# General Decision Process for Managing Invasive Plant Species in Garry Oak and Associated Ecosystems (GOEs)

This decision support tool is intentionally short and concise. It is driven by a series of questions to help users decide whether, and how, to manage invasive plant species in any GOE. It assumes that users are sufficiently knowledgeable about GOEs and invasive, native and rare species to understand the questions and to know where to look for help in answering them if needed.

## Part 1. Things to consider when deciding **whether** to engage in invasive plant species management in a GOE:

### A. ECOSYSTEM CHARACTERISTICS

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

If not, other ecosystems may require consideration of factors not covered in this tool. (Useful reference: Erickson and Meidinger 2007. Full citation provided in Part 3.)

**2. What are the characteristics of the ecosystem?**

a) Does the GOE have any *protected status* (e.g., park, conservation covenant)?

b) Has the landowner or manager identified any *management objectives* for the GOE?

c) What types of *activities* is the GOE used for (including unauthorized uses), and where?

d) What *special elements or features* occur in the GOE, such as species or communities at risk, elements of cultural significance for First Nations, and sensitive areas such as vernal pools and seeps? Are any of these elements vulnerable to invasive species control actions; or does any species at risk rely on invasive species for food or habitat?

e) What is the general *ecological quality and health* of the ecosystem? How much work is needed beyond invasive species management, including planting or seeding with native species, to restore the ecosystem?

**3. What invasive plant species are present?**

**4. What is their degree of invasion?** For each invasive species:

a) *How many areas* of the GOE has it invaded: a few, many, or all?

b) What is its *density* in each of these areas: low (e.g., less than 10% coverage), medium (e.g., 10-40%), or high (e.g. greater than 40%)?

c) What is its *degree of establishment*: just starting to establish with plants that are still young or immature; or well-established with mature plants?

## B. RISK ASSESSMENT

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

Threats to species at risk

a) Might any species or communities at risk suffer from the *control efforts* for invasive plant species? In other words, are species at risk in the GOE particularly vulnerable to the types of disturbance that might be caused by invasive plant removal activities? Are they vulnerable only during defined periods or seasons, which can be avoided?

b) Might species at risk in the GOE suffer from the *absence* of the invasive plant species? Are invasive plant species providing habitat (e.g., food, shelter) for species at risk? Can these habitat attributes be replaced by non-invasive species as part of the control efforts?

Risk of greater damage if action taken

c) Is the invasive plant species serving a useful management purpose at the site (e.g., hindering visitor access to sensitive areas or blocking "bandit trails")?

Risk of conflict with neighbours

d) Are the invasive plant species performing a valued service to people? For example, providing edible berries, providing a visual buffer, helping prevent undesired access, or providing habitat for species not designated "at risk" that people still care about? What sort of local reaction would you expect from efforts to control the invasive plant species?

Legal risk

e) Is there a legal requirement to control invasive plant species? For example, are there any laws or bylaws that require landowners to control certain invasive plants?

## C. DECISION

### 6. Proceed with management and control?

Consider the following factors to help you decide *if* you should proceed with invasive plant species management, using your answers from A and B above to guide you.

a) What is the *ecological value* of the GOE? In answering this, consider your answers to questions 2d) and 2e).

b) Are invasive plant species control efforts in line with the *management objectives* for the GOE (if such objectives exist)? Consider your answer to questions 2b) and 5c).

c) Will the *species or communities at risk* or other elements of significance that are present in the GOE be less threatened by controlling the invasive plant species in the GOE, or by leaving things as they are? Consider your answers to questions 5a), 5b) and 5c).

d) Would you expect a strong negative reaction from the *local community* if you take action against invasive plant species? Consider your answers to questions 2c) and 5d).

e) Is the GOE in a jurisdiction (municipal, regional, provincial) with *laws or bylaws* requiring control of invasive plant species? Refer back to your answer for question 5e).

f) Is *land ownership likely to change* in the foreseeable future, particularly to new owners less supportive of restoration efforts?

g) Control and management of invasive plant species requires repeated treatments and monitoring. Are you willing to make a *long-term commitment* to this?

h) Do you have *sufficient resources* available over the long-term (e.g., time, funding, people)?

