

Decision Support Tool for Invasive Species in Garry Oak and Associated Ecosystems

WHAT is this Decision Support Tool for?

Garry oak and associated ecosystems are among British Columbia's most valuable and most threatened ecosystems. They are home to over 90 species designated as "at risk" in the province, and many of these are also at risk nationally and globally. Less than 5% of the original habitat in BC remains in a near-natural condition, and invasions of non-native species pose a serious threat to remaining ecosystems. **This tool will help you make decisions regarding whether, and how, to manage invasive species in Garry oak and associated ecosystems (GOEs) in BC.**

This is a decision support tool, not a decision making tool. It will provide you with guidance regarding the identification of an invasive species problem and management options for dealing with its control, and point to other sources of information that may help. It will still be up to you to consider all the information at hand to make a final informed decision. Please also recognize that invasive species control is only one aspect of ecosystem restoration and should be part of a larger restoration plan or strategy for the GOE.

This tool currently only covers selected invasive plant species. The plan is to expand the tool to address other species in the future.

WHO should use this decision support tool?

This tool is intended for groups of people who are interested in engaging in well-planned stewardship activities over a period of several years. This includes agencies with management authority over GOEs (e.g. municipal or regional governments) led by ecosystem managers who have on-the-ground experience with GOEs, and local non-governmental groups (e.g. "Friends Of" groups) interested in GOEs under the leadership of someone knowledgeable about these ecosystems. The tool may also be used by private landowners interested in managing GOEs on their property, if they have some knowledge of GOEs or will work in association with someone who has this knowledge. **This tool is not meant for "weekend warriors" who want to just go pull up weeds.** Without sufficient planning and care, you may do more harm than good. If you want to contribute to such efforts, look for more organized groups to join - your energy will be welcome!



Garry Oak
Ecosystems
Recovery Team

Canada

NATURE
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CANADA

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DE LA NATURE
CANADA

Citation

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Feedback

We are very interested in learning what you think of this tool. Is it helpful? Is it easy to use? Are there any parts of it that you find particularly useful or more difficult? Please let us know! We would very much appreciate hearing from you. (An Evaluation Sheet is provided at the back for your convenience.) Please provide your comments via fax or email to:

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Acknowledgements

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In addition, the assistance of the following experts has been integral to developing this tool, and is greatly appreciated: Louise Blight, Ron Carter, Adolf Ceska, Patrick Dunn, Tim Ennis, Marilyn Fuchs, Richard Hebda, Laura Hooper, Andrew MacDougall, Willie MacGillivray, Carrina Maslovat, Edo Nyland, Eileen Palmer, Briony Penn, Raj Prasad, Hans Roemer, Andrea Schiller, and Joel Ussery.

¹ The Habitat Stewardship Program for Species at Risk is a partnership-based conservation initiative sponsored by the Government of Canada. The Program is managed cooperatively by Environment Canada, the Department of Fisheries and Oceans and Parks Canada, and administered by Environment Canada.

² http://www.ec.gc.ca/press/2001/011107_b_e.htm

³ <http://www.natureconservancy.ca/files/index.asp>

³ <http://www.goert.ca>

Table of Contents

INTRODUCTION

How To Use This Decision Support Tool.....	1
What You Should Know Before You Start	2
The Decision Support Tool Framework.....	3

INSTRUCTIONS

PART A: ECOSYSTEM CHARACTERIZATION 1

1. Is the site a "Garry oak or associated ecosystem" (GOE)?.....	2
2. What are the site characteristics?	3
3. What invasive species are present?	5

PART B: RISK ASSESSMENT 7

4. Which species pose the greatest threat?.....	8
5. What are the risks of action versus no action?.....	10
6. Proceed with management and control?	11
6, continued. For which species?	12

PART C: MANAGEMENT ACTIONS..... 13

7. Assess (Scotch broom).....	14
7. Assess (English ivy).....	17
7. Assess (Blackberry).....	20
8. Design	23
9. Implement.....	24
10. Monitor.....	24
11. Evaluate.....	25
12. Adjust	25

RECORDING SHEETS

For Questions 1-2.....	1
Sketch map of the GOE.....	2
For Question 3	3
For Question 4	4
For Question 5	5
For Question 6	6
Record of Decision:.....	6
For Step 8	7
Record of Management Plan:	8
For Step 9	9
For Step 10	10
For Step 11.....	11
Record of Learning:.....	11

REFERENCE

Glossary1
Plant and Animal Species at Risk in Garry Oak and Associated Ecosystems in BC 2
Susceptibility of Vascular Plant Species at Risk in GOEs in BC to Scotch broom 6
Exotic Species in Garry oak and associated ecosystems in BC as of February 2002 8
 Plant Species..... 8
 Vertebrate Species11

NOTES

EVALUATION SHEET

INTRODUCTION

How To Use This Decision Support Tool

This decision support tool is divided into different sections:

INTRODUCTION Background information regarding the decision support tool and how it works, and what you need to know before you start.

INSTRUCTIONS The "guts" of the decision support tool: questions you need to answer in order to help you decide what to do. The **INSTRUCTIONS** are organized according to an overall framework, which is shown on page 3 of the **INTRODUCTION**.

Some of the questions in the **INSTRUCTIONS** section can be answered at home, and are indicated by a desk icon:



Some of the questions in the **INSTRUCTIONS** section must be answered in the field, and are indicated by a tree icon:



RECORDING SHEETS Where you will record information, provide answers and note your decisions according to the **INSTRUCTIONS**. Please carefully record the information as indicated. This will not only help you organize and remember the information you collect and the decisions you make, but will also provide an information sheet you can share with others. This is critical to expanding our collective base of knowledge about how to manage invasive species in *GOEs*.

If you intend to use this tool in different *GOEs*, you will need to print out a set of **RECORDING SHEETS** for each *GOE* you will be managing.

REFERENCE Reference materials that may help you answer the questions listed in the **INSTRUCTIONS**. There is a glossary, a list of species at risk that can be found in *GOEs*, a list of species at risk that are vulnerable to broom, and a list of exotic species currently threatening *GOEs*.

There is also a page at the back for miscellaneous **NOTES**, and an **EVALUATION SHEET** that we would very much appreciate you filling out and sending back to us! The header and footer at the bottom of each page tell you what section you are in.

We recommend printing this document, 3-hole-punching it, and placing it into a three ring binder. Inserting tabbed dividers between the different sections will also make it easier to flip between the **INSTRUCTIONS** and the **RECORDING SHEETS**.

What You Should Know Before You Start

Consult with the Landowner or Land Steward

Get permission from the landowner or land steward (unless that is you!) before going any further. The land may be privately owned, or owned by government (municipal, regional, provincial/state, or federal). There is no use in spending time assessing the need for invasive species control action if you do not have permission to undertake such action. You may also learn of management plans, conservation covenants or control initiatives already underway that will affect potential decisions regarding invasive species control on the GOE.

Be Prepared to Make a Long-term Commitment

Management and control of invasive species requires a long-term commitment. As you know, weedy invaders are persistent. Success may require repeated treatments over several years. It is also necessary to return to the GOE for several years to monitor whether the control treatments worked, and to learn if there were any unexpected results. You do not have to do this alone! For example, you can engage the assistance and participation of other groups. However, be aware that effective control of invasive species involves much more than spending one weekend pulling out plants. Are you willing to make this commitment?

Be Prepared to Keep Detailed Records

There is a lot we still need to learn about how best to successfully manage and control invasive species in GOEs. Filling these knowledge gaps requires careful documentation of what is done, where, when and why, and careful monitoring of the results. Are you prepared to record and share this information with others committed to GOE restoration?

Recognize that Considerable Assessment is Needed Before Taking Action

There are several questions you will need to answer in order to make decisions about whether, and how, to manage invasive species in GOEs, and it may take you a few days to work your way through these questions. Answering them will also require some field assessments, for which you will need the following equipment:

- ✓ This decision support tool
- ✓ "Illustrated Flora of British Columbia", and "Plants of Coastal British Columbia" (try to borrow these, if you don't own them)
- ✓ Camera
- ✓ Map of the GOE and surrounding vicinity
- ✓ Trowel
- ✓ Tape measure (100 m)
- ✓ Pencil and eraser
- ✓ Clipboard with Recording Sheets (discussed later) and extra paper
- ✓ Flagging tape
- ✓ Magnetic bearing compass

Be Prepared to Solicit Expert Help

There are a few places where the tool may recommend that you bring in an expert to help you. For example, you need to have a good understanding of the "species at risk" that are present and may be particularly vulnerable to invasive species control methods. Some of the species at risk in the GOE may even rely on invasive species for food or habitat. You will likely need to ask one or more experts in rare species identification to visit the GOE and help you with your assessment.

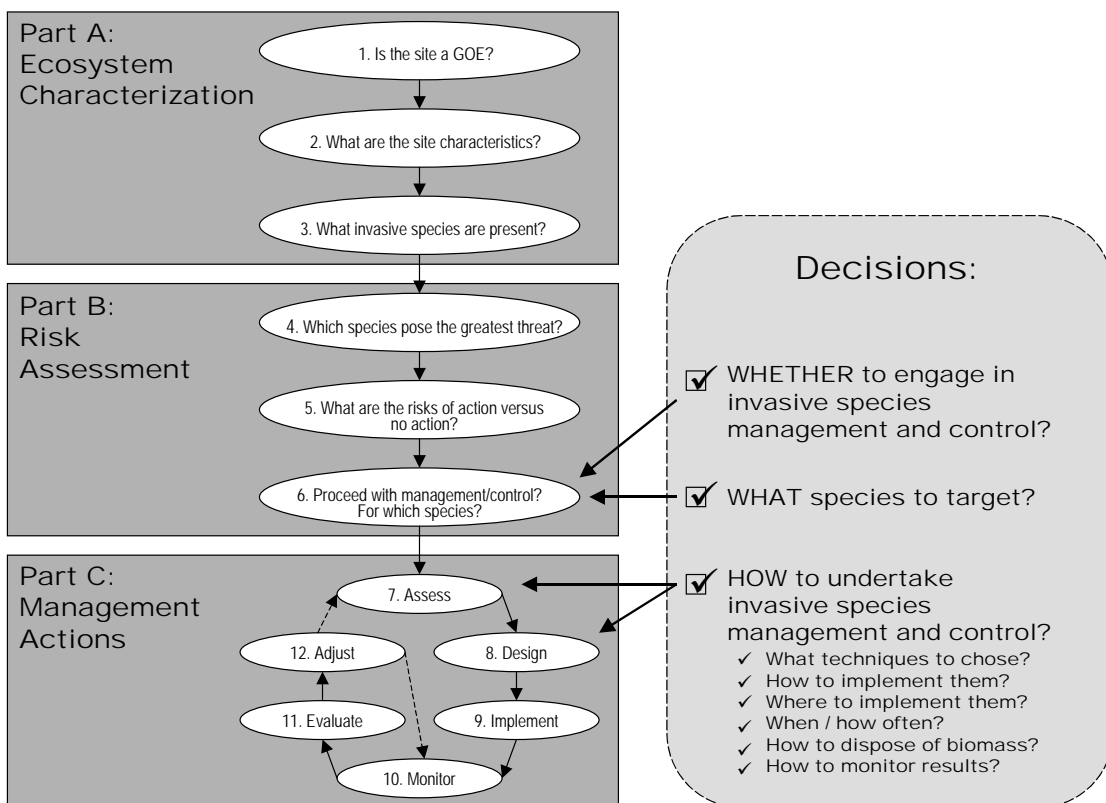
☞ **Read through the whole tool before using it so you know what to expect!** ☞

The Decision Support Tool Framework

The INSTRUCTIONS are organized according to a three-part framework:

- Part A: Ecosystem Characterization** Ecosystem types and characteristics to identify for the area being considered for management.
- Part B: Risk Assessment** Important issues to consider in deciding whether to manage invasive species, and which ones to focus on.
- Part C: Management Actions** Guidance on how to choose the appropriate invasive species management actions.

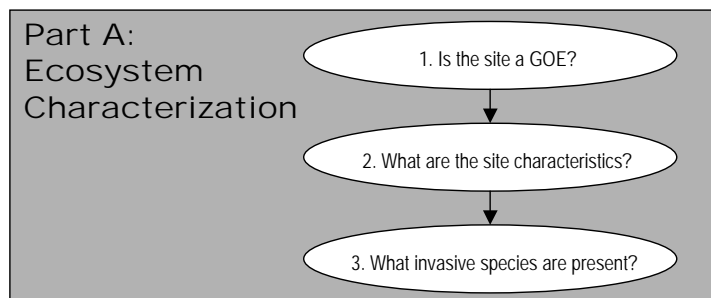
The INSTRUCTIONS lead you sequentially through Questions 1-3 in Part A and Questions 4-6 in Part B, which will help you decide *whether* to manage for invasive species. If your decision is "yes" then the INSTRUCTIONS will lead you through Steps 7-12 in Part C, which will help you decide *how* to manage for invasive species. There are INSTRUCTIONS for each question in the framework, and RECORDING SHEETS for most of them.

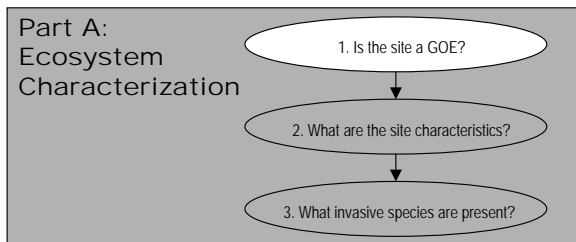


There is bound to be uncertainty with a number of these questions. Rather than being a reason for doing nothing (although there will be times when "no action" is the best decision, all things considered), uncertainty may provide an opportunity to learn through *adaptive management*, an approach designed specifically to accommodate uncertain management situations. This approach is incorporated into Part C of the tool.

INSTRUCTIONS

Part A: Ecosystem Characterization



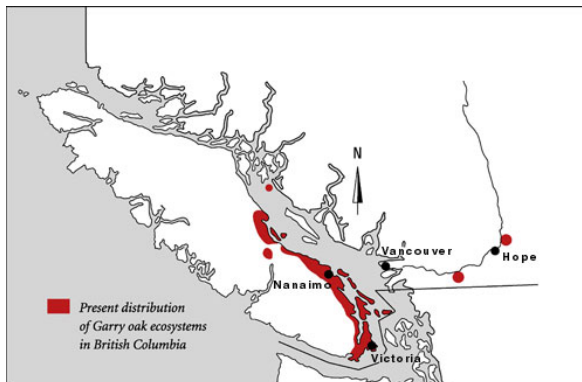


1. Is the site a "Garry oak or associated ecosystem" (GOE)?

A Garry oak ecosystem is: any ecosystem with natural occurrence of Garry oak trees, and some semblance of native plant communities and natural ecological processes.

