part 4 Resources](#).

Landscape with Native Plants

The use of native plant species for landscaping reduces water demand and creates beautiful landscapes that require minimal maintenance. There is an amazing diversity of native plants that are well-suited to all different garden conditions from rockeries to shady spots. By planting native species in your yard, you are helping re-connect the fragments of GOEs throughout the region. More information can be found in [Section 2.7 Plant & Maintain Native Species](#). A comprehensive guide to native plant gardening, including a complete list of suppliers of native plants and seed, can be found in the *Garry Oak Gardener's Handbook* (www.goert.ca/gardeners).

In many cases, newly planted areas may need to be fenced in order to protect them from deer, rabbits, and pets. Many native plants will be eaten by deer and will need to be protected at least until they become well established.

Keep Records

When looking at Garry Oak sites, keep in mind that it is useful to visit at different times of the year, since a species that might be visible one month may be gone by the next month. Keep track of what you see, when, and where you see it. Detailed inventories can help you plan your management activities. Take photographs with dates that can be used to compare before and after treatments.

Camas Meadow Project

In the fall of 2010, Fort Rodd Hill and Fisgard Lighthouse National Historic Sites of Canada began the Camas Meadow Project by planting 175,000 camas seeds into 127 propagation flats. The 98,000 surviving bulbs will be outplanted after they have flowered (after 3–4 years of growth) to help restore one acre of mowed turf grasses to a native Garry Oak meadow. Other native species, including a variety of shrubs, forbs, and grasses, have been propagated from seed collected at Fort Rodd Hill and a local private native plant garden. Propagation, site preparation, fencing, development of monitoring protocols, and community outreach are all part of this highly visible restoration project.



Camas (Camassia spp.) seedlings grown for Fort Rodd Hill Camas Meadow Project. Photo: Hailey O'Neill, Parks Canada Agency

3.6 Provincial & Federal Governments

The federal government of Canada and the BC Provincial government have important roles to play in the protection and management of Garry Oak and associated ecosystems (GOEs). Senior governments have a legal obligation to care for GOEs on federal and provincial properties where species at risk are found.

The Species At Risk Act

Although there is no explicit legislation to protect GOEs or other sensitive ecosystems, the *Species at Risk Act (SARA)* protects federally listed species at risk and their habitat. On federal lands, Parks Canada is the *SARA* responsible authority/agency for Garry Oak species at risk. Once Critical Habitat is designated on federal land, Environment Canada is the minister/department responsible to ensure that Critical Habitat has been effectively protected within 180 days. The Canadian Wildlife Service, as part of Environment Canada, is responsible for the protection of Critical Habitat and responsible for enforcement.

Species at risk that do not occur on federal land will be protected by a bilateral agreement between the federal and provincial governments under *SARA's Safety Net Clause*. For Critical Habitat on provincial lands, if the minister is of the opinion that the Critical Habitat is not effectively protected, the minister must within 180 days (6 months) make an order to protect that critical habitat, and post a notice on the *SARA* registry saying what is being done to protect any unprotected critical habitat.

The legal implications of protecting Critical Habitat are evolving, in part through court cases, but it seems that all elements of habitat are addressed. Protecting Critical Habitat may therefore include addressing specific threats that face GOE species at risk including grazing, ATVs, invasive species, and fire suppression. This means that senior governments may be legally obligated to manage and restore GOEs in order to address these threats.

Existing Provincial Legislation

Although species at risk on non-federal lands are protected under *SARA* through the bilateral agreement, the BC provincial legislation that may be used to protect GOEs and species at risk is varied. Legislation includes the *Wildlife Act*, *Wildlife Amendment Act*, *Forest & Range Practices Act*, *Land Act*, *Land Amendment Act*, *Water Act*, *Parks Act* and the *Ecological Reserves Act*. GOERT's *Restoring British Columbia's Garry Oak Ecosystems* contains a thorough description of relevant provincial legislation in Chapter 4 Species & Ecosystems at Risk (www.goert.ca/restoration).

The Conservation Framework

The BC Ministry of Environment's Conservation Framework (www.env.gov.bc.ca/conservationframework) prioritizes species and ecosystems for conservation and provides recommended conservation options. The Conservation Framework ranks B.C. species and ecosystems of conservation concern for management action, based on five clearly defined criteria: global and provincial status; trends; threats; stewardship responsibility; and, feasibility of recovery. It is used to inform conservation activities conducted by the Ministry of Environment and Ministry of Forests, Lands and Natural Resource Operations, and can be used to prioritize GOE protection and management.

