**Trial Island**

**Invasive Plant Species Management Plan**

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# Introduction and Purpose

Trial Island is a 15.7 hectares island located one kilometer south of Anderson Hill in Oak Bay, BC in the Juan de Fuca Strait (BC Parks 2003). It has one of the most outstanding assemblages of rare plants in Canada and has been referred to as a “living museum” of the Victoria area prior to European settlement (BC Parks 2003). Invasive plants threaten many of the species at risk found on Trial Island and there has been ongoing control of these invasive species for over 10 years by various groups.

This management plan was developed in order to evaluate previous invasive species control and to provide directions for future work on Trial Island. In particular, an evaluation of the threats posed by English Ivy, which has currently received relatively little focus, is provided. A monitoring approach to determine re-invasion of previously cleared areas is outlined to guide future invasive management.

# Background

There are three distinct landowners/landmanagers on Trial Island: Canada Coast Guard; provincial Crown land leased to a communications company; and provincial ecological reserve. Canada Coast Guard maintains a light station on the island and there is a resident lightkeeper on the island. Seacoast Communications has a series of antennae on the island, which require infrequent maintenance. Trial Islands Ecological Reserve was established to: 1) preserve representative examples of British Columbia's ecosystems; 2) protect rare and endangered plants and animals in their natural habitat; 3) preserve unique, rare or outstanding botanical, zoological or geological phenomena; 4) perpetuate important genetic resources; and 5) allow scientific research associated with the natural environment (BC Parks 2008). Permits are required in order to land on the ecological reserve (BC Parks 2008).

Trial Island has one of the greatest concentrations of species at risk in all of Canada, including: 1 moss, 18 vascular plants and 2 butterflies (list of species at risk included in Appendix A). Nine of the vascular plant species, one of the butterflies, and the moss are listed by COSEWIC as being either endangered, threatened or of special concern. Status reports are in progress for two other plant species including a newly described species, Victoria owl-clover (*Castilleja victoriae*)*.*

Invasive species have been identified as one of the most serious threats facing plant species at risk in maritime meadows, woodlands and vernal pools/ephemeral wetlands associated with Garry oak ecosystems (Parks Canada Agency 2006a; 2006b; 2006c). Invasive species decrease both the quality and quantity of habitat for many species at risk which occur on Trial Island including: Golden Paintbrush, Seaside Bird’s-foot Trefoil, Dense-flowered Lupine, Bear’s-foot sanicle, Coastal Scouler’s Catchfly, Purple Sanicle, White-top Aster, California Buttercup, Spanish-clover, Elegant Rein-orchid, Black Knotweed, Common Ringlet and Taylor’s Checkerspot (Fairbarns and Kohler 2006). Other species restricted to poorly drained vernal pools (e.g. Banded Cord-moss, Rosy Owl-clover, Macoun’s Meadowfoam, Victoria Owl-clover, Carolina Meadow-foxtail, Pigmyweed and Nuttall’s Quillwort) or rocky shorelines (e.g. Beach Sand-spurry) are less threatened by invasive woody species (Fairbarns and Kohler 2006).

Approximately 1/3 of the 200 species reported from Trial Island are non-native and about 40 of these species are moderate to highly invasive (Fairbarns and Kohler 2006). There are currently no known effective control measures for invasive grass and forb species (Fairbarns pers. comm. 2008; Roemer pers. comm. 2008). Invasive woody species found on Trial Island are more easily controlled and are the focus of this management plan. Target species include English ivy (*Hedera helix*), Scotch broom (*Cytisus scoparius*), Gorse (*Ulex europaeu*s), Cotoneaster (*Cotoneaster* spp.), Himalayan blackberry (*Rubus armeniacus*), Spurge-laurel (*Daphne laureola*), English holly (*Ilex aquifolium*), Common privet (*Ligustrum vulgare*), English hawthorn (*Crateagus monogyna*) and an unidentified species of Yew (*Taxus* sp.).

The risk of damage to species at risk from invasive species management is also a significant threat. Poorly planned invasive species removal can harm plants at risk through excessive trampling, improper removal facilitating spread of invasives, piling of slash and creating excessive soil disturbance. Properly planned invasive species management is essential for minimizing these risks.

# Previous Invasive Species Management

There have been attempts to control invasive species on Trial Island for over a decade, although early efforts were volunteer based and poorly documented. In 2003, volunteers were co-ordinated using a more rigorous approach. A work analysis prepared in 2005 determined that the scale of the work exceeded the capacity of volunteers. In 2005, the Garry Oak Ecosystems Recovery Team (GOERT) submitted a funding proposal to the Habitat Stewardship Program (HSP), using in-kind assistance from BC Parks as matching funds (Fairbarns 2007).

Funding from HSP was received for 2006/2007. A BC Conservation Corp work crew, hired by BC Parks, removed invasive shrubs from much of the island before March of 2007. Invasive species were not removed in core areas near the center of the island where invasive shrub density was highest (Fairbarns 2007).