A Garry oak ecosystem is not: a backyard with Garry oak trees, a lawn and other non-native plants.

An associated ecosystem is: one that does not have a predominance of Garry oak trees, but supports many of the same plants and animals.



Garry oak ecosystems in BC comprise a wide variety of habitats. Varying from savannah to parkland, and to open and closed woodlands, they also include forests with mixed canopies comprising Garry oak, arbutus, Douglas-fir and other tree species.

Interspersed with Garry oak ecosystems are other ecosystem types that do not have Garry oak trees, but which support many of the same plant and animal species. These associated ecosystems share other

characteristics in common with Garry oak ecosystems, such as similar climatic influences, soils, disturbance histories and ecological processes. They also share many of the same threats to long-term ecosystem survival. Maritime meadows, coastal bluffs, vernal (spring/seasonal) pools, grasslands, and rock outcrops without oak cover fall within this category. These associated ecosystems may or may not occur immediately next to a site with Garry oak trees. Also included are transitional forests that include a Garry oak component.

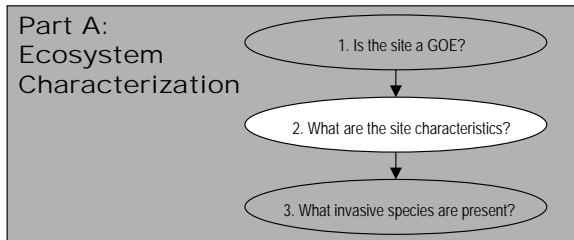
(Map ©Province of British Columbia)

Need help? Try browsing websites that can tell you more about Garry oak ecosystems, e.g.:






- <http://www.goert.ca/ecoinfo/what.htm>
- <http://www.for.gov.bc.ca/hre/becweb/publications-garryoak.htm>
- <http://www.garryoak.bc.ca/>
- <http://wlapwww.gov.bc.ca/wld/documents/garryoak.pdf>

← Write the answer on the RECORDING SHEET for Questions 1-2.

[If the site is not a GOE, you can still use the tool - just be aware that it is designed for GOEs, and other ecosystems may require consideration of factors not covered in this tool.]



2. What are the site characteristics?

- a) Look at the land beyond the boundaries of the GOE. What are these lands used for? You should be able to determine this from maps of the area or your knowledge of the site. 
- b) Does the GOE have any protected status? For example, is it a park, or does it have a conservation covenant? The landowner should have this information. (Remember, you should have consulted the landowner first thing!) 
- c) Are there any management objectives for the GOE? There may not be any documented, but you should find out the management intentions of the landowner. If such objectives exist, they will likely be stated in some sort of management plan or conservation covenant. 
- d) What types of activities is the GOE used for? Common answers may include recreation (e.g. hiking, dog walking, cycling), nature appreciation (e.g. birdwatching), or harvesting (e.g. berry picking). If you live in the area you may already know the answer(s). If not, you may need to talk to local residents and local special interest groups (e.g. natural history groups) or spend some time in the GOE observing what people do there. 
- e) Are there any "species at risk"⁴ on the site? In particular, are there any species at risk that are particularly vulnerable to invasive species control methods, or that rely on invasive species for habitat? If you are not skilled in recognizing species at risk, engage the assistance of experts in identifying rare species. Contact the BC Conservation Data Centre⁵ to find out if any rare species surveys or mapping have already been carried out at the site. (Be aware that some species are not visible in certain seasons. If you conduct this site assessment in the fall, and end up deciding to take management action in late spring, you should conduct another site assessment in the spring to ensure you have not missed anything important.) 
- f) What is the quality of the ecosystem?
 High quality: fairly undisturbed and in relatively natural condition.
 Medium quality: somewhat disturbed or altered from a natural state, but still considered restorable, with effort.
 Low quality: greatly disturbed or altered from a natural state, and restoration - if possible - would require tremendous effort and resources.

← Write the answer on the RECORDING SHEET for Questions 1-2.

⁴ A species deemed to be in danger of disappearing from the wild (further explained in the GLOSSARY)

⁵ CDC website: <http://srmwww.gov.bc.ca/cdc/> E-mail: cdcdata@victoria1.gov.bc.ca Phone: (250) 356-0928, or toll free through Enquiry BC at 1-800-663-7867

2, continued.

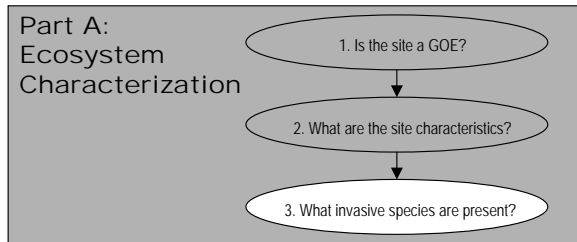
Now draw a rough sketch map of the GOE or portion of the GOE that you intend to consider, using the RECORDING SHEET designated for this.



Include in the sketch map:

- Paths, roads, and access points
- Buildings and other man-made structures
- Water courses (creeks, streams) and water bodies (ponds, pools) - including those that may not have water year round
- Particularly steep areas
- Particularly rocky areas
- The locations of vulnerable species at risk
- Habitat types⁶
 - Oak woodlands or forest
 - Mixed Douglas-fir, Arbutus, oak woodlands or forest
 - Conifer forest (with or without Arbutus)
 - Tall rock cliffs
 - Very exposed, dry grassland slopes
 - Very thin soils / short turf over rock, slightly seepy in spring
 - Vernal pools and seeps (i.e. wet in the spring)
 - Flat, vernal wet meadow (usually on clay)
 - Marine shoreline vernal seeps and pools on shallow soil
 - Marine shoreline short turf due to extreme exposure
 - Maritime meadows (lush, but no tall vegetation due to exposure)
- Arrow showing north

⁶ From Hans Roemer



3. What invasive species are present?

Conduct a thorough visual survey of the *GOE*. Are any of these species present? This can be done in any season, but the winter is preferable because the invasives listed below are all easily visible in the winter and their extent can be more clearly identified when other vegetation is dormant.



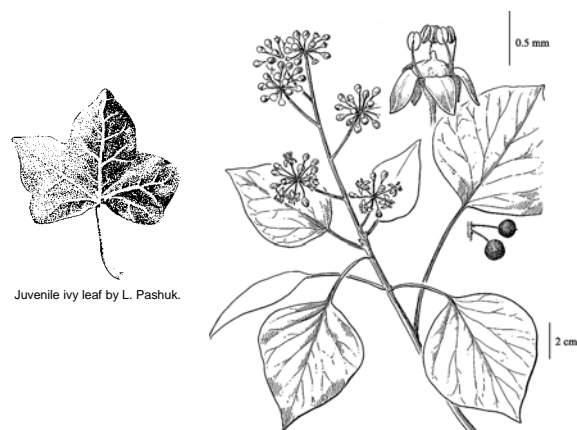
From the *Vascular Plants of the Pacific Northwest* by C.L. Hitchcock et al. © 1955-1969. Reprinted by permission of the University of Washington Press.

Scotch broom (*Cytisus scoparius*)



From the *Vascular Plants of the Pacific Northwest* by C.L. Hitchcock et al. © 1955-1969. Reprinted by permission of the University of Washington Press.

Himalayan blackberry (*Rubus armeniacus/discolor/procerus*)



From the *Vascular Plants of the Pacific Northwest* by C.L. Hitchcock et al. © 1955-1969. Reprinted by permission of the University of Washington Press.

English ivy (*Hedera helix*)



© Province of British Columbia

Evergreen blackberry (*Rubus laciniatus*)

4, continued.

The following is NOT an invasive species! It is native to GOEs, but is similar to evergreen blackberry and is shown here to help ensure that you do not confuse them. If you are uncertain whether you are looking at evergreen blackberry or dewberry, seek expert advice. (You should never entertain any invasive species management actions unless you are sure that the species you are targeting are invasives.)

**Dewberry (*Rubus ursinus*)**

(A native species that can be confused with invasive blackberries)

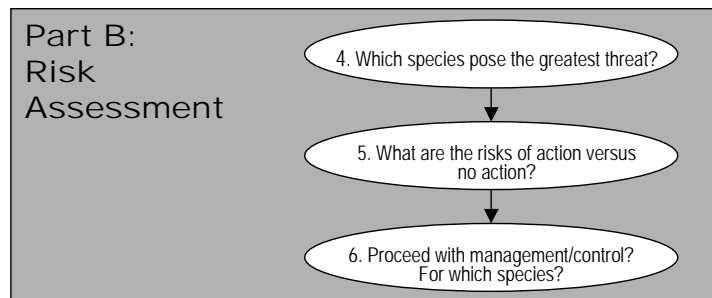
Need help? Consult plant identification books and websites, e.g.:

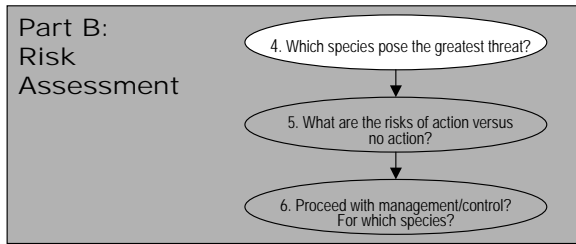
- Pojar and MacKinnon (editors). 1994. Plants of Coastal British Columbia. Lone Pine Publishing, Edmonton, Alta. (also published as Plants of the Pacific Northwest Coast)
- Douglas, Straley, Meidinger, and Pojar. 1998. Illustrated Flora of British Columbia. Vols. 1, 3 & 4. Ministry of Environment, Lands and Parks and Ministry of Forests, Victoria, B.C.
- Scotch broom: http://24.43.24.85/nbs/ipcan/bc_broom.html
- English ivy: <http://www.nps.gov/plants/alien/fact/hehe1.htm>
- Himalayan blackberry: <http://tncweeds.ucdavis.edu/esadocs/rubudisc.html>

Still need help? Engage the assistance of an experienced botanist and have them accompany you to the site. Make sure you take along your recording sheets for taking further notes.

- ➡ Write the answer on the RECORDING SHEET for Question 3, and add the locations of the invasive species to the sketch.

Part B: Risk Assessment




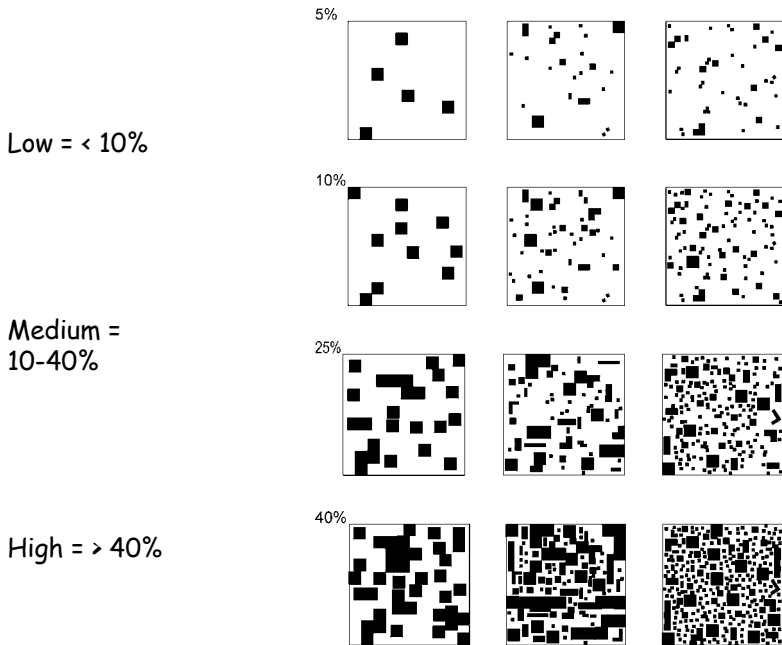



4. Which species pose the greatest threat?

This depends on two factors: *degree of invasion*, and *significance of impact*. Invasive species that pose the greatest threat to natural communities, and the most important to target in management activities, are those that are just beginning their invasion into relatively undisturbed habitats, and those that have the greatest potential to damage the ecosystem once they are well established.

To determine degree of invasion, consider the following 2 factors for the invasive species listed:

- a) What is the density of the invasive species in the GOE? Use the following density diagrams for guidance: 



- b) What is the degree of establishment within the GOE? Is the species just beginning to establish (plants still young or immature) or is it well established (the plants will be old or mature)? 

☛ For each question, and for each invasive species, select the most appropriate answer in each cell in the table on the RECORDING SHEET for Question 4. (If a the listed invasive species is not present, just ignore that column.)

4, continued.

➤ Continue to fill out the table on the RECORDING SHEET for Question 4.

- c) In each column, add the numbers in the square brackets beside the answers you checked for questions a) and b) and write the sum in this row for "degree of invasion". In the example below, for Scotch broom we added 1+1 for a total of 2.



a) low [1]	1
b) just beginning to establish [1]	1
Sum =	2

- d) The "significance of impact" factor has already been determined for you by experts⁷, based on a ranking of the top ten invasive plant species most threatening to GOEs. The closer this number is to "1", the greater the significance of the impact.

- e) For each column, add the numbers from c) and d) and write the sum in the e) row (total). For the example below, the sum for Scotch broom is: 2 + 1.8 = 3.8.



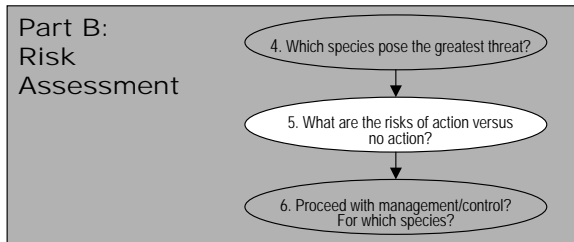
- f) Then write "1", "2" or "3" in the last cell for each row, depending on what the total was on the line above. The lowest total should be ranked "1", and the highest ranked "3". In the example below, Scotch broom is rated as a 1, because the total for broom was lower (3.8) than the total for ivy (14.5) or blackberry (10.7).

**EXAMPLE:**

	Scotch broom	English ivy	blackberry	
a) Density within the invaded areas in the GOE	<input checked="" type="checkbox"/> low [1] <input type="checkbox"/> medium [3] <input type="checkbox"/> high [5]	<input type="checkbox"/> low [1] <input type="checkbox"/> medium [3] <input checked="" type="checkbox"/> high [5]	<input checked="" type="checkbox"/> low [1] <input type="checkbox"/> medium [3] <input type="checkbox"/> high [5]	← Select the most appropriate answer
b) Degree of establishment in the GOE	<input checked="" type="checkbox"/> just beginning to establish [1] <input type="checkbox"/> somewhat established [3] <input type="checkbox"/> well established [5]	<input type="checkbox"/> just beginning to establish [1] <input type="checkbox"/> somewhat established [3] <input checked="" type="checkbox"/> well established [5]	<input type="checkbox"/> just beginning to establish [1] <input checked="" type="checkbox"/> somewhat established [3] <input type="checkbox"/> well established [5]	← Select the most appropriate answer
c) Degree of invasion (a + b) →	2	10	4	← Add a) + b)
d) Significance of Impact	1.8	4.5	6.7	← Provided for you
e) Total (c + d) →	3.8	14.5	10.7	← Add c) + d)
f) Rank of totals (=Threat Rating) →	1	3	2	← Rank the e)'s

The species ranked "1" in row f) poses the greatest threat. In the example above, Scotch broom poses the greatest threat, because it is in earlier stages of invasion and it also has the most significant impact once it has invaded. Blackberry is ranked second, because although it does not have as significant an impact as ivy, in this example it is not as well established yet as ivy, and a serious blackberry invasion can still be prevented.