The BC Conservation Data Centre (CDC)

The BC CDC (www.env.gov.bc.ca/cdc) is one of the most effective tools for identifying where GOEs and species at risk occur. Knowing where GOEs occur on non-government lands can help senior governments know which properties are desirable for future acquisition. Broad scale mapping is important for high-level planning.

Establishing Formal Protection for GOEs

GOEs can be more formally protected by establishing a Wildlife Management Area, National Wildlife Area, Ecological Reserve, or provincial or national park. These provincial and federal designations help to protect GOEs from development and provide opportunities for public enjoyment of these areas.

An Ecosystem-Based Approach for Species At Risk Protection

Although legislation such as the *Species at Risk Act* is targeted at protecting individual species, an ecosystem approach may be the most effective and cost-effective approach for protecting GOEs. Many GOE sites with species at risk have more than one rare species, sometimes with differing management needs. Protecting all remaining GOEs also ensures there is habitat that can be used for reintroducing species that have been lost. Senior governments can also take steps on their own land to plant native species.

GOERT's Conservation Planning and Site Protection Recovery Implementation Group (www.goert.ca/activities/rig_conservation_planning.php) has identified a list of priority sites which includes detailed inventory and mapping data (where available), and protection and management urgency rankings according to established international methodology. Contact GOERT for these data.

part 4

Resources

4.1 General Resources

BC Conservation Data Centre (BC CDC)

www.env.gov.bc.ca/cdc

The Conservation Data Centre provides information on the species and ecosystems found in British Columbia including those that occur in GOEs. The CDC Species and Ecosystems Explorer (www.env.gov.bc.ca/atrisk/toolintro.html) is a data base of over 6,000 species and over 600 ecosystems that occur in British Columbia. The mapping service provides the latest information on the locations of species at risk and should be consulted prior to any management.

The Conservation Data Centre also provides links to status reports and other information from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (www.cosewic.gc.ca). The Conservation Data Centre portal also provides access to the Sensitive Ecosystems Inventory, Ecological Reports, and a variety of other related information. You can contact the CDC directly (cdcdata@gov.bc.ca) for data requests.

Building Inside Nature's Envelope

Waskowski. 2000. *Building Inside Nature's Envelope: How New Construction & Land Preservation Can Work Together*. Oxford University Press.

Coastal Invasive Plant Committee (CIPC)

www.coastalinvasiveplants.com

The Coastal Invasive Plant Committee is a non-profit society whose goal is to minimize the impacts of invasive plants. The CIPC provides up to date information, including baseline inventory and mapping, on the impacts of invasive plants, and coordinates management of invasive plants. The CIPC works to prevent new introductions and strives to contain, control and eradicate existing invasions.

Capital Region Invasive Species Partnership (CRISP)

www.saanich.ca/parkrec/parks/natural/pdf/13_CRISPPurpose.pdf

A sub-committee of the Coastal Invasive Plant Committee (CIPC).

Develop with Care

www.env.gov.bc.ca/wld/BMP/bmpintro.html#second_

The *Develop with Care* series has been developed by the BC Ministry of Environment to provide province-wide guidelines for the protection of environmental values in British Columbia. The guidelines provide direction for proposed development to make sure activities are in compliance with the appropriate legislation, regulations, and policies. The *Environmental Guidelines for Rural & Urban Land Development* outlines the necessary steps for environmental protection at each stage of development and explains how stewardship can provide benefits for the community, property owner, and developer. There is a specific document for wetland protection and conservation and specific guidelines for restoration involving the re-introduction of rare plants.

Develop with Care: Environmental Guidelines for Urban & Rural Land Development in British Columbia.
www.env.gov.bc.ca/wld/documents/bmp/devwithcare2012

Wetland Ways: Interim Guidelines for Wetland Protection & Conservation in British Columbia.
www.env.gov.bc.ca/wld/documents/bmp/wetlandways2009/wetlandways_docintro.html

Guidelines for Translocation of Plant Species at Risk in British Columbia
www.env.gov.bc.ca/wld/BMP/bmpintro.html#second_

EcoCat: The Ecological Reports Catalogue

www.env.gov.bc.ca/ecocat

EcoCat is the provincial Ministry of Environment's catalogue of digital reports and publications. The information includes maps, datasets, and inventory information including Terrestrial Ecosystem Mapping and Sensitive Ecosystem Inventory.