HSP funding was also received for 2007/2008. Invasive species removal was done by a much smaller crew over a longer period of time rather than a short period of intense activity by a larger crew. Seven target species at risk (including COSEWIC listed and provincially-listed) were marked using temporary markers on the island and a botanist removed all reproductive-age invasive species within two meters of each occurrence. The crew removed all Scotch broom, Gorse and Spurge-laurel plants over 30 cm tall from August to October 2007 (Fairbarns 2007; Barrett pers. comm. 2007). The locations of the species at risk occurrences were also mapped and kept on file with the Ecosystems Branch of the BC Ministry of Environment (Fairbarns 2007).

# Methodology

In order to prepare this invasive plant species management plan, Trial Island was surveyed for all woody non-native plants on October 21PstP 2007. Priority was given to those species identified as the greatest threats by the GOERT Decision Support Tool (Fairbarns and Kohler 2006), based on their density within invaded areas and their degree of establishment. In addition, species that are easily controlled and currently have a low degree of invasion but with the potential for future harm are targeted. “Satellite” locations where invasions are just beginning and can be easily controlled are also priorities. The locations of invasive species were recorded using a hand-held GPS and the locations mapped using OZI-Explorer.

# Invasive Woody Species on Trial Island

The following section describes each invasive shrub species, provides a description of the distribution on Trial Island and outlines appropriate management techniques including an evaluation of the work conducted to date. Disposal of invasive biomass and monitoring protocol to identify re-invasion are included in separate following sections.

A permit is required prior to any work in BC Parks Ecological Reserves, including the application of herbicide.

## 1. English ivy (*Hedera helix*)

**Species description**

English ivy is a climbing vine with leathery, glossy evergreen leaves. The clustered flowers are greenish-yellow and the fruits are blue-black berries. With support, the vines can reach up to 30 meters tall (Douglas *et al.* 1998).

English ivy is extremely fast growing and can form dense patches, shading out native plants and preventing germination of their seeds. Trees may be weakened or killed when English ivy grows over their trunks and branches in its climbing form (GOERT 2003).

**Distribution**

English ivy is distributed throughout Trial Island. Some portions of the island have been heavily invaded and in the densest patches, few native plants survive. In other areas, English ivy exists in small pockets or as an understory to native shrubs. In areas where the English ivy grows vertically (i.e. over a beach house on the west side of the island, over small trees or over exposed rock outcrops), the vines flower and produce fruit.



Figure 1. Concentrations of English ivy on Trial Island (2007)

**Recommended management**

English ivy is difficult to control because the plants spread vegetatively by growing roots on advancing stems. The plants do not reach maturity until 10 or more years old when the plants produce flowers and fruit that are widely dispersed by birds. The seeds require scarification by passing through a bird’s digestive system for germination (Cal-IPC 2008). Plants are extremely long-lived (up to 433 years old) (Cal-IPC 2008). Cut stems or root fragments will resprout if left in contact with the soil (King County Weed Control Program 2002; GOERT 2003). English ivy toxic contains compounds that may cause vomiting, diarrhea, nervous conditions and/or dermatitis so workers should wear gloves and protective clothing when removing English ivy (King County Weed Control Program 2002; GOERT 2003; Washington Native Plant Society 2007).

To date, very little English ivy has been removed from Trial Island (Barrett pers. comm. 2007). Because of the high degree of invasion and the density of the growth in some locations, it may not be possible to completely remove English ivy from Trial Island. Due to financial constraints, it may be necessary to leave some larger patches that are not close to species at risk as “sacrifice areas” (Fairbarns 2007).

The first priority is to remove any vertical growth to eliminate flower production and prevent further seed spread (King County Weed Control Program 2002). In areas where the English ivy is growing over structures (e.g. buildings, small trees or rock outcrops), the vines should be cut at shoulder and ankle height and vines removed from cut section. The ivy above the cut section should be gently pulled off (Washington Native Plant Society 2007). In areas where few native plants remain, the ivy should be pulled from the ground. However, in areas where native plants remain, the ivy should be cut from around the native plants first to ensure there is minimal damage to existing plants (Washington Native Plant Society 2007).

Small isolated “satellites” of ivy should also be targeted for control. It is easier to eliminate ivy in small pockets than in areas where is has already become well established.

In areas where removing the roots of plants will cause excessive soil disturbance and/or erosion and where little native vegetation exists, the leaves should be cut and the remaining plants treated with triclopyr (Garlon 4®) and a surfactant (King County Weed Control Program 2002). In areas where native vegetation exists, herbicides should only be used during the dormant season.

In order to prevent further infestation of ivy due to resprouts, all cut material should be placed in bags and transported to the disposal site. Ideally, ivy piles should be stored above the ground to keep cut stems and roots from soil contact, and/or the clippings should be turned to expose rootlets to air. Alternatively, piled ivy should be wrapped into bundles and left to dry out or decompose (covering the pile with a tarp will speed up the process) (King County Weed Control Program 2002).