⁷ From the February 2002 report entitled "Towards a Decision Support Tool to Address Invasive Species in Garry Oak & Associated Ecosystems in B.C." (<http://www.goert.ca/assets/docs/GOEDSTreport.pdf>).





5. What are the risks of action versus no action?

In this section you must look at some of the risks of invasive species control actions.


Risk to "species at risk"

- a) Are there species at risk that will likely suffer from the *control efforts* for invasive plant species? In other words, are any species at risk in the GOE particularly vulnerable to the types of disturbance that might be caused by invasive plant removal activities? Is the vulnerability only during defined periods or seasons, which you might be able to avoid through careful scheduling of control activities? You will likely need to consult with someone knowledgeable about the species at risk. Note: do not just look at species at risk near the current invasions; invasive species may appear in the future in locations where there are currently none, so you should consider this question for the whole GOE. 
- b) Are there species at risk in the GOE that may suffer from the *absence* of any of the listed invasive species? That is, are any of these invasives providing valuable habitat (e.g. food, shelter) for species at risk? You will likely need to consult with an experienced botanist (to learn about potential ecosystem services these invasive plant species might provide), as well as someone knowledgeable about the species at risk. 

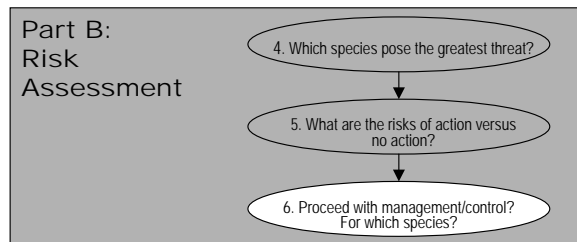
Risk of outcry from neighbours

- c) Are the invasive species listed performing a valued service to people? For example, they may provide edible berries, provide a visual buffer, help prevent undesired access, or provide habitat for species not designated "at risk" that people still care about. Ask the landowner, people you see using the GOE, and local neighbours. 
- d) What sort of local reaction would you expect from efforts to control the invasive plant species that are listed? Ask the landowner; they may have some idea. You may also need to conduct an informal poll of a representative selection of nearby residents. 

Legal Risk

- e) Is there a legal requirement to control for any of these invasive species? For example, are there any laws or bylaws that require landowners to control any of the invasive species listed in the tool? 

➡ Write the answers on the RECORDING SHEET for Question 5.



6. Proceed with management and control?

Consideration of the following factors will help you decide if you should proceed with management and control.



For each question, think about whether your answer would sway you towards proceeding with invasive species control or management, or not proceeding, and check the appropriate cell in the table on the RECORDING SHEET for Question 6. Note: If invasive species present in your GOE include Scotch broom, English ivy and/or blackberry, we strongly suggest that you proceed with management and control, provided you can answer yes to Questions 6d), 6g) and 6h) below:

- What is the **ecological value** of the GOE: is it "worth saving"? If it is already severely degraded from its natural state, your efforts may be better spent on an alternative GOE. To answer this question consider your answers to Questions 2a), 2b), 2c), and 2f).
- What is the **degree of disturbance** on adjacent land? If all the surrounding land is subject to frequent physical disturbance, or comprises thick and expansive tracts of invasive species, your efforts may be better spent on an alternative GOE. To answer this question, consider your answer to Question 2a).
- Are invasive species control efforts in line with the **management objectives** for the GOE (if such objectives exist)? Consider your answers to Questions, 2c) and 5d).
- Will the **species at risk** that are present in the GOE be "safer" by controlling the invasive species in the GOE, or by leaving things as they are? To answer this question consider your answers to Questions 5a) and 5b).
- Would you expect a strong negative reaction from the **local community** if you take action against invasive species? Consider your answers to Questions 2d), 5c) and 5d).
- Is the GOE in a jurisdiction (municipal, regional, provincial) with **laws or bylaws** requiring control of invasive species? Refer back to your answer for Question 5e).
- Control and management of invasive species requires repeat treatments and monitoring. Are you willing to make a **multi-year commitment** to this?
- Do you have **sufficient resources** (e.g. funding, staff or volunteers) to undertake invasive species management and control over a period of several years?

6, continued. For which species?

If you decide to proceed, you must now decide on which species to control.



If there is only one invasive species in the GOE, then this decision is simple - select the species that is present. However, if there are several invasive species in the GOE, you may not have the resources to tackle all of them and will therefore need to prioritize them. The "Which Species?" table on the RECORDING SHEET for Question 6 will help you do this.

In row i) for "Degree of invasion", fill in the number for each species as calculated in question 4c). The values for "Significance of impact", "Urgency of control" and "Difficulty of control" have already been determined for you by the experts. Then, for each species, sum the numbers from i) through l) and write the total in row m).

EXAMPLE:

Which species?	Scotch broom	English ivy	blackberry	
i) Degree of invasion →	2	10	4	← From Question 4c)
j) Significance of impact	1.8	4.5	6.7	← Provided for you
k) Urgency of control	2.8	4.2	6.2	← Provided for you
l) Difficulty of control	3.8	4.3	7.2	← Provided for you
m) Total rank →	10.4	23	24.1	← Add i) + j) + k) + l)

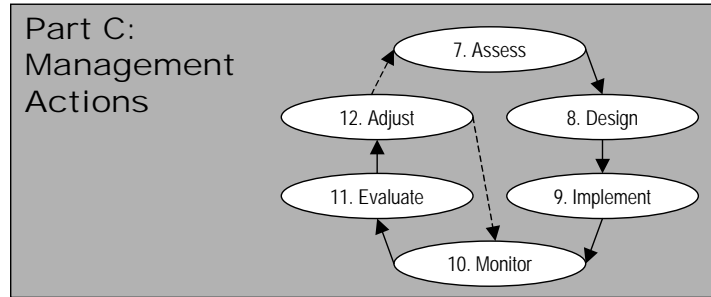
Your highest priority species should be the one with the lowest rank. In the example above, you should make control and management of Scotch broom your top priority.

Carefully consider all the factors listed above, and decide **WHETHER** to proceed with control and management, and for **WHICH** of the invasive plant species listed in this tool.

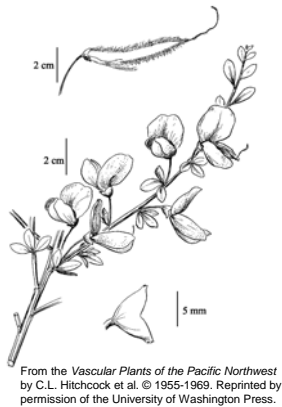


- ☞ If you decide to proceed with invasive species control and management in the GOE, fill out the decision box at the bottom of the RECORDING SHEET for Question 6, and fax the sheet to the Garry Oak Ecosystems Recovery Team (250-479-0546). **Then go to the Part C INSTRUCTIONS and proceed to Step 7 for the species you have chosen.**
- ☞ If you decide not to control and manage for invasive species in the GOE, fill out the decision box at the bottom of the RECORDING SHEET for Question 6, and fax the sheet to the Garry Oak Ecosystems Recovery Team (250-479-0546).
- ☞ If you are not sure what to decide, seek outside help, review the questions for which you are most uncertain, and then come back to this page.

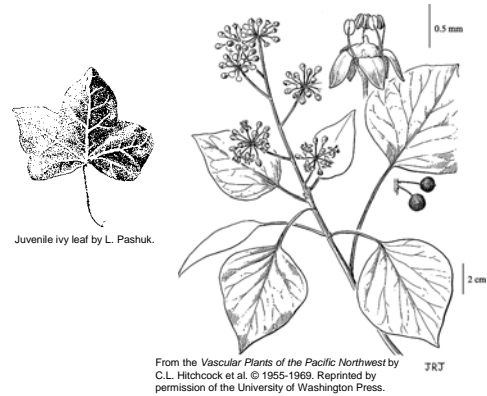
Part C: Management Actions



For:



Scotch broom
(*Cytisus scoparius*)



English ivy
(*Hedera helix*)



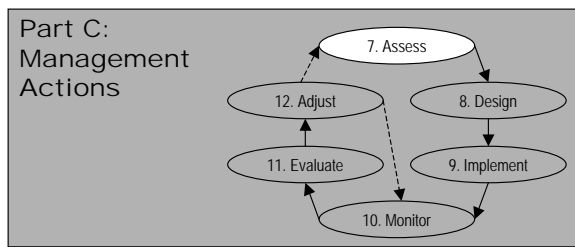
Himalayan blackberry
(*Rubus armeniacus/dicolor/procerus*)



Evergreen blackberry
(*Rubus laciniatus*)

The following INSTRUCTIONS for Part C: Management Actions follow an adaptive management approach: Step 7-Assess, Step 8-Design, Step 9-Implement, Step 10-Monitor, Step 11-Evaluate, and Step 12-Adjust. There are 3 sets of INSTRUCTIONS Step 7, one for each of the three invasive species listed above, followed by INSTRUCTIONS for Steps 8 to 12 that apply to all three species.

We are trying to build knowledge collectively regarding what management and control techniques work best in different situations. What you **do**, and what you **learn** from doing it, will be valuable contributions to that knowledge. Please share this with the rest of us by faxing the requested Part C RECORDING SHEETS to the Garry Oak Ecosystems Recovery Team, where instructed.



Scotch Broom

7. Assess (Scotch broom)

Assess the site characteristics and your available resources to help you decide where to take management action, what action to take, and when. These decisions should be made within the context of the overall restoration objectives (and restoration plan, if one exists). Much of this information has already been recorded in Steps 1 - 6. There is no further recording needed for Step 7; instead you will document your decisions under Step 8: Design. You will, however, be asked to mark certain things on your sketch map (drawn for Question 2). It may be helpful to laminate your sketch map, and then use a grease pencil to layout your treatment design.



a) Deciding where to take action

Factor 1: Broom density

Survey the areas in the GOE where broom occurs. Outline and label these areas "zone 1", "zone 2" or "zone 3" on your sketch map. Use the following descriptions:

- Zone 1 isolated plants, small isolated patches, and low-density edges around larger, denser broom areas
- Zone 2 medium-density areas
- Zone 3 high-density areas

(Use the density diagrams from Question 2 for guidance.)

Where to focus your effort? Follow the **Priority Principle: contain the invasive species first, then reduce its amount!** The highest priority is to prevent further spread of broom. Only take action to reduce the "footprint" of the broom invasion after it is contained. Therefore Zone 1 areas should be your first priority, and you should only move into Zones 2 areas when broom has been successfully removed from Zone 1. Leave Zone 3 areas for last! Zone 3 will often require the greatest amount of resources and effort. (Sometimes concerns about species at risk should override this zone prioritization. For example if a population of a species at risk is directly and imminently threatened by broom this should be a top priority. Such decisions should be made in consultation with species at risk experts.)

Factor 2: Ecological quality

To help you prioritize areas *within* Zones, consider GOE quality, presence of species of concern, and broom vulnerability. First priority areas should be those of highest ecosystem value, especially where species at risk are threatened by a broom invasion. Within such areas, start where the conditions for broom are marginal and their tolerance is lowest - this is where they will be most vulnerable and most likely to be affected by your control actions. Focus first in dry areas, then areas with deeper soils, and then in Douglas-fir areas.

Factor 3: Accessibility

Broom management will require repeated efforts, as regeneration from re-sprouting and from seeds already in the soil (the "seed bank") is inevitable. Focus action first in areas that can practically be accessed for repeat treatments.

7, continued.**b) Deciding what action to take, and when**

Circumstances	Method	When	Caveats
<i>In Low or Medium Density Broom Areas:</i>			
<ul style="list-style-type: none"> Broom stem is smaller than pencil size, AND No rare plants are in immediate vicinity 	Pulling	Late fall (after rains start) to end of January	<ul style="list-style-type: none"> The plant should pop out readily without taking any soil; otherwise choose another method Do not use a regular weed wrench to pull the plant out. You may use a "mini" weed wrench but if that will not work, the plant is too big for this method; consider <i>cutting with loppers</i>
<ul style="list-style-type: none"> Broom stem is bigger than pencil size, OR Rare plants are in the immediate vicinity 	Cutting with loppers	After broom plants flower but before the seed pods ripen	<ul style="list-style-type: none"> If you find it a struggle to cut through the stem, the plant is too big for this method; consider using a hand saw Cut at or slightly below the ground level Be careful; wildflower species may be in bloom at this time and vulnerable to trampling
<i>In High Density Broom Areas:</i>			
<ul style="list-style-type: none"> Broom plants are young No rare annuals present Ground is dry 	Mowing	Dry season, when other plants are not blooming	<ul style="list-style-type: none"> Can only be done where mower access is feasible and where the terrain permits (not too steep or rocky)
<ul style="list-style-type: none"> Any age/size of broom plant 	Brush saw	While seed pods are forming or area still small and green	<ul style="list-style-type: none"> Ensure safety training for saw operators Do not use in rocky terrain (sparks can cause a fire)
<ul style="list-style-type: none"> Dense stands of seedlings (may happen after initial control treatments) 	Weed eater	Fall	<ul style="list-style-type: none"> Only after native forbs and grasses have died back, and after whatever natural mortality may occur to seedlings over the summer
<ul style="list-style-type: none"> Area is very disturbed Patch is very dense (>1000 seedlings/m²) Other methods have been ineffective 	Herbicide	Depends on herbicide; consult expert	<ul style="list-style-type: none"> Only with extreme caution, and by (or advised by) experts May be restricted (legally) in some jurisdictions
<ul style="list-style-type: none"> Explosion of seedlings Low fuel-load on site Small confined area 	Selective flaming	Any time except dry season	<ul style="list-style-type: none"> Only with extreme caution, and by (or advised by) experts Small danger of fire spread May require permission in some jurisdictions
<ul style="list-style-type: none"> No fuel-load on site 	Fire	Before seeds set	<ul style="list-style-type: none"> Only with extreme caution, and by (or advised by) experts Most effective, and risky, in dry season Will trigger germination of seeds in seed bank; therefore requires follow up treatment appropriate for new seedlings May be restricted in some jurisdictions May trigger germination of other weeds May harm some species at risk; get expert advice

7, continued.