Eflora & Efauna

www.geog.ubc.ca/biodiversity/eflora

This site is a comprehensive online field guide. It provides photos, illustrations, maps, and descriptions of all plant and animal species found in BC. It is a great resource for checking the identification of plants and animals.

Garry Oak Ecosystems Recovery Team (GOERT)

www.goert.ca

The Garry Oak Ecosystems Recovery Team is a broad partnership devoted to the protection and recovery of GOEs. GOERT has developed an extensive library of references on everything from restoration of GOEs to field manuals to help identify species at risk.

The following is a partial list of publications that will be useful supplements to this *Best Management Practices for Garry Oak & Associated Ecosystems*:

Protecting Garry Oak Areas During Land Development
www.goert.ca/industry

The Garry Oak Gardener's Handbook: Nurturing Native Plant Habitat in Garry Oak Communities. Second Edition.
www.goert.ca/gardener

Species at Risk in Garry Oak & Associated Ecosystems in BC
www.goert.ca/publications_resources/species_at_risk.php

Invasive Species in Garry Oak & Associated Ecosystems in BC
www.goert.ca/invasive

A Quick Guide to Garry Oak Ecosystem Restoration
www.goert.ca/gardeners_restoration/quick_guide.php

Planting & Caring for Garry Oaks
www.goert.ca/gardeners_restoration/garryoak_trees.php

Dealing with Deer
www.goert.ca/gardeners_restoration/dealing_with_deer.php

General Decision Process for Managing Invasive Plant Species in Garry Oak & Associated Ecosystems (includes an algorithm to help set priorities for invasive species removal)
www.goert.ca/invasive

Restoring British Columbia's Garry Oak Ecosystems: Principles & Practices
www.goert.ca/restoration

Native Plant Propagation Guidelines
www.goert.ca/propagation

Green Bylaws Toolkit

www.greenbylaws.ca

The *Green Bylaws Toolkit* and the new addendum *Model Bylaws for the Protection of Garry Oak & Associated Species & Ecosystems* provide comprehensive information on the different types of protection measures that can be used by all levels of local government.

Invasive Species Council of British Columbia (ISC)

www.bcinvasives.ca

The Invasive Species Council of BC has a Report-a-weed hotline number and provides information on how to prevent the spread of invasive species. There are links to outreach materials including best management practices for controlling invasive plants on roadsides and “Grow Me Instead” booklets that recommend alternatives to “BC’s most unwanted” horticultural plants.

Sensitive Ecosystems Inventory (SEI)

www.env.gov.bc.ca/sei

The Sensitive Ecosystem Inventory has systematically identified and mapped all rare and fragile ecosystems on Southern Vancouver Island and the Gulf Islands. The mapping is derived from air photos and some of the sites have been ground-truthed. This mapping is an important tool for determining if you have GOEs on your land and for broader scale land-use planning exercises.

South Puget Sound Prairie Landscape Working Group

www.southsoundprairies.org

The South Sound Prairie working group is a group comprised of conservation organizations in addition to state, county, and federal agencies that is working towards conservation actions in South Puget Sound Prairies. These prairies have many of the same species as GOEs and there has been significant work in developing the restoration and management of these systems.

Prairie Landowner Guide for Western Washington & a Landowner’s Guide for Restoring & Managing Oregon White Oak Habitats

www.southsoundprairies.org/prairie-oak-guides

4.2 Tax Incentive Programs

Ecological Gifts

www.ec.gc.ca/pde-egp

Environment Canada’s Ecological Gifts Program offers tax incentives for the protection of ecologically sensitive land. In exchange for a donation of land or an interest in land (e.g., conservation easement, covenant or servitude), donors are given a tax credit or deduction as well as a reduction in the taxable capital gain.

Natural Area Protection Tax Exemption Program (NAPTEP)

www.islandstrustfund.bc.ca/initiatives/privateconservation/naptep.aspx

NAPTEP provides up to 65% tax exemption for property owners that protect significant environmental features of their land.

4.3 Funding Opportunities

BC Conservation Foundation (BCCF)

www.bccf.com/land-for-wildlife

BCCF’s Land for Wildlife Fund provides funds for the purchase of land for conservation.

BC Gaming

www.pssg.gov.bc.ca/gaming/grants/community-gaming.htm

Community Gaming Grants are available for non-profit organizations to benefit the broader community, including the environment.