## Part 2. Things to consider when deciding **how** to undertake invasive plant species management in the GOE:

### 7. Which invasive plant species are the highest priorities for management?

Invasive plant species that pose the greatest threat to GOEs and are the highest priority for management are those that are *just beginning their invasion* into relatively undisturbed habitats, and have the *greatest potential to damage the ecosystem* once they are well established. Tables 1 and 2 below can help you rate the management priority of the invasive plant species in the GOE (if you don't have the resources to manage all of them). Another and more rigorous tool, developed by Jeff Hallworth of the BC Ministry of Forest and Range's Invasive Alien Plant Program, might be helpful in prioritizing invasive species – it is an Excel-based tool, however a paper version is provided in Appendix 1. Other resources can also be found on the GOERT website.

Table 1: Relative rating of the significance of the impact of 15 of the most invasive plants on GOEs.[1]

| Invasive Plant Species | Relative Significance Rating |
|---|---|
| Orchard-grass (*Dactylis glomerata*) | **Highest** |
| Scotch broom (*Cytisus scoparius*) | |
| English ivy (*Hedera helix*) | |
| Gorse (*Ulex europeus*) | |
| Velvet-grass (*Holcus lanatus*) | |
| English hawthorn (*Crataegus monogyna*) | |
| Laurel-leaved daphne (*Daphne laureola*) | |
| Sweet vernalgrass (*Anthoxanthum odoratum*) | Medium |
| Hedgehog dogtail grass (*Cynosurus echinatus*) | |
| Himalayan blackberry (*Rubus proseris/discolora/armeniacs*) | |
| Morning-glory/bindweed (*Convolvulus arvensis/sepium*) | |
| Non-native thistles (*Cirsium spp*.) | |
| Oyster plant (*Tragopogon porrifolius*) | |
| Holly (*Ilex aquifolium/europea*) | Lower |
| Rose campion (*Lychnis coronaria*) | |

Table 2: Factors to consider in determining overall invasive plant species management priority.

| FACTOR: | Lower priority | ➔ | **Highest priority** |
|---|---|---|---|
| Number of areas invaded within the GOE, from question 4a) | all | many | few |
| Density in invaded areas, from question 4b) | > 40% coverage | 10% - 40% coverage | < 10% coverage |
| Degree of establishment, from question 4c) | well-established | somewhat established | starting to establish |
| Potential significance of impact | Lower | Medium | Highest |

[1] Based on the significance ratings by a panel of experts, from "Towards a Decision Support Tool to Address Invasive Species in Garry Oak & Associated Ecosystems in B.C.", prepared in 2002, for GOERT. Available from the GOERT website.

### 8. Where, within the GOE, to take action?

Focus first on containing the invasive plant species (preventing further spread), and then on reducing the footprint of the invasion. For particularly aggressive invaders, focus first on areas where action now can prevent a full invasion. Priority should be given to areas of high conservation value within the GOE. Also consider accessibility, as repeated treatments will likely be needed.

### 9. What action to take, and when?

a) What are the *best practices* for managing each invasive plant species? (Information on best practices for some invasive species can be found on the GOERT website).

b) In what *season* or during what *time of year* are these practices most effective?

c) Are there *species at risk* or *sensitive areas* that must be avoided, or that require adjustments to practices or timing of management activities? Particular dangers to sensitive species and sites include trampling, and disturbance to the soil or duff layer.

d) Is your *labour force* large enough, and do they have sufficient knowledge and skill?

e) Do you have access to the necessary *tools and equipment*?

f) Are there *health and safety risks* associated with any of the practices, or any of the species you are managing? Do you have the required safety gear and WorkSafeBC information?

g) What *planting or seeding* should be done after the invasive plant species is removed? In most cases planting or seeding following treatment is advisable to increase the rate of re-establishment of native species.

### 10. How to dispose of the dead plant material?

a) What *volume* of dead plant material will be generated through your management methods?

b) What are the *risks* of different disposal methods? Will burning release noxious compounds? Will leaving it on site release nitrogen or phytotoxins into the soil, allow it to re-sprout from stems or leaves, or result in seed release?

c) How will you *transport* it to the disposal site? What route through the GOE will be used for carrying it out? Does it need to be wrapped in tarps to prevent seed spread? Does it contain noxious compounds that would pose a risk in an enclosed passenger vehicle (e.g., Daphne)?