In deciding which method(s) to choose, also consider:

- Your budget to acquire the necessary tools and equipment for the methods chosen (e.g. "mini" weed wrenches, loppers, hand saws, brush saws, mower, or weed eater),
- Your budget to acquire the necessary protective clothing and equipment (e.g. gloves, safety goggles),
- The need to comply with Workers Compensation Board regulations, and
- The number and skill level of the people that will be assisting you.

Consider following up on any of these control methods with a planting or seeding treatment in order to speed up re-establishment of native species. The need for this will depend on what bulbs and seeds already exist in the soil, light conditions, and how well they germinate and sprout when the broom is removed. You may wish to first monitor the site after the control methods have been implemented, and then plant or seed later if the desired native plants do not appear or are sparse. If you are going to plant native species, consult with someone knowledgeable about this first, ensure that your plant and seed stock originate from sources that follow ethical guidelines, and take genetic issues into consideration.

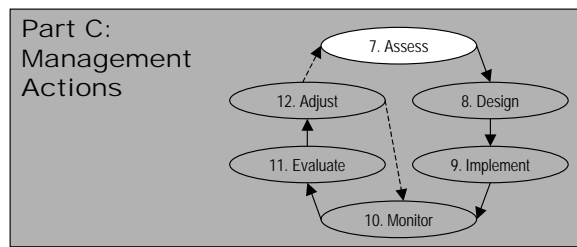
c) Deciding how to dispose of dead plant material

If you choose any mechanical removal method, you must think about what to do with the plant material that you have cut or pulled. It is not acceptable to leave large piles of broom on site, as it may be a fire hazard, or may smother native plants underneath. There is also concern that broom contains phytotoxins (poisonous plant chemicals) that may leach into the soil and contaminate it. Consider the following options, based on the amount of dead broom you expect to remove from the areas you plan to target:

Material	Removal from site	Disposal
Large amount of dead broom, <i>OR</i> any volume of dead broom with seeds present, <i>AND</i> burning not feasible or permitted on site	Remove from site on tarps or makeshift "stretchers", being very careful to not spread seeds to other sites en route to nearest access road	<ul style="list-style-type: none"> • Cover and transport to a location where it can be safely burned • Composting is risky, as the seeds may not be destroyed by the composting process
Large amount of dead broom, <i>OR</i> any volume of dead broom with seeds present, <i>AND</i> burning feasible and permitted on site	Move to bonfire or burning barrels on tarps or makeshift "stretchers", being very careful to not spread seeds to other sites en route	<ul style="list-style-type: none"> • Burn safely; transport ash offsite when cool • Consult BC government's <i>Open Burning Smoke Control Regulation</i>: www.toffan.com/clear/OBSCR.pdf
Small amount of dead broom without seeds	Not necessary	<ul style="list-style-type: none"> • Leave on site, scattered or mulched, or deposit in densely shaded area under conifers where there is no ground vegetation

d) Recognizing uncertainty

In making these decisions, there will be things you are unsure about. This is normal, and should not cause undue concern. The important thing is to be *aware* of the things you are most uncertain about, document them on your RECORDING SHEET as directed in Step 8, and plan your actions in a manner that will help you learn and reduce this uncertainty.



English Ivy

7. Assess (English ivy)

Assess the site characteristics and your available resources to help you decide where to take management action, what action to take, and when. These decisions should be made within the context of the overall restoration objectives (and restoration plan, if one exists). Much of this information has already been recorded in Steps 1 - 6. There is no further recording needed for Step 7; instead you will document your decisions under Step 8: Design. You will, however, be asked to mark certain things on your sketch map (drawn for Question 2). It may be helpful to laminate your sketch map, and then use a grease pencil to layout your treatment design.



a) Deciding where to take action

Follow the **Priority Principle: contain the invasive species first, then reduce its amount!** The highest priority is to prevent further spread of ivy. Only take action to reduce the "footprint" of the ivy invasion after it is contained. Therefore, for any invaded area you should start with the satellite patches on the periphery and move towards the middle. The following factors will help you decide which areas to focus on first.

Factor 1: Ivy maturity

Survey the areas in the GOE where ivy occurs, and identify patches where the ivy has reached its adult phase. The juvenile phase has a triangular, deeply lobed leaf, whereas the adult phase has ovate, unlobed leaves and fruit or flowers may also be visible. The adult phase usually (but not always!) occurs where ivy is spreading vertically (e.g. climbing a fence or tree trunk). Outline and label these areas "juvenile zones" and "adult zones" on your sketch map. Focus on the adult zones first, as the ability of this phase to produce seed increases the chances that it will spread to other areas. (Sometimes concerns about species at risk should override this zone prioritization. For example if a population of a species at risk is directly and imminently threatened by ivy this should be a top priority. Such decisions should be made in consultation with species at risk experts.)

Factor 2: Ecological quality

To help you prioritize areas within zones, consider GOE quality, presence of species of concern, and ivy vulnerability. First priority areas should be those of highest ecosystem quality, where species at risk are threatened by an ivy invasion. Within such areas, start in dry places where the conditions for ivy are marginal and their tolerance is lowest. Within adult zones, start by saving the biggest trees first.

Factor 3: Accessibility

Ivy management will require repeated efforts, due to the difficulty in removing all of the roots from the soil. Focus action first in areas that can practically be accessed for repeat treatments.

7, continued.

b) Deciding what action to take, and when

Circumstances	Method	When	Caveats
Mats of ivy spreading horizontally (usually in juvenile phase)	Dig out roots (using paring knife, dandelion weed fork, or weed wrench) and roll into 2-person-manageable piles	Late fall (Nov)	<ul style="list-style-type: none"> • Lift gently, or roots will break and re-sprout • Lay planks down to work from, to minimize soil compaction • Be cautious of species that are emerging in fall (e.g. licorice fern) • Remind volunteers there are species we are trying to protect; avoid a "just get the ivy" mind set • With weed wrenches, use leverage pads when soils are wet
Steep area OR riparian area OR area where ivy provides important habitat (e.g. nesting site for birds)	Same as above	Same as above	<ul style="list-style-type: none"> • Remove ivy a bit at a time, rather than all at once, so that the "services" the ivy might be providing (e.g. cover, shade) are removed gradually in a manner that allows the ecological community to adjust
Ivy climbing trees (often in adult phase)	Remove a 1 m tall band at waist height all the way around the trunk (using folding saw, loppers, axe, weed wrench with a leverage pad to pry off of, or hand clippers)	Fall	<ul style="list-style-type: none"> • Ivy above the removed band can be left in place to die, but the band must be kept clear as old ivy makes a great ladder for the next invasion • If the tree is dead (a "snag") then pulling to remove ivy may cause it to topple. This presents a serious safety concern, and may also damage important habitat for wildlife. Ivy should be removed from snags by an experienced person who knows the risks and follows proper WCB safety procedures, and after a Hazardous Wildlife Tree Assessment. • Must ensure all contact between roots and upper parts of the ivy plant are severed
Ivy at base of tree following removal of ivy band from tree	Pry roots from base of trunk and soil, using grub hoe, or cable, winch and truck or come-along	Late fall (Nov)	<ul style="list-style-type: none"> • Is hard work; some roots may be over 10 feet long
Ivy at base of tree, following removal of ivy band from tree	Topical application of herbicide (Triclopyr)	When new growth appears	<ul style="list-style-type: none"> • Only with extreme caution, and by (or advised by) experts • May be restricted (legally) in some jurisdictions • Surface applications of Glyphosate and 2-4D may not work on ivy, due to their waxy leaves
Any ivy with a trunk thick enough to drill a ~3/8" hole into	Herbicide (Glyphosate) poured into a hole drilled in the ivy trunk	Spring or summer	<ul style="list-style-type: none"> • Only with extreme caution, and by (or advised by) experts • May be restricted (legally) in some jurisdictions • Drill hole on a downward angle, as far in possible without emerging on the other side • Use concentrated herbicide • Will also work in winter, but more slowly (results not seen until spring)

7, continued.

In deciding which method(s) to choose, also consider:

- Your budget to acquire the necessary tools and equipment for the methods chosen (e.g. folding saws, come-along, clippers, axes),
- Your budget to acquire the necessary protective clothing and equipment (e.g. gloves, safety goggles),
- The need to comply with Workers Compensation Board regulations, and
- The number and skill level of the people that will be assisting you.

Consider following up on any of these control methods with a planting or seeding treatment in order to speed up re-establishment of native species. The need for this will depend on what bulbs and seeds already exist in the soil or in adjacent areas, light conditions, and how well they germinate and sprout when the ivy is removed. You may wish to first monitor the area after the control methods have been implemented, and then plant or seed later if the desired native plants do not appear or are sparse. If you are going to plant native species, consult with someone knowledgeable about this first, ensure that your plant and seed stock originate from sources that follow ethical guidelines, and take genetic issues into consideration.

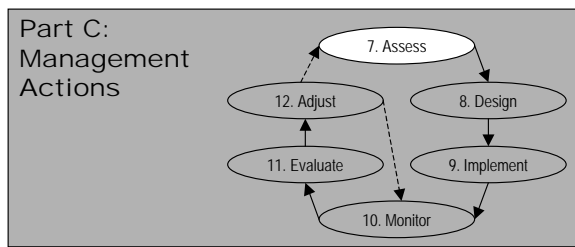
c) Deciding how to dispose of dead plant material

If you choose any mechanical removal method, you must think about what to do with the plant material that you have cut or pulled. It is not acceptable to leave large piles of ivy on site, as it may re-sprout, or may smother native plants underneath. Consider the following options, based on the amount of dead ivy you expect to remove:

Material	Removal	Disposal
Large amount of ivy, AND no seeds present	Move to disposal area on tarps or makeshift "stretchers"	<ul style="list-style-type: none"> • Pile on tarps, paved or concrete surface where plants can dry and decompose without re-sprouting, OR remove to composting facility
Any volume of dead ivy with seeds present	Move to disposal or transport area on tarps or makeshift "stretchers", being very careful to not spread seeds to other areas en route	<ul style="list-style-type: none"> • Burn on site, if permitted, OR cover and transport to a location where it can be safely burned • Ivy smoke may irritate lungs; keep people upwind • Consult BC government's <i>Open Burning Smoke Control Regulation</i>: www.toffan.com/clear/OBSCR.pdf • Composting is risky, as the seeds may not be destroyed by the composting process
Small amount of ivy without seeds	Not necessary	<ul style="list-style-type: none"> • Leave on site, draped over shrubs where the ivy will dry out without touching bare soil OR deposit in small piles on a path where it can dry and decompose without re-sprouting


d) Recognizing uncertainty

In making these decisions, there will be things you are unsure about. This is normal, and should not cause undue concern. The important thing is to be *aware* of the things you are most uncertain about, document them on your RECORDING SHEET as directed in Step 8, and plan your actions in a manner that will help you learn and reduce this uncertainty.



Himalayan & Evergreen Blackberry

7. Assess (Blackberry)

Assess the site characteristics and your available resources to help you decide where to take management action, what action to take, and when. These decisions should be made within the context of the overall restoration objectives (and restoration plan, if one exists). Much of this information has already been recorded in Steps 1 - 6. There is no further recording needed for Step 7; instead you will document your decisions under Step 8: Design. You will, however, be asked to mark certain things on your sketch map (drawn for Question 2). It may be helpful to laminate your sketch map, and then use a grease pencil to layout your treatment design. 

Before proceeding, be aware that it is very important to not confuse Evergreen blackberry (*R. laciniatis*) with the native Dewberry (*R. ursinus*). Evergreen blackberry is often found in association with Himalayan blackberry. If Evergreen blackberry is found alone and you are uncertain you have identified it correctly, leave it alone. Also leave it alone if it is in trailing form (rather than upright); you may damage understory vegetation by trying to remove it.

a) Deciding where to take action

Factor 1: Blackberry density

Survey the areas in the GOE where blackberry occurs. Sketch-out and label these areas "zone 1", "zone 2" or "zone 3" on your sketch map. Use the following descriptions:

- Zone 1 satellite patches (from a few canes, to a 5 foot by 5 foot patch)
- Zone 2 edges around larger patches
- Zone 3 larger patches (larger than 5' by 5')

Where to focus your effort? Follow the **Priority Principle: contain the invasive species first, then reduce its amount!** The highest priority is to prevent further spread of blackberry. Only take action to reduce the "footprint" of the blackberry invasion after it is contained. Therefore Zones 1 and 2 should be your first priority, and you should only move into Zones 3 areas when blackberry has been successfully removed from Zones 1 and 2. (Sometimes concerns about species at risk should override this. For example if a population of a species at risk is directly and imminently threatened by blackberry this should be a top priority. Such decisions should be made in consultation with species at risk experts.)

Factor 2: Ecological quality

To help you prioritize areas *within* Zones, consider GOE quality, presence of species of concern, and blackberry vulnerability. First priority areas should be those of highest ecosystem quality, where species at risk are threatened by a blackberry invasion. Within such areas, start in the more open, vigorous fruitley blackberry patches, which are likely to be in dry areas where the plants are stressed and often not the most robust.

Factor 3: Accessibility

Blackberry management will require repeated efforts. Focus first in areas that can be accessed more easily for repeat treatments before moving into hard-to-access spots. On some areas where further spread is unlikely, you may actually wish to leave blackberry as an access barrier, if that fits the overall management objectives for the GOE.

7, continued.**b) Deciding what action to take, and when**

Circumstances	Method	When	Caveats
Any size of patch	Manual control: loppers (can also be used as tongs to pull the cut cane out), hand clippers, brush saw	August - October before roots form from draping shoots	<ul style="list-style-type: none"> If patch is used as a nesting site for native passerine birds, remove the patch gradually and avoid nesting season Also remove the root crowns or burls, as they can remain viable for a long time (use pick axe, mattock or Pulaski)
Large, thick, patch of just blackberry, with no native species	Back hoe to remove biomass, and scrape down to the soil surface	When risk of damage to GOE (e.g. soil compaction, physical site damage) from machine access is lowest	<ul style="list-style-type: none"> Should only be used on extreme invasions where manual control seems hopeless Be sure hoe will not destroy sensitive areas on its way to the blackberry patch it is targeting
Areas too expansive for manual control AND not concerned about species at risk	Mowing	In the winter, when most native plant species are dormant	<ul style="list-style-type: none"> Is more of a maintenance regime for control rather than eradication, though mowing may sometimes also encourage native species growth Will only work on relatively flat areas where mowers can be operated
Draping tips starting to root	Hand extraction: paring knife	As soon as tips form roots (late October - November)	<ul style="list-style-type: none"> This is a mitigation, not a recommended control method; try to get to the canes before the drooping tips form roots Don't just pull! You'll leave the roots, and have lots of new shoots to deal with later
New growth from root fragments or root crown	Manual control: loppers, hand clippers	2-3 times per year, for 2-3 years following initial control	<ul style="list-style-type: none"> May take 5 years to fully eradicate it
New growth from root fragments or root crown	Herbicide	As soon as new growth appears	<ul style="list-style-type: none"> Only with extreme caution, and by (or advised by) experts May be restricted (legally) in some jurisdictions Only use herbicides such as Glyphosate that do not remain active in the soil 2 treatments will likely be necessary for root fragments on the soil surface 3 treatments will likely be necessary for root crowns or root fragments underground

If unsure which end of a vine is the tip (can be tricky if the tip has drooped and rooted), look at the barbs - they point back to the original root end.