BC Hydro Fish & Wildlife Compensation Program (FWCP)

www.bchydro.com/toolbar/about/sustainability/environmental_responsibility.html

The FWCP grants are available for projects that protect and enhance habitat for fish and wildlife and their habitat.

Canadian Wildlife Foundation (CWF)

www.cwf-fcf.org

CWF's Funding Program provides funding for non-profit organizations and affiliates for conservation and education programs related to wildlife and research.

Environment Canada

www.ec.gc.ca/eee-ias

Environment Canada has a range of funding opportunities that may be used for work in GOEs where species at risk occur. These include the following:

- **Habitat Stewardship Program (HSP)**
HSP has funds available for the conservation and protection of COSEWIC listed species on any non-federal property. GOEs are one of their priority areas.
- **Interdepartmental Recovery Fund (IRF)**
IRF provides funding for federal departments and departmental corporations to conduct species at risk surveys and other recovery activities on lands that are federally owned or under federal jurisdiction.
- **Endangered Species Recovery Fund (ESRF)**
ESRF can be used to fund applied research and education projects on endangered species and their habitat.
- **Aboriginal Funds for Species at Risk (AFSAR)**
AFSAR provides funds to support implementation of the Species at Risk Act by Aboriginal communities and protect species at risk and their habitat on First Nation land.
- **EcoAction**
EcoAction provides funding for non-profit groups for projects with an action focus, community capacity building focus or both. One of EcoAction priorities is the protection of wildlife and plants

Habitat Conservation Trust Foundation (HCTF)

www.hctf.ca

HCTF provides funds for projects relating to BC fish, wildlife, and their habitat through the Public Conservation Assistance Fund and the Conservation Education Assistance Fund.

Mountain Equipment Co-op (MEC)

www.mec.ca/AST/ContentPrimary/Sustainability/CommunityContributions.jsp

MEC has grants available for land acquisition, capacity building for conservation organizations, research, advocacy, and education that may be applied to GOEs.

Natural Areas Conservation Program

www.ec.gc.ca/default.asp?lang=En&xml=782EBD4F-60D5-4895-9D7A-46A378A100C3

Environment Canada's Natural Areas Conservation Program provides funding for non-governmental organizations for the acquisition of sensitive lands through donation, purchase or stewardship agreements.

Royal Bank of Canada Blue Water Project

www.rbc.com/community-sustainability/apply-for-funding/guidelines-and-eligibility/blue-water-pre.html

The Blue Water Project provides Leadership Grants and Community Action Grants for watershed protection.

Salt Spring Island Foundation

www.saltspringislandfoundation.org

The Salt Spring Island Foundation provides grants to organizations that benefit the citizens of Salt Spring Island.

Shaw

www.shaw.ca/Corporate/About-Shaw/Community-Initiatives

Shaw Quarterly Grants Program provides funding for organizations that impact local communities.

Shell Fuelling Change

www.shell.ca/en/environment-society/environment-tpkg/fuellingchange.html

Fuelling Change grants money to environmental projects related to land, air, and water.

TD Friends of the Environment Foundation

www.fef.td.com

TD Friends of the Environment Foundation provides funds for environmental projects including greening of schoolyards and environmental education.

Vancity

www.vancity.com/MyCommunity/NotForProfit/Grants/enviroFund

The Vancity EnviroFund provides funds for ecosystem preservation and restoration and the Community Project Grants support creating sustainable places to live.

Vancouver Foundation

www.vancouverfoundation.ca

In general, Vancouver Foundation supports growth and innovation through project-based grants for new initiatives. Their environment grants support the health and resilience of British Columbia's environment in a changing world.

Victoria Foundation

www.victoriafoundation.bc.ca/granting

The Victoria Foundation's Environment Fund provides funds to support environmental programs that benefit residents of Victoria.

Walmart Evergreen

www.evergreen.ca/docs/forms/Walmart-Evergreen-Guide-2012EN.pdf

Evergreen grants are available to community groups for restoration activities including removing invasive species, mulching, site maintenance, monitoring, planting native plants, and public outreach.

Wildlife Habitat Canada

www.whc.org/conservation/conservation-grants

Wildlife Habitat Canada's conservation grants provide funding for habitat conservation projects.

World Wildlife Foundation (WWF)

www.wwf.ca

WWF has Green Community School Grants available for environmental initiatives in elementary or secondary schools.



Garryoak ecosystems recovery team

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