### 11. How to learn from management and control activities?

a) Undertake regular monitoring at the site for at least three to five years (and ideally longer) after beginning treatment to track the success of management efforts. Re-treat as needed, using best practices available on the GOERT website, and also applying modifications based on observed results.

b) Contact others working on similar problems in other GOEs for advice and to share what you learn from your own efforts.

c) Explicitly recognize key uncertainties, and deliberately design treatments to reduce this uncertainty using an adaptive management (i.e., experimental management) approach. (Useful reference for adaptive management in ecosystem restoration: Murray and Marmorek 2003.)

## Part 3. Selected references and resources:

Erickson, W.R. and D.V. Meidinger. 2007. Garry oak (*Quercus garryana*) plant communities in British Columbia: a guide to identification. B.C. Min. For. Range, Res. Br., Victoria, B.C. Tech. Rep. 040. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr040.htm>

Garry Oak Ecosystems Recovery Team (GOERT) web page, which provides numerous resources as well as links to other web pages and resources. (<www.goert.com>)

Garry Oak Ecosystems Recovery Team. 2003. Invasive Species in Garry Oak and Associated Ecosystems in British Columbia. Garry Oak Ecosystems Recovery Team, Victoria, BC. Available from <http://www.goert.ca/pubs_invasive.php>.

Boyle, Patricia. nd. Matrix showing the best months to kill selected invasive plants in Victoria. Available from <http://www.goert.ca/pubs_invasive.php>.

Murray, C. and D. Marmorek. 2003. Adaptive Management and Ecological Restoration. Chapter 24, in: Freiderici, P. (ed.). 2003. Ecological Restoration of Southwestern Ponderosa Pine Forests. Island Press (Washington, Covelo CA, London), pp. 417-428.

WorkSafeBC Toxic Plant Warning for *Daphne laureola*. <http://www.worksafebc.com/publications/health_and_safety/bulletins/toxic_plants/assets/pdf/tp0601.pdf >

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# Appendix 1. 2006 IAPP Species Scoring Algorithm

The following is provided with the permission of the developer, Jeff Hallworth, Coastal Invasive Plant Specialist, Ministry of Forests & Range - Range Branch, Port Alberni, BC. It was developed as an Excel tool in which calculates subtotals and the overall score automatically, and has been modified slightly for use in paper format.

**Notes to Users of the paper-based version of the IAPP Algorithm**

1. There are four criteria used to derive an Overall Score: Biological, Containability, Controllability and Impact.

Biological Criteria questions:

- proceed one question at a time down the list, and if the condition is consistent with the biology of the species in question, then transfer the number shown in the Points column into the Score column for that question.

- in two instances, an "OR" scenario exists whereby you must choose the most applicable condition between two choices. Only enter the points from the question that is most applicable to the biology of the plant; or if neither applies, then leave the score column blank for both questions.

Containability, Controllability and Impact questions:

- enter the highest ranking, most applicable points for any of these questions into the Subtotal column only, for each section.

2. In the box at the bottom, write in each Subtotal for the corresponding criteria; multiply that number by its respective Prorate Factor, and enter the Prorated Score for each criteria.

3. Add the four Prorated Scores for a Grand Subtotal, and then divide this by 3 for an Overall Score out of 10.

# 2006 IAPP Species Scoring Algorithm

***Note to Users:*** *only input information into the white fields.*

| | |
|---|---|
| **Common Name:** | |
| **Scientific Name:** | |
| **Management Area:** | |