7, continued.

In deciding which method(s) to choose, also consider:

- Your budget to acquire the necessary tools and equipment for the methods chosen (e.g. pick axes, pitch forks, loppers, hand clippers, brush cutters, back hoe and operator),
- Your budget to acquire the necessary protective clothing and equipment (e.g. gloves, hats, thick- and hard-soled boots),
- The need to comply with Workers Compensation Board regulations, and
- The number and skill level of the people that will be assisting you.

Consider following up on any of these control methods with a planting or seeding treatment in order to speed up re-establishment of native species. The need for this will depend on what bulbs and seeds already exist in the soil, vegetation immediately adjacent to the area, light conditions, and how well seeds or bulbs germinate and sprout when the blackberry is removed. You may wish to first monitor the site after the control methods have been implemented, and then plant or seed later if the desired native plants do not appear or are sparse. If you are going to plant native species, consult with someone knowledgeable about this first, ensure that your plant and seed stock originate from sources that follow ethical guidelines, and take genetic issues into consideration.

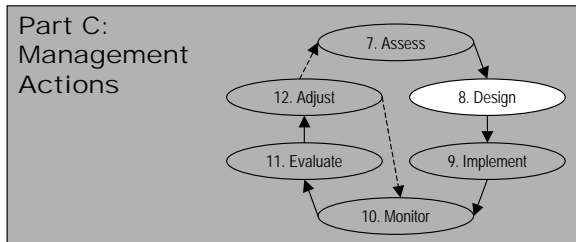
c) Deciding how to dispose of dead plant material

If you choose any mechanical removal method, you must think about what to do with the plant material that you have cut or pulled. Consider the following options, based on the amount of dead blackberry you expect to remove from the areas you plan to target:

Material	Removal from site	Disposal
Large amount of dead blackberry	Necessary only if being chipped or burned off site; cut canes to manageable length and move on tarps or makeshift "stretchers" Pitch forks can be useful for moving quantities of blackberry on site	<ul style="list-style-type: none"> • Pile on site in area where smothering native vegetation underneath is not a concern OR chip and mulch on site OR burn safely, either at the time of removal or the following spring (Consult BC government's <i>Open Burning Smoke Control Regulation</i>: www.toffan.com/clear/OBSCR.pdf) • Do <i>not</i> pile on blackberry root crowns; you will want access to these for re-treatment • If piling on site, revisit the piles and re-flatten as they break down; do not flatten right away as cut material may root if pressed into soil
Small amount of dead blackberry shoots	Not necessary	<ul style="list-style-type: none"> • Leave on site in small piles; can be used to block "bandit trails"
Blackberry root crowns	Necessary only if being burned off site; no special techniques required	<ul style="list-style-type: none"> • Leave them on a rock or paved surface to dry out OR burn safely (Consult BC government's <i>Open Burning Smoke Control Regulation</i>: www.toffan.com/clear/OBSCR.pdf)

d) Recognizing uncertainty

In making these decisions, there will be things you are unsure about. This is normal, and should not cause undue concern. The important thing is to be *aware* of the things you are most uncertain about, document them on your RECORDING SHEET as directed in Step 8, and plan your actions in a manner that will help you learn and reduce this uncertainty.



8. Design

Prepare a Management Plan for the GOE that documents the decisions made in Step 7. Use the RECORDING SHEET for Step 8. The Management Plan should include:



Action Plan: Clearly document:

- The invasive species you are managing,
- The control method(s) you plan to undertake to remove the invasive species,
- A schedule for when you plan to do this, and in which locations in the GOE,
- The number of people helping you and their skill levels in the chosen methods,
- The tools you will need for the method(s) you've chosen,
- Requirements under Worker's Compensation Board regulations, and
- The results you expect.

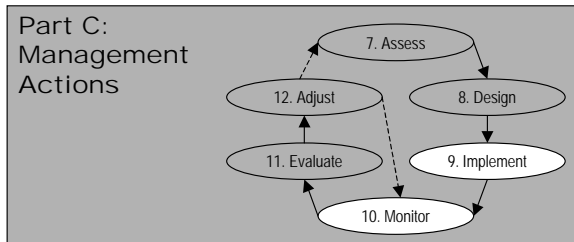
In addition to listing the chosen method(s), mark on your sketch map where you plan to use the treatments. Label each area with a unique name or number (i.e. according to its location in the GOE, the Zone it is in, and the methods to be used). This will help you later when you monitor the effectiveness of your treatments.

Disposal Plan: Describe the removal and disposal techniques you plan to use. Mark access and disposal spots on your sketch. How much dead material will result from your Action Plan? Often the hardest part is removing the material for proper disposal. Be sure your Disposal Plan can accommodate the volume of material expected from your Action Plan, and includes a method for moving the material off site with minimal damage to the GOE. Consider designating an "ecologically safe" route through the GOE for carrying dead plant material to disposal sites, avoiding species at risk and other sensitive features.

Monitoring Plan: Clearly document when you plan to return to the site, and what you intend to record during these visits. You should return at least every 3 months, and look for indicators of treatment effects: re-growth on cut stems, occurrence of new seedlings, seedlings of other weeds, and re-establishment of native plants - an important objective. If species at risk occur at the site, your monitoring plan should assess the response of these species to treatments. Select indicators for this in consultation with experts.

Declaration of Uncertainty: List the things you are most uncertain about. Also consider plans for reducing this uncertainty. For example, if you are uncertain whether to cut with loppers or a brush saw, your Action Plan may include trying both methods and then monitoring to see which had the best results. If you try this, follow these simple rules:

1. Try different methods in comparable places with similar site characteristics. For example, don't try and compare loppers on a damp north slope and a brush saw on a drier south slope, because if the results are different you won't know if it was due to different moisture levels or the different treatments. Instead, try both methods in more similar conditions, to reduce the potential for other factors to affecting your results.
2. Clearly document your intended experiment, its location, and the rationale. That will make it much easier for you to monitor the area later and learn what method worked best. Use your sketch map to mark out where your different test areas are located.



9. Implement



Prepare for and undertake the Action Plan and Disposal Plan described in Step 8.

Preparation:

- Use wood stakes and flagging tape to clearly mark the areas in the GOE where you plan to apply the chosen control methods, AND areas that should be avoided.
- Ensure that each area has a unique name or number, according to the method to be used, and that it is clearly marked on your sketch map.
- Take a "before" photo at each area, so you have a visual record against which you can later compare "after" photos. This may be your most powerful monitoring tool! Be sure to establish and mark photo points/direction, and record the focal length, distance and lens size to ensure before and after photos match.
- Acquire the tools you will need, according to the methods chosen.
- Print forms for participants to sign, acknowledging the hazards of the equipment.

Implementation:

- Ensure those working with you know exactly what they are doing, where, and why, including the nature of the commitment. They should know the importance of sticking to the Action Plan.
 - If any deviations are necessary, be sure to carefully record them on your RECORDING SHEET for Step 9, and record the reason for the change.
- Ensure that your assistants know of any sensitive areas to be careful of or avoid (e.g. species at risk), and that they know the importance of causing minimal disturbance to the GOE.
- In each area, start with the perimeter (outermost part of the invasive species patch) and work into the centre of the patch.
- Keep a close watch to make sure that the methods are implemented as you intended.
- On the RECORDING SHEET for Step 9 note the success of the implementation compared with the Action Plan and Disposal Plan as designed in Step 8.

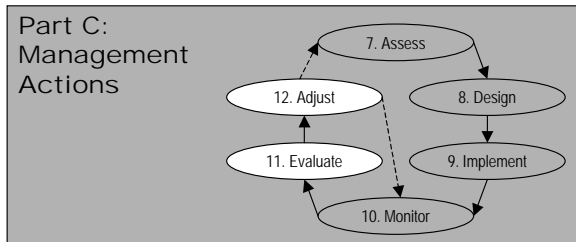
10. Monitor



Undertake the Monitoring Plan as described in Step 8.

- Fill out the RECORDING SHEET for Step 10 for each visit.
- In the table provided, for each area number, record observations (e.g. new seedlings, cut stems sprouting, other species appearing) and if possible take a photo. (Use the same parameters as in the "before" photos! Later record on the photo the date and area number, so you can cross-reference it to the monitoring report.)
- If you have more areas than fit on one recording sheet, print out another copy of the blank RECORDING SHEET template for Step 10 - print as many as you need.

Keep these in a safe place! We recommend you keep all the RECORDING SHEETS for one GOE in a binder so all the information is together and handy.



11. Evaluate

Consider your monitoring results and compare them with the results you expected as documented in your Action Plan.



On the RECORDING SHEET for Step 11, record:

- Which methods worked as expected
- Which methods did not, and the possible reasons
- What you would do differently next time
- What surprises occurred, and how you handled them

Fax this sheet to the Garry Oak Ecosystems Recovery Team, because what you have learned will be very valuable to others who are also trying to manage for invasive species in GOEs!

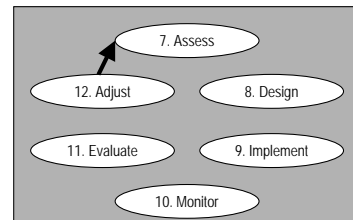
12. Adjust

Consider what you have learned from your evaluation in Step 11 and decide on what to do with this information. Your options:

Repeat Treatments

On areas where the invasive species is re-growing, continue control methods - either the same ones, or different ones, depending on the circumstances. On areas where it is under control but you are unsatisfied with regeneration of native plants, consider planting or seeding native plant species. (Be sure to consult with someone knowledgeable about this first!)

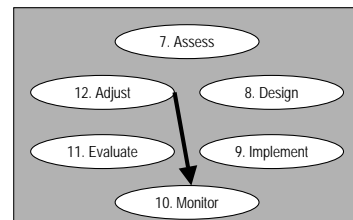
- ☛ Return to the INSTRUCTIONS for Step 7 for the species to re-assess these areas, return to Step 8 to design a new Action Plan, and then proceed again through the INSTRUCTIONS for Steps 9-12 according to your new Action Plan.



Continued Monitoring

On areas where no repeated treatments or planting/seeding seem necessary, continue to monitor on a regular basis (at least annually) to learn the longer-term results of your actions.

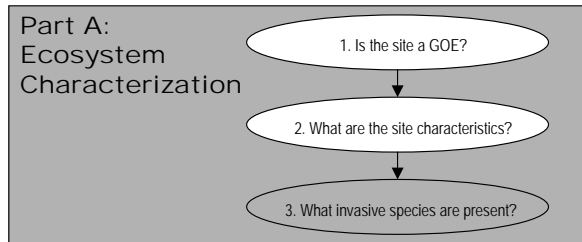
- ☛ Return to the INSTRUCTIONS for Step 10, record the monitoring observations, and then proceed again through the INSTRUCTIONS for Steps 11-12.



END OF INSTRUCTIONS

RECORDING SHEETS

For Questions 1-2



1. Is the site a "Garry oak or associated ecosystem" (GOE)?
 yes no

2. What are the site characteristics?

a) Description of adjacent lands (check all that apply):
 residential/houses
 other built environment
 farm
 park/natural area
 other (specify:) _____

b) Does the GOE have any protection status? yes no
 If "yes", please describe: _____

c) What are the management objectives of the site? _____

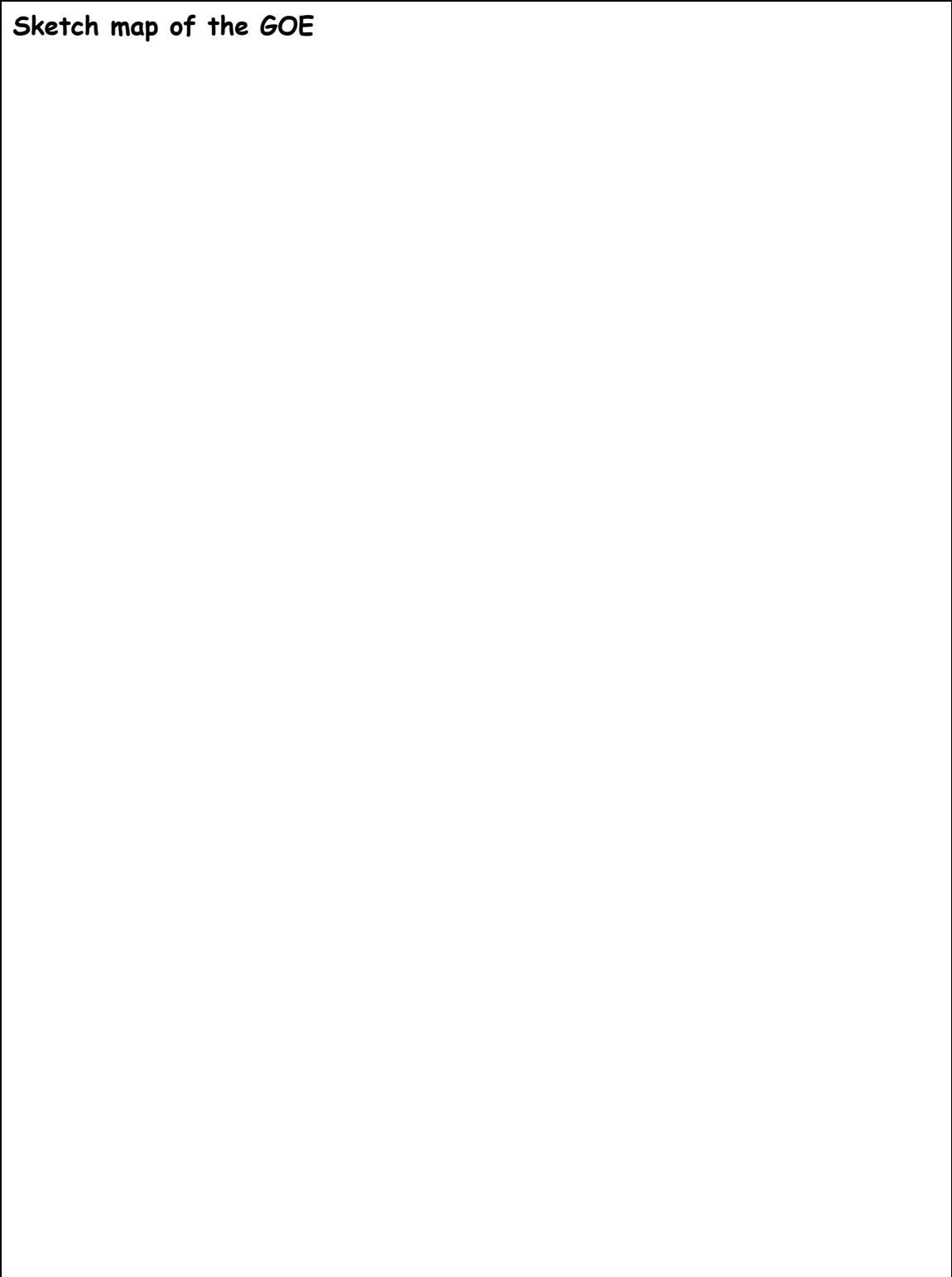
d) What types of activities is the GOE used for? _____

e) Are there any "species at risk" on the site? yes no
 If "yes", please list them: _____

f) The quality of the ecosystem could best be described as:
 high
 medium
 low

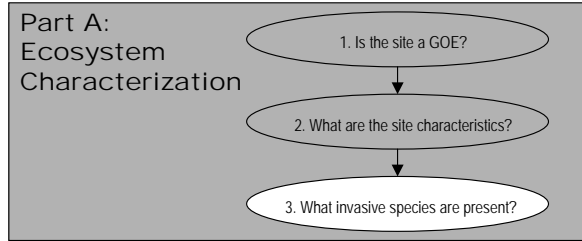
On the next page, draw a sketch map of the GOE according to the INSTRUCTIONS.

Sketch map of the GOE



RECORDING SHEET

For Question 3



3. What invasive species are present?

Are there any invasive species in the *GOE*? yes no

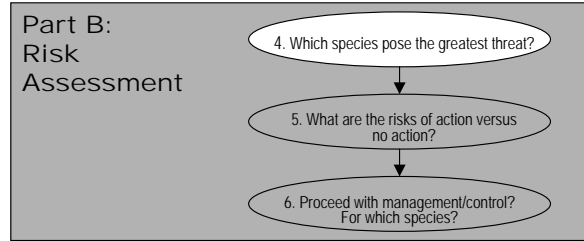
If "yes", please list them:

Add the locations of these species to your sketch map of the *GOE*.

(While this Decision Support Tool is currently only designed to help you make decisions regarding the management of selected species, you should also list other invasive species that are present on the site, if you are able to identify them.)

RECORDING SHEET

For Question 4



4. Which species pose the greatest threat?

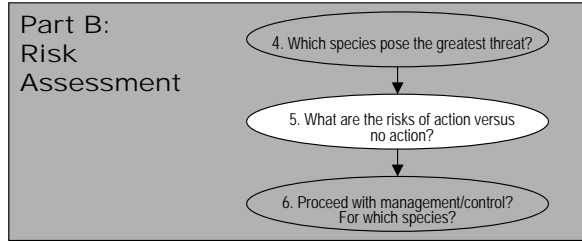
If the invasive species listed in any of the columns below are not present in your GOE, simply ignore that column and leave c), e) and f) blank for that species.

	Scotch broom	English ivy	blackberry
a) Density within the invaded areas in the GOE	<input type="checkbox"/> low [1] <input type="checkbox"/> medium [3] <input type="checkbox"/> high [5]	<input type="checkbox"/> low [1] <input type="checkbox"/> medium [3] <input type="checkbox"/> high [5]	<input type="checkbox"/> low [1] <input type="checkbox"/> medium [3] <input type="checkbox"/> high [5]
b) Degree of establishment in the GOE	<input type="checkbox"/> just beginning to establish [1] <input type="checkbox"/> somewhat established [3] <input type="checkbox"/> well established [5]	<input type="checkbox"/> just beginning to establish [1] <input type="checkbox"/> somewhat established [3] <input type="checkbox"/> well established [5]	<input type="checkbox"/> just beginning to establish [1] <input type="checkbox"/> somewhat established [3] <input type="checkbox"/> well established [5]
c) Degree of invasion (a + b) →			
d) Significance of Impact	1.8	4.5	6.7
e) Total (c + d) →			
f) Rank of totals (=Threat Rating) →			

The species ranked "1" in row f) poses the greatest threat.

RECORDING SHEET

For Question 5



5. What are the risks of action versus no action?

a) Are there species at risk that will likely suffer from *control efforts* for invasive plant species? yes no

If yes, list the species at risk and describe their vulnerabilities: _____

b) Are there species at risk that rely on any of the following invasive species for habitat?

Scotch broom yes no If yes, list: _____

 English ivy yes no If yes, list: _____

 blackberry yes no If yes, list: _____

c) Are the following invasive species performing a valued service?

Scotch broom yes no If yes, describe: _____

 English ivy yes no If yes, describe: _____

 blackberry yes no If yes, describe: _____

d) What sort of local reaction would you expect from efforts to control:

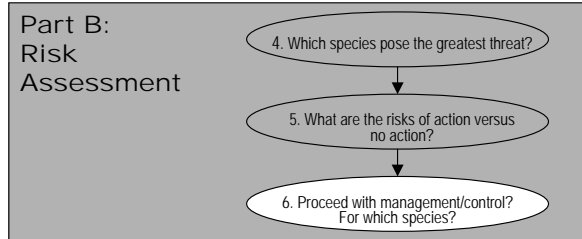
Scotch broom positive neutral negative mixed
 English ivy positive neutral negative mixed
 blackberry positive neutral negative mixed

e) Is there a legal requirement to take action?

Scotch broom Act/Bylaw: _____
 English ivy Act/Bylaw: _____
 blackberry Act/Bylaw: _____

RECORDING SHEET

For Question 6



6. Proceed with management and control? For which species?

Factors to consider:	This factor suggests to "proceed"	This factor suggests "do not proceed"
a) Ecological value of the GOE		
b) Degree of disturbance on adjacent land		
c) Management objectives for the GOE		
d) Risks to species at risk		
e) Risks of public outcry		
f) Legal requirement		
g) Willingness to make long-term commitment		
h) Resources to make long-term commitment		

Which species?	Scotch broom	English ivy	blackberry
i) Degree of invasion →			
j) Significance of impact	1.8	4.5	6.7
k) Urgency of control	2.8	4.2	6.2
l) Difficulty of control	3.8	4.3	7.2
m) Total rank →			

Record of Decision:

Name of GOE: _____

Location: _____

Name of DST user: _____ Date: _____

Telephone #: _____ Email: _____

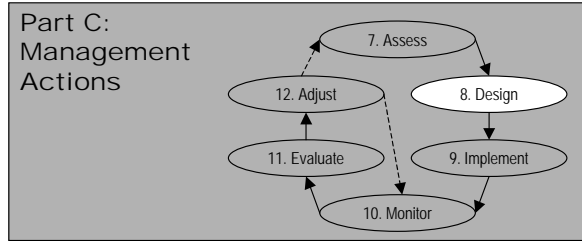
Decision: Proceed with control and management for invasive plant species?

No. Reason: _____

Yes, for: Scotch broom
 English ivy
 blackberry

☞ Regardless of whether you check 'No' or 'Yes' in the box, please fax or email this page ☞
 to the Garry Oak Ecosystems Recovery Team: 250-479-0546 or info@goert.ca

RECORDING SHEET
For Step 8



8. Design

Action Plan for the following invasive species: _____			
Area Name/#	Control Method	Scheduled Date	Expected Results
Briefly describe any follow-up planting or seeding you plan to do, and in which areas:			
Brief description of size and skill of your assisting labour force:			
List of tools you will need for the method(s) you've chosen:			

Recording Sheet for Step 8, continued.

Disposal Plan:

Monitoring Plan:

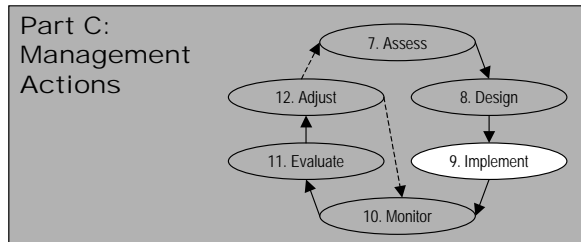
Uncertainties:

Record of Management Plan:
Name of invasive species being managed: _____
Name of GOE: _____ Location: _____
Name of DST user: _____ Date: _____

☞ Fax or email your Management Plan (this page and the previous page) to the ☜
Garry Oak Ecosystems Recovery Team: 250-479-0546 or info@goert.ca

RECORDING SHEET

For Step 9



9. Implement

Was the **Action Plan** successfully implemented?

Did any deviations occur? If so, what and why?

Other notes, comments:

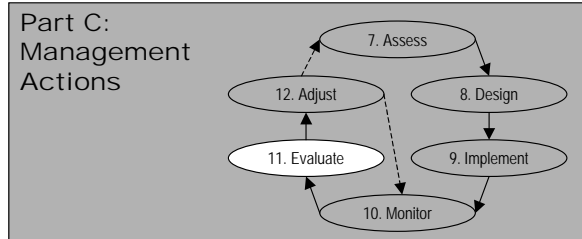
Was the **Disposal Plan** successfully implemented?

Did any deviations occur? If so, what and why?

Other notes, comments:

RECORDING SHEET

For Step 11



11. Evaluate

What Have You Learned?

What methods worked?

What methods didn't work, and why not?

What would you do differently next time?

Where there any surprises? If so, what did you do about them?

Record of Learning:

Name of invasive species being managed: _____
Name of GOE: _____ Location: _____
Name of DST user: _____ Date: _____

☞ Fax or email this page to the Garry Oak Ecosystems Recovery Team: ☞
250-479-0546 or info@goert.ca

REFERENCE

Glossary

Adaptive management	A rigorous, systematic approach to improving management and accommodating change by learning from the outcomes of management experiments. ⁸
Biodiversity	The variety of species and ecosystems on Earth, and the ecological processes of which they are a part. ⁹
Fuel-load	The amount and type of dead woody material (twigs, stems, branches, etc.) on the ground surface that has the potential to be ignited and cause a fire.
Species at risk	<p>A species deemed to be in danger of disappearing from the wild.¹⁰ This includes:</p> <ul style="list-style-type: none">• Species that are considered extirpated, endangered (facing imminent extirpation or extinction), threatened (likely to become endangered if limiting factors are not reversed) or vulnerable (particularly sensitive to human activities or natural events) in British Columbia as determined by the BC Conservation Data Centre; or• Species considered extirpated, endangered, threatened or of special concern in Canada as determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). <p>For more information, visit the following websites:</p> <ul style="list-style-type: none">• http://wlapwww.gov.bc.ca/wld/documents/ranking.pdf• http://srmwww.gov.bc.ca/cdc/• http://www.cosewic.gc.ca/eng/sct0/index_e.cfm

⁸ From Taylor, Kremsater and Ellis, 1997 (<http://www.for.gov.bc.ca/hfd/pubs/docs/Sil/sil426-1.pdf>).

⁹ From the Canadian Biodiversity Strategy (http://www.bco.ec.gc.ca/documents/CBS_E.pdf).

¹⁰ From the Garry Oak Ecosystems Recovery Team website (<http://www.goert.ca/eoinfo/risk.htm>).

Plant and Animal Species at Risk in Garry Oak and Associated Ecosystems in BC

This list is based on information current as of June 2005, and is updated from GOERT's draft Recovery Strategy for Garry Oak and Associated Ecosystems and their Associated Species at Risk in Canada, 2001-2006¹¹. Explanations of COSEWIC status and provincial and global ranks and listings are provided in the strategy.

Latin Name	Common Name	COSEWIC Status ¹²	Provincial Rank and Listing ¹³	Global Rank ¹⁴
Mosses				
<i>Bartramia stricta</i>	Rigid apple moss = apple moss	Endangered	S1-Red	G2G4
<i>Entosthodon fascicularis</i>	banded cord-moss	Special Concern	S2-Red	G4G5
<i>Syntrichia laevipila</i> = <i>Tortula laevipila</i> var. <i>laevipila</i> and <i>T. laevipila</i> var. <i>meridionalis</i>	twisted oak moss	Special Concern	S1-Red	G3G5TNR
Vascular Plants				
<i>Agrostis pallens</i>	Dune bentgrass		S3-Blue	G4G5
<i>Allium amplexans</i>	Slimleaf onion		S3-Blue	G4
<i>Allium crenulatum</i>	Olympic onion		S2-Red	G4
<i>Allium geyeri</i> var. <i>tenerum</i>	Geyer's onion		S2-Red	G4G5TNR
<i>Alopecurus carolinianus</i>	Carolina meadow-foxtail		S2-Red	G5
<i>Aster radulinus</i>	Rough-leaved aster		S1-Red	G4G5
<i>Balsamorhiza deltoidea</i>	Deltoid balsamroot	Endangered	S1-Red	G5
<i>Callitriche marginata</i>	Winged water-starwort		S1-Red	G4
<i>Carex feta</i>	Green-sheathed sedge		S2-Red	G5
<i>Carex tumulicola</i>	Foothill sedge		S1-Red	G4
<i>Castilleja ambigua</i> ssp. <i>ambigua</i>	Paintbrush owl-clover		S2-Red	G4TNR
<i>Castilleja levisecta</i>	Golden paintbrush	Endangered	S1-Red	G1
<i>Centaurium muehlenbergii</i>	Muhlenberg's centaury		S1-Red	G5?
<i>Cheilanthes gracillima</i>	Lace fern		S2S3-Blue	G4G5
<i>Clarkia amoena</i> var. <i>caurina</i>	Farewell-to-spring		S3-Blue	G5T5?
<i>Clarkia amoena</i> var. <i>lindleyi</i>	Farewell-to-spring		S3-Blue	G5T5
<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	Small-flowered godetia		S1-Red	G5T5
<i>Crassula aquatica</i>	Pygmyweed		S3-Blue	G5
<i>Crassula connata</i> var. <i>connata</i>	Erect pygmyweed		S2-Red	G5T?
<i>Dryopteris arguta</i>	Coastal wood fern	Special Concern	S2S3-Blue	G5
<i>Epilobium densiflorum</i>	dense spike-primrose	Endangered	S1-Red	G5
<i>Epilobium torreyi</i>	Brook spike-primrose		S1-Red	G5
<i>Fraxinus latifolia</i>	Oregon ash		S1-Red	G5
<i>Githopsis specularioides</i>	common bluecup		S2S3-Blue	G5
<i>Helenium autumnale</i> var. <i>grandiflorum</i>	mountain sneezeweed		S2S3-Blue	G5TNR

¹¹ http://www.goert.ca/docs/RSDr_Feb02.pdf

¹² Risk status in Canada as determined by the Committee on the Status of Wildlife in Canada (COSEWIC) (http://www.cosewic.gc.ca/eng/sct5/index_e.cfm).