| Proceed down this list answering each of the 21 Yes/No questions, one by one. If the answer is Yes to any question, then transfer the number shown in the Points column into the Score column for that question, add the scores, divide the sum by 21, and write the result in the Subtotal box. **Is this species:** | | **Points** | **Score** |
|---|---|---|---|
| **Biological Criteria** | new to the area (e.g. within the last 25 years) and suited to thrive in the local climate? | 5 | |
| | adapted to thrive in an aquatic, riparian or sensitive ecosystem? | 5 | |
| | tolerant a wide range of soil conditions? | 3 | |
| | able to live in excess of 5 years? | 5 | |
| | capable of forming thickets? | 4 | |
| | able to quickly dominate a site without disturbance and form a dense monoculture? **OR** | 5 | |
| | capable of slow domination of a site, but in patches without disturbance? | 3 | |
| | shade tolerant? | 4 | |
| | geophytic? (it has underground storage organs - bulbs, corms, or tubers) | 3 | |
| | a producer of seed whose viability exceeds 5 years? | 5 | |
| | capable of hybridizing or self-fertilizing? | 5 | |
| | able to fix nitrogen or alter soil chemistry to inhibit native plant establishment (alleopathic)? | 5 | |
| | able to reproduce by vegetatively, by stolons, rhizomes, bulbils or other asexual means? | 5 | |
| | seed, spore or cuttings adapted to dispersal by birds/animals, water or wind? | 4 | |
| | a prolific seed producer @ 5,000 or more seeds per plant? **OR** | 5 | |
| | a moderate producer of seed @ 1,000 to 5,000 seeds per plant? | 3 | |
| | possessing evergreen and/or waxy leaves? | 3 | |
| | capable of active *stem* photosynthesis? | 4 | |
| | stimulated by mutilation, cultivation, or fire? | 4 | |
| | parasitic or able to smother by climbing on host native plant? | 4 | |
| | a plant woody (including stems or roots)? | 5 | |
| | **Subtotal** (sum of scores/21)**:** | | |

| Select the single **most** relevant scenario and write the associated points into the bottom Subtotal cell. **Is this species found in:** | | **Points** | **Score** |
|---|---|---|---|
| **Containability Criteria** | isolated areas?<br>- good chance of containment given that species is confined to only a few areas with jurisdiction<br>- a newly arrived species | 5 | |
| | moderate distribution?<br>- moderate chance of containment given that species is moderately distributed throughout jurisdiction | 3 | |
| | and throughout the subject area (e.g. is ubiquitous)?<br>- poor chance of containment given that species is found throughout jurisdiction<br>- a species with a long history in the area | 1 | |
| | **Subtotal:** | | |

## 2006 IAPP Species Scoring Algorithm (continued)

| Select the single **most** relevant scenario and write the associated points into the bottom Subtotal cell. **Is this species:** | | Points | Score |
|---|---|---|---|
| **Controllability Criteria** | extremely difficult to control?<br>- few if any treatment options and extremely expensive<br>- multiple re-treatments are necessary | 5 | |
| | difficult to control?<br>- options are available but expensive<br>- re-treatments are necessary | 4 | |
| | moderately difficult to control?<br>- multiple options are available but less expensive<br>- re-treatment(s) may not be necessary | 3 | |
| | easy to kill but re-treatments are necessary?<br>- garden escapees, annuals | 1 | |
| | | **Subtotal:** | |

| Select the single **most** applicable impact and write the associated points into the bottom Subtotal cell. **Does this species negatively affect:** | | Points | Score |
|---|---|---|---|
| **Impact Criteria** | human health and/or safety?<br>- lethal or toxic to ingest<br>- causes pain or discomfort e.g. puncture wounds or allergies<br>- obstructs visibility along transportation corridors<br>- degrades infrastructure or poses risk to public e.g. fire, accelerated windthrow | 5 | |
| | animal health (domestic or wild)?<br>- lethal or toxic to ingest<br>- causes pain or discomfort | 4 | |
| | natural or agricultural environments?<br>- taints forage crop or is unpalatable<br>- reduces crop yields<br>- increased erosion or restricted water flow in aquatic or riparian areas | 4 | |
| | native plant communities?<br>- outcompeting and crowding them out<br>- reduction in overall biodiversity | 3 | |
| | recreation, and/or animal migration?<br>- obstacle to travel<br>- turf grass invasion | 2 | |
| | landscape aesthetics?<br>- visual blight | 1 | |
| | | **Subtotal:** | |

| Criteria | Subtotal Score | Prorate Factor | Prorated Score |
|---|---|---|---|
| **Biological** | | x 1.3 | |
| **Containability** | | x 1.5 | |
| **Controllability** | | x 1.5 | |
| **Impact** | | x 2.0 | |
| | | **Grand Subtotal** (sum of Prorated Scores): | |
| | | **Overall Score** (Grand Subtotal/3): | |