¹³ Risk status in BC as determined by the Conservation Data Centre (<http://srmwww.gov.bc.ca/cdc/>). Red List species are considered to be extirpated, endangered or threatened, and Blue List species are considered vulnerable.

¹⁴ Global conservation status rank, as determined by NatureServe (<http://www.natureserve.org>) based on information provided by Natural Heritage Programs and Conservation Data Centres.

Latin Name	Common Name	COSEWIC Status ¹²	Provincial Rank and Listing ¹³	Global Rank ¹⁴
<i>Heterocodon rariflorum</i>	heterocodon		S3-Blue	G5
<i>Idahoia scapigera</i>	scalegod		S2-Red	G5
<i>Isoetes nuttallii</i>	Nuttall's quillwort		S3-Blue	G4?
<i>Juncus kelloggii</i>	Kellogg's rush	Endangered	S1-Red	G3?
<i>Lasthenia glaberrima</i>	smooth goldfields		S1-Red	G5
<i>Limnanthes macounii</i>	Macoun's meadowfoam	Threatened	S3-Blue	G3
<i>Lomatium dissectum</i> var. <i>dissectum</i>	fern-leaved desert-parsley		S1-Red	G3G4T4
<i>Lomatium grayi</i>	Gray's desert-parsley		S1-Red	G5
<i>Lotus formosissimus</i>	seaside birds-foot lotus = seaside bird's-foot trefoil	Endangered	S1-Red	G5
<i>Lotus pinnatus</i>	bog bird's-foot trefoil	Endangered	S1-Red	G4G5
<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	Spanish-clover		S2S3-Blue	G5T5
<i>Lupinus densiflorus</i> var. <i>densiflorus</i>	dense-flowered lupine	Endangered	S1-Red	G5T4
<i>Lupinus lepidus</i> var. <i>lepidus</i> = <i>Lupinus lepidus</i>	prairie lupine	Endangered	S1-Red	G5
<i>Lupinus oregonus</i> var. <i>kincaidii</i>	sulphur lupine		SX-Red	G5T2
<i>Madia minima</i>	small-headed tarweed		S1-Red	G4
<i>Marah oregonus</i>	manroot		S1-Red	G5
<i>Meconella oregana</i>	white meconella	Endangered	S1-Red	G2G3
<i>Microseris bigelovii</i>	coast microseris		S1-Red	G4
<i>Microseris lindleyi</i>	Lindley's microseris		S1-Red	G5
<i>Minuartia pusilla</i>	dwarf sandwort	Endangered	S1-Red	G5
<i>Myosurus apetalus</i> var. <i>borealis</i>	bristly mouse-tail		S2-Red	G5T?
<i>Navarretia intertexta</i>	needle-leaved navarretia		S2-Red	G5?
<i>Orobancha pinorum</i>	pine broomrape		S1-Red	G4
<i>Orthocarpus bracteosus</i>	rosy owl-clover	Endangered	S1-Red	G3?
<i>Piperia candida</i>	white-lip rein orchid		S2-Red	G3G4
<i>Piperia elegans</i>	elegant rein orchid		S3-Blue	G4
<i>Plagiobothrys figuratus</i>	fragrant popcornflower		S1-Red	G4
<i>Plagiobothrys tenellus</i>	slender popcornflower		S2-Red	G4G5
<i>Psilocarphus elatior</i>	tall woolly-heads	Endangered (Pacific population)	S1-Red	G4Q
<i>Psilocarphus tenellus</i> var. <i>tenellus</i>	slender woolly-heads	Not at risk	S2-Red	G4T4
<i>Ranunculus alismaefolius</i> var. <i>alismaefolius</i> = <i>Ranunculus alismifolius</i> var. <i>alismifolius</i>	water-plantain buttercup	Endangered	S1-Red	G5T5
<i>Ranunculus californicus</i>	California buttercup		S2-Red	G5
<i>Ranunculus lobbii</i>	Lobb's water-buttercup		SX-Red	G4
<i>Rupertia physodes</i>	California-tea		S3-Blue	G4
<i>Sanicula arctopoides</i>	bear's-foot sanicle = snake-root sanicle	Endangered	S1-Red	G5
<i>Sanicula bipinnatifida</i>	purple sanicle	Threatened	S2-Red	G5
<i>Senecio macounii</i>	Macoun's groundsel		S3-Blue	G5
<i>Sericocarpus rigidus</i> = <i>Aster curtus</i>	white-top aster	Threatened	S2-Red	G3
<i>Silene scouleri</i> ssp. <i>grandis</i>	Scouler's campion = coast Scouler's catchfly	Endangered	S1-Red	G5TNRQ
<i>Tonella tenella</i>	small-flowered tonella	Endangered	S1-Red	G5
<i>Toxicodendron diversilobum</i>	poison oak		S2S3-Blue	G5

Latin Name	Common Name	COSEWIC Status ¹²	Provincial Rank and Listing ¹³	Global Rank ¹⁴
<i>Trifolium cyathiferum</i>	cup clover		S1-Red	G4
<i>Trifolium depauperatum</i> var. <i>depauperatum</i>	poverty clover		S3-Blue	G5T5?
<i>Trifolium dichotomum</i>	Macrae's clover		S2S3-Blue	G3G4
<i>Triphysaria versicolor</i> ssp. <i>versicolor</i>	bearded owl-clover	Endangered	S1-Red	G5T5
<i>Triteleia howellii</i>	Howell's triteleia	Endangered	S1-Red	G3G4
<i>Viola howellii</i>	Howell's violet		S2S3-Blue	G4
<i>Viola praemorsa</i> ssp. <i>praemorsa</i>	yellow montane violet	Threatened	S2-Red	G5T3T5
<i>Yabea microcarpa</i>	California hedge-parsley		S1-Red	G5?
Insects Excluding Butterflies				
<i>Camirus porosus</i>	(shield-backed bug)		S1-Red	G5
<i>Ceratocapsus downesi</i>	(leaf bug)		S1-Red	G1?
<i>Clivenema fusca</i>	(plant bug)		S1-Red	G1?
<i>Erythemis collocata</i>	western pondhawk		S3-Blue	G5
<i>Harmostes dorsalis</i>	(scentless plant bug)		S1-Red	G5
<i>Nicocles rufus</i>	(robber fly)		S1-Red	G?
<i>Pachydiplax longipennis</i>	blue dasher		S3S4-Blue	G5
<i>Scleropogon bradleyi</i>	(robber fly)		S2-Red	G?
<i>Scolopostethus tropicus</i>	(seed bug)		S1-Red	G5
<i>Sympetrum vicinum</i>	yellow-legged meadowhawk = autumn meadowhawk		S3S4-Blue	G5
Butterflies				
<i>Cercyonis pegala incana</i>	common woodnymph, <i>incana</i> subspecies		S3-Blue	G5TNR
<i>Coenonympha californica insulana</i>	common ringlet, <i>insulana</i> subspecies		S2-Red	G5T3T4
<i>Colias occidentalis</i>	western sulphur		S3S4-Blue	G3G4
<i>Erynnis propertius</i>	Propertius duskywing		S3-Blue	G5
<i>Euchloe ausonides</i> = <i>E. ausonides</i> ssp. 1 = <i>E. ausonides insulana</i>	island marble = island marble, undescribed island subspecies	Extirpated	SX-Red	G5T1
<i>Euphydryas editha taylori</i>	Taylor's checkerspot = Edith's checkerspot, <i>taylori</i> subspecies	Endangered	SH-Red	G5T1
<i>Euphyes vestris</i>	dun skipper	Threatened (western population)	S3-Blue	G5
<i>Hesperia colorado oregonia</i>	common branded skipper, <i>oregonia</i> subspecies		S3-Blue	G5T3T4
<i>Icaricia icariodes blackmorei</i>	Boisduval's blue, <i>blackmorei</i> subspecies		S3-Blue	G5T3
<i>Incisalia mossii mossii</i>	Moss' elfin, <i>mossii</i> subspecies		S3-Blue	G4T4
<i>Oeneis nevadensis</i>	great arctic		S3-Blue	G5
<i>Plebejus saepiolus insulanus</i>	island blue = greenish blue, <i>insulanus</i> subspecies	Endangered	SH-Red	G5TH
<i>Speyeria zerene bremnerii</i>	zerene fritillary, <i>bremnerii</i> subspecies		S3-Blue	G5T3T4
Reptiles				
<i>Contia tenuis</i>	sharp-tailed snake	Endangered	S1-Red	G5
<i>Pituophis catenifer catenifer</i>	Pacific gopher snake = gopher snake, <i>catenifer</i> subspecies	Extirpated	SX-Red	G5T5
Birds				
<i>Ardea herodias fannini</i>	Pacific great blue heron = great blue heron, <i>fannini</i> subspecies	Special Concern	S3B,S4N-Blue	G5T4
<i>Asio flammeus</i>	short-eared owl	Special Concern	S3B,S2N-Blue	G5

Latin Name	Common Name	COSEWIC Status ¹²	Provincial Rank and Listing ¹³	Global Rank ¹⁴
<i>Coccyzus americanus</i>	yellow-billed cuckoo		SXB, SAN-Red	G5
<i>Columba fasciata</i>	band-tailed pigeon		S3S4B, SZN-Blue	G4
<i>Eremophila alpestris strigata</i>	horned lark, <i>strigata</i> subspecies	Endangered	SX-Red	G5T1T2
<i>Falco peregrinus anatum</i> ¹	anatum peregrine falcon = peregrine falcon, <i>anatum</i> subspecies ¹	Threatened	S2B, SZN-Red	G4T3
<i>Glaucidium gnoma swarthi</i>	northern pygmy-owl, <i>swarthi</i> subspecies		S3-Blue	G5T3Q
<i>Megascops kennicottii kennicottii</i> = <i>Otus kennicottii kennicottii</i>	western screech-owl, <i>kennicottii</i> subspecies	Special Concern	S3-Blue	G5T4
<i>Melanerpes lewis</i>	Lewis's woodpecker	Special Concern	SXB, SZN-Red (Georgia Depression population)	G5TNRQ (Georgia Depression population)
<i>Pooecetes gramineus affinis</i>	vesper sparrow, <i>affinis</i> subspecies		S1B-Red	G5T3
<i>Progne subis</i>	purple martin		S2B-Red	G5
<i>Sialia mexicana</i> , population 1	western bluebird, Georgia Depression population		SHB, SZN-Red	G5TNRQ
<i>Sturnella neglecta</i> , population 1	western meadowlark, Georgia Depression population		SXB, SZN-Red	G5TNRQ
<i>Tyto alba</i>	barn owl	Special Concern (western population)	S3-Blue	G5
Mammals				
<i>Cervus elaphus roosevelti</i>	Roosevelt elk		S2S3-Blue	G5T4
<i>Corynorhinus townsendii</i>	Townsend's big-eared bat		S2S3-Blue	G4
<i>Mustela erminea anguinae</i>	Ermine, <i>anguinae</i> subspecies		S3-Blue	G5T3

¹Subspecific taxonomy uncertain

Susceptibility of Vascular Plant Species at Risk in GOEs in BC to Scotch broom¹⁵

Habitat / Latin Name of species	Common Name of Species	Habitat Susceptibility to Scotch Broom
Oak woodlands or forests		
<i>Balsamorhiza deltoidea</i>	Deltoid balsamroot	Highly susceptible to broom invasion
<i>Carex tumulicola</i>	Foothill sedge	
<i>Rupertia physodes</i>	California-tea	
<i>Sanicula bipinnatifida</i>	Purple sanicle	
<i>Sericocarpus rigidus</i> = <i>Aster curtus</i>	White-top aster	
<i>Viola praemorsa</i> ssp. <i>praemorsa</i>	Yellow montane violet	
Mixed Douglas-fir, Arbutus, oak woodlands or forests		
<i>Rupertia physodes</i>	California-tea	Moderately susceptible, depending on amount of light at ground level
<i>Toxicodendron diversilobum</i>	Poison oak	
<i>Viola howellii</i>	Howell's violet	
<i>Yabea microcarpa</i>	California hedge-parsley	
Conifer forest (+/- Arbutus)		
<i>Orobancha pinorum</i>	Pine broomrape	No broom due to shading by evergreens
<i>Piperia candida</i>	White-lip rein orchid	
Tall Rock cliffs		
<i>Cheilanthes gracillima</i>	Lace fern	Low risk of broom (cracks, ledges)
<i>Lomatium grayi</i>	Gray's desert-parsley	
Very exposed, dry grassland slopes		
<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	Small-flowered godetia	Limited potential for broom due to drought
<i>Plagiobothrys tenellus</i>	Slender popcornflower	
<i>Trifolium dichotomum</i>	Macrae's clover	
Very thin soils / short turf over rock, slightly seepy in spring		
<i>Idahoia scapigera</i>	Scalegod	Occurs in mosaic with deeper soils and cracks. Broom will colonize these surrounding habitats and impact small patches of this microhabitat by shading
<i>Githopsis specularioides</i>	Common bluecup	
<i>Meconella oregana</i>	White meconella	
<i>Microseris lindleyi</i>	Lindley's microseris	
<i>Trifolium depauperatum</i>	Poverty clover	
<i>Tonella tenella</i> ?	Small-flowered tonella	
Vernal pools and seeps, general		
<i>Alopecurus carolinianus</i>	Carolina meadow-foxtail	Usually free of broom, but where seeps and pools are small enough, surrounding broom will impact on these species by shading
<i>Callitriche marginata</i>	Winged water-starwort	
<i>Isoetes nuttallii</i>	Nuttall's quillwort	
<i>Limnanthes macounii</i>	Macoun's meadowfoam	
<i>Lotus pinnatus</i> (deeper water)	Bog bird's-foot trefoil	
<i>Psilocarphus elatior</i>	Tall woolly-heads	
<i>Epilobium densiflorum</i>	Dense spike-primrose	
<i>Epilobium torreyi</i>	Brook spike-primrose	

¹⁵ From Hans Roemer

Habitat / Latin Name of species	Common Name of Species	Habitat Susceptibility to Scotch Broom
Flat, vernal wet meadow (usually on clay)		
<i>Centaurium muehlenbergii</i>	Muhlenberg's centaury	Usually too wet for broom survival
<i>Juncus kelloggii</i>	Kellogg's rush	
<i>Navarretia intertexta</i>	Needle-leaved navarretia	
<i>Plagiobothrys figuratus</i>	Fragrant popcornflower	
<i>Ranunculus alismaefolius</i> var. <i>alismaefolius</i> = <i>Ranunculus alismifolius</i> var. <i>alismifolius</i>	Water-plantain buttercup	
<i>Ranunculus lobbii</i> ?	Lobb's water-buttercup	
Marine shoreline vernal seeps and pools on shallow soil		
<i>Castilleja ambigua</i> ssp. <i>ambigua</i>	Paintbrush owl-clover	Usually free of broom, but where seeps and pools are small enough, surrounding broom will impact on these species by shading
<i>Crassula connata</i> var. <i>connata</i>	Erect pygmyweed	
<i>Orthocarpus bracteosus</i>	Rosy owl-clover	
<i>Limnanthes macounii</i>	Macoun's meadowfoam	
Marine shoreline short turf due to extreme exposure		
<i>Microseris bigelovii</i>	Coast microseris	Usually free of broom, but susceptible
<i>Minuartia pusilla</i>	Dwarf sandwort	
<i>Sanicula arctopoides</i>	Bear's-foot sanicle = snake-root sanicle	
<i>Triphysaria versicolor</i> ssp. <i>versicolor</i>	Bearded owl-clover	
<i>Lotus formosissimus</i>	Seaside birds-foot lotus = seaside bird's-foot trefoil	
<i>Trifolium depauperatum</i>	Poverty clover	
Maritime meadows (lush, but no tall vegetation due to exposure)		
<i>Castilleja levisecta</i>	Golden paintbrush	Susceptible to broom invasion
<i>Lotus formosissimus</i>	Seaside birds-foot lotus = seaside bird's-foot trefoil	
<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	Spanish-clover	
<i>Ranunculus californicus</i>	California buttercup	
<i>Silene scouleri</i> ssp. <i>grandis</i>	Scouler's campion	
Other special habitats		
<i>Agrostis pallens</i>	Dune bentgrass	Habitat unsuitable for broom
<i>Carex feta</i>	Green-sheathed sedge	???
<i>Dryopteris arguta</i>	Coastal wood fern	Habitat susceptible to broom
<i>Helenium autumnale</i> var. <i>grandiflorum</i>	Mountain sneezeweed	Habitat unsuitable for broom
<i>Lupinus densiflorus</i> var. <i>densiflorus</i>	Dense-flowered lupine	Habitat susceptible to broom
<i>Lupinus lepidus</i> var. <i>lepidus</i> = <i>Lupinus lepidus</i>	Prairie lupine	Habitat susceptible to broom
<i>Lupinus oregonus</i> var. <i>kincaidii</i>	Sulphur lupine	???
<i>Marah oregonus</i>	Manroot	Habitat susceptible to broom
<i>Psilocarphus tenellus</i> var. <i>tenellus</i>	Slender woolly-heads	Habitat unsuitable for broom
<i>Trifolium cyathiferum</i>	Cup clover	???
<i>Triteleia howellii</i>	Howell's triteleia	Habitat susceptible to broom

Exotic Species in Garry oak and associated ecosystems in BC as of February 2002

Plant Species¹⁶

Species Latin Name	Species Common Name
Trees	
<i>Pinus ponderosa</i>	ponderosa pine
<i>Prunus avium</i>	sweet cherry
<i>Prunus domestica</i>	common plum
<i>Prunus pissardii</i> = <i>P. cerasifera</i> cv. <i>Atropurpurea</i>	cherry plum
Shrubs	
<i>Cotoneaster</i> , several spp	rock cotoneaster
<i>Crataegus monogyna</i>	common hawthorn
<i>Cytisus scoparius</i>	Scotch broom
<i>Daphne laureola</i>	laurel-leaved daphne
<i>Hedera helix</i>	English ivy
<i>Ilex aquifolium</i>	English holly
<i>Ligustrum vulgare</i>	common privet
<i>Lycium barbarum</i> (= <i>L. halimifolium</i>)	box thorn
<i>Rosa eglanteria</i>	sweet brier
<i>Rubus procerus</i> (= <i>R. discolor</i> , <i>R. armeniacus</i>)	Himalayan blackberry
<i>Rubus laciniatus</i>	cut-leaved blackberry
<i>Vinca minor</i>	common periwinkle
<i>Vinca major</i>	greater periwinkle
<i>Ulex europaeus</i>	gorse
Herbs	
<i>Agrostis capillaris</i> (= <i>A. tenuis</i>)	colonial bentgrass
<i>Agrostis gigantea</i> (= <i>A. alba</i> , in part)	redtop
<i>Agrostis stolonifera</i> (= <i>A. alba</i> , in part)	creeping bentgrass
<i>Aira caryophyllea</i>	silver hairgrass
<i>Aira praecox</i>	early hairgrass
<i>Alliaria petiolata</i> (= <i>Alliaria officinalis</i>)	garlic mustard
<i>Allium vineale</i> ssp. <i>vineale</i>	field garlic
<i>Alopecurus geniculatus</i>	water meadow-foxtail
<i>Alopecurus pratensis</i>	meadow meadow-foxtail
<i>Amsinckia menziesii</i>	small-flowered fiddleneck
<i>Anagallis arvensis</i> ssp. <i>arvensis</i>	scarlet pimpernel
<i>Anthoxanthum odoratum</i>	sweet vernalgrass
<i>Anthoxanthum aristatum</i>	annual vernalgrass
<i>Aphanes arvensis</i> (= <i>Alchemilla occidentalis</i>)	field parsley-piert
<i>Aphanes microcarpa</i>	small-fruited parsley-piert
<i>Arabidopsis thaliana</i>	mouse-ear
<i>Arabis holboellii</i> var. <i>retrofracta</i>	Holboell's rockcress
<i>Arenaria serpyllifolia</i>	thyme-leaved sandwort
<i>Arrhenatherum elatius</i>	tall oatgrass
<i>Artemisia absinthium</i>	wormwood
<i>Barbarea vulgaris</i>	bitter winter cress
<i>Bellis perennis</i>	English daisy

¹⁶ From the GOERT website (http://www.goert.ca/reference/exotic_pl.html), with edits from Hans Roemer.

<i>Brassica campestris</i>	field mustard
<i>Briza minor</i>	small quaking grass
<i>Bromus commutatus</i>	meadow brome
<i>Bromus hordeaceus</i> (= <i>B. mollis</i>)	soft brome
<i>Bromus inermis</i>	smooth brome
<i>Bromus racemosus</i>	smooth brome
<i>Bromus rigidus</i>	rip-gut brome
<i>Bromus sterilis</i>	barren brome
<i>Bromus tectorum</i>	cheatgrass
<i>Capsella bursa-pastoris</i>	shepherd's purse
<i>Centaurea biebersteinii</i> (= <i>C. maculosa</i>)	spotted knapweed
<i>Centaurea cyanus</i>	cornflower
<i>Centaurea melitensis</i>	Maltese star-thistle
<i>Centaurea nigrescens</i>	short-fringed knapweed
<i>Centaurea paniculata</i>	Jersey knapweed
<i>Centaurium erythraea</i> (= <i>C. umbellatum</i>)	common centaurium
<i>Cerastium semidecandrum</i>	little chickweed
<i>Cerastium glomeratum</i>	sticky chickweed
<i>Cerastium fontanum</i> ssp. <i>triviale</i>	mouse-eared chickweed
<i>Chenopodium album</i>	lamb's quarter
<i>Leucanthemum vulgare</i> (= <i>Chrysanthemum leucanthemum</i>)	entire-leaved daisy
<i>Cichorium intybus</i>	chicory
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium vulgare</i>	bull thistle
<i>Conium maculatum</i>	poison-hemlock
<i>Conyza canadensis</i>	horseweed
<i>Crepis capillaris</i>	smooth hawkbeard
<i>Cynosurus cristatus</i>	crested dogtail
<i>Cynosurus echinatus</i>	hedgehog dogtail
<i>Dactylis glomerata</i>	orchardgrass
<i>Daucus carota</i>	wild carrot
<i>Digitalis purpurea</i>	common foxglove
<i>Draba verna</i>	common draba
<i>Elymus repens</i> (= <i>Agropyron repens</i>)	quackgrass
<i>Erodium cicutarium</i>	common stork's-bill
<i>Festuca trachyphylla</i> (= <i>F. ovina</i>)	hard fescue
<i>Festuca rubra</i> (in part)	red fescue
<i>Galium aparine</i>	cleavers
<i>Geranium dissectum</i>	cut-leaved geranium
<i>Geranium molle</i>	dovefoot geranium
<i>Geranium robertianum</i>	Robert's geranium
<i>Gnaphalium purpureum</i>	purple cudweed
<i>Gnaphalium uliginosum</i>	marsh cudweed
<i>Holcus lanatus</i>	common velvet-grass
<i>Hordeum murinum</i>	seagreen barley
<i>Hypericum perforatum</i>	common St. John's-wort
<i>Hypochaeris glabra</i>	smooth cat's-ear
<i>Hypochaeris radicata</i>	hairy cat's-ear
<i>Ilopesis setacea</i> (= <i>Scirpus setaceus</i>) add a space	bristle clubrush
<i>Lamium amplexicaule</i>	common dead-nettle
<i>Lamium purpureum</i>	purple dead-nettle
<i>Lapsana communis</i>	nipplewort
<i>Lathyrus latifolius</i>	broad-leaved pea-vine
<i>Lathyrus sphaericus</i>	grass peavine
<i>Leontodon taraxacoides</i> (= <i>L. nudicaulis</i>)	hairy hawkbit

<i>Lepidium densiflorum</i>	prairie pepper-grass
<i>Linaria genistifolia</i> ssp. <i>dalmatica</i> (= <i>L. dalmatica</i>)	Dalmatian toadflax
<i>Linaria vulgaris</i>	butter-and-eggs
<i>Lolium multiflorum</i> (= <i>L. persicum</i>)	Italian ryegrass
<i>Lolium perenne</i>	perennial ryegrass
<i>Lotus corniculatus</i>	birds-foot trefoil
<i>Lotus tenuis</i>	narrow-leaved birds-foot trefoil
<i>Lychnis coronaria</i>	rose campion
<i>Marrubium vulgare</i>	common horehound
<i>Matricaria discoidea</i> (= <i>M. matricarioides</i>)	pineapple weed
<i>Medicago arabica</i>	spotted medic
<i>Medicago lupulina</i>	black medic
<i>Medicago sativa</i>	alfalfa
<i>Melilotus albus</i>	white sweet-clover
<i>Muscari botryoides</i>	common grape hyacinth
<i>Myosotis discolor</i>	common forget-me-not
<i>Narcissus pseudonarcissus</i>	daffodil
<i>Phleum pratense</i>	common timothy
<i>Plantago lanceolata</i>	ribwort plantain
<i>Plantago major</i>	common plantain
<i>Plantago media</i>	hoary plantain
<i>Poa annua</i>	annual bluegrass
<i>Poa bulbosa</i>	bulbous bluegrass
<i>Poa compressa</i>	Canada bluegrass
<i>Poa pratensis</i>	Kentucky bluegrass
<i>Polygonum arenastrum</i>	oval-leaved knotweed
<i>Polypogon monspeliensis</i>	rabbitfoot polypogon
<i>Ranunculus repens</i>	creeping buttercup
<i>Rorippa sylvestris</i>	creeping yellow cress
<i>Rumex acetosella</i>	sheep sorrel
<i>Saxifraga tridactylites</i>	rue-leaved saxifrage
<i>Sedum acre</i>	goldmoss stonecrop
<i>Sedum album</i>	white stonecrop
<i>Senecio vulgaris</i>	common groundsel
<i>Sherardia arvensis</i>	blue-field-madder
<i>Silene anthirrhina</i>	sleepy catchfly
<i>Silene gallica</i>	small-flowered catchfly
<i>Silene latifolia</i> ssp. <i>alba</i> (= <i>Lychnis alba</i>)	white cockle
<i>Solanum dulcamara</i> var. <i>dulcamara</i>	European bitterweet
<i>Soliva sessilis</i>	carpet burweed
<i>Sonchus arvensis</i>	perennial sowthistle
<i>Sonchus asper</i>	prickly sowthistle
<i>Stellaria media</i>	chickweed
<i>Tanacetum vulgare</i>	common tansy
<i>Taraxacum laevigatum</i>	red-seeded dandelion
<i>Taraxacum officinale</i>	common dandelion
<i>Teesdalia nudicaulis</i>	shepherd's cress
<i>Thlaspi arvense</i>	field pennycress
<i>Tragopogon porrifolius</i>	common salsify
<i>Trifolium campestre</i> (= <i>T. procumbens</i>)	low hop-clover
<i>Trifolium dubium</i>	small hop-clover
<i>Trifolium hybridum</i>	alsike clover
<i>Trifolium repens</i>	white clover
<i>Trifolium subterraneum</i>	subterranean
<i>Triticum aestivum</i>	wheat

<i>Veronica arvensis</i>	wall speedwell
<i>Veronica serpyllifolia</i> var. <i>serpyllifolia</i>	thyme-leaved speedwell
<i>Veronica officinalis</i>	common speedwell
<i>Vicia cracca</i>	tufted vetch
<i>Vicia hirsuta</i>	hairy vetch
<i>Vicia sativa</i>	common vetch
<i>Vicia tetrasperma</i>	slender vetch
<i>Viola odorata</i>	sweet violet
<i>Vulpia bromoides</i>	barren fescue
<i>Vulpia myuros</i> var. <i>myuros</i>	rattail fescue

Vertebrate Species¹⁷

Species Latin Name	Species Common name
Reptiles	
<i>Podarcis muralis</i>	European wall lizard
Birds	
<i>Phasianus colchicus</i>	ring-necked pheasant
<i>Callipepla californica</i>	California quail
<i>Columba livia</i>	rock dove
<i>Alauda arvensis</i>	skylark
<i>Sturnus vulgaris</i>	European starling
<i>Passer domesticus</i>	house sparrow
Mammals	
<i>Didelphis virginiana</i>	Virginia opossum
<i>Oryctolagus cuniculus</i>	European rabbit
<i>Sylvilagus floridanus</i>	eastern cottontail
<i>Mus musculus</i>	house mouse
<i>Rattus norvegicus</i>	Norway rat
<i>Rattus rattus</i>	black rat
<i>Sciurus carolinensis</i>	eastern gray squirrel

¹⁷ From the GOERT website (http://www.goert.ca/reference/exotic_an.html)

NOTES

EVALUATION SHEET

Name of DST user: _____ Date: _____
Telephone #: _____ email address: _____

1. Was this Decision Support Tool easy to download and print? yes no
If not, please explain:

2. Was this Decision Support Tool easy to understand? yes no
If not, please explain:

3. Was this Decision Support Tool easy to use? yes no
If not, please explain:

4. What improvements (if any) would you consider essential to making this tool effective?

5. Can you suggest any additional "nice to have" improvements?

Please fax or email this page to the
Garry Oak Ecosystems Recovery Team: 250-479-0546 or Chris.Junck@goert.ca

Thank you!