## 2. Scotch broom (*Cytisus scoparius*)

**Species description**

Scotch broom is an upright medium to tall shrub that grows up to 3 meters tall. The twigs are 5-sided with leaves in 3 egg-shaped leaflets. The pea-shaped flowers are bright yellow and the black. The flattened seedpods disperse explosively when dry (Douglas *et al.* 1999a).

Scotch broom changes plant community structure, out-competes native plant species and increases fuel loading of ecosystems thereby increasing the risk of fire hazard (GOERT 2003). Scotch broom also fixes nitrogen, which in turn alters soil chemistry and promotes further invasion by other exotic plant species (GOERT 2003). Scotch broom also provides cover to invasive small mammals that graze native plants (Fairbarns 2005).

**Distribution**Trial Island was previously heavily invaded by Scotch broom. Almost all of the mature, flowering-sized Scotch broom has been removed from Trial Island, although seedlings and an abundant seedbank remain. Only a few scattered large plants were observed during the 2007, primarily in the southern portion of the island. Many small seedlings were hidden by larger vegetation.



Figure 2. Scotch broom on Trial Island (yellow lines indicate former areas with major concentrations of Scotch broom, red lines indicate Scotch broom plants observed during 2007 surveys)

**Recommended management**

Scotch broom seed can remain viable in the soil for 30 (and possibly up to 80) years and plants as young as 2 years old can produce seed (GOERT 2003). A single plant can produce 12,000 seeds per year. The seeds are dispersed when the pods snap open and further spread by ants or rain wash (Cal-IPC 2008). Removing established broom often results in increased recruitment of new seedlings the following year (GOERT 2003).

Previous control efforts have been highly effective at eliminating large Scotch broom plants from Trial Island. All areas that were previously cleared will require ongoing maintenance to prevent re-invasion from the extensive seed bank. Control of Scotch broom should be a high priority because of the high speed with which it is able to re-establish and because of the high ecological impact.

Scotch broom on Trial Island should be removed during the dormant season (August to October) in order to minimize harm to species at risk. However, it may be useful to survey during the summer for flowering Scotch broom plants, which can be flagged for later removal. Larger plants should be cut with loppers or secateurs below all lateral branches, as close to the ground as possible, while minimizing damage to adjacent vegetation. Small plants should be hand pulled carefully to minimize soil disturbance. Medium-sized plants may resprout from cut stems (Fairbarns 2005). Intermediate sized plants which are too big to pull (but too small to kill with an above-ground cut), or Scotch broom growing in rock outcrops should be gently pried up a few cm using a weed wrench and subsequently cutting below the exposed root crown. Care should be taken to minimize dispersal of seeds when removing cut or pulled plants off site (GOERT 2003).

## 3. Gorse (*Ulex europaeus*)

**Species description**

Gorse is a medium to tall shrub up to 3 meters tall. The dense greenish branches are 5-angled and covered with spines. The pea-shaped flowers are bright yellow and the black, grey- or brown-hairy flattened seedpods disperse explosively when dry (Douglas *et al.* 1999a).

Gorse alters plant community structure by shading and out-competing native plant species. Gorse fixes nitrogen and deposits large amounts of acidic litter, altering soil chemistry and promoting further invasion by other exotic plant species. Gorse can establish dense thickets, which can exclude all native species. Gorse also increases fuel loading of ecosystems increasing the risk of fire hazard (GOERT 2003; Cal-IPC 2008).

**Distribution**

There were previously only four mature gorse plants on Trial Island scattered around the middle of the island. All mature gorse has been removed during previous invasive species management although seedlings and an abundant seedbank remain next to where the mature plants were removed.



Figure 3. Location of mature Gorse on Trial Island prior to 2007 surveys

**Recommended management**

Gorse plants produce prolific amounts of seed, which can remain viable in the seedbank for up to 30 years, with records of viability after 70 years (GOERT 2003; Cal-IPC 2008). Ants, quail, water and humans disperse Gorse seeds (Cal-IPC 2008). After mature plants have been removed, there is often increased recruitment of new seedlings from of the seed bank the following year (GOERT 2003). Established Gorse plants quickly resprout from cut stem bases, which become very difficult to remove (GOERT 2003).

Previous control of Gorse on Trial Island used a cut stem treatment of triclopyr (Garlon®) to kill the root crown and prevent re-sprouting. This approach has been very successful, eliminating all mature Gorse plants. Previous use of small squeeze bottles to apply the herbicide was very effective at applying the herbicide directly to the stems and causing very little impact to adjacent vegetation.

Control of any new Gorse plants should be considered a high priority because of the high speed with which it can establish, the high ecological impacts and the difficulty of control once the species becomes established. Any new plants observed on Trial Island should be cut with loppers or secateurs as close to the ground as possible without disturbing adjacent native vegetation. The freshly cut stems should be treated with herbicide immediately. The spiny branches are unwieldy and unpleasant for volunteers to control.

## 4. Spurge-laurel (*Daphne laureola*)

**Species description**

Spurge-laurel is a bushy evergreen shrub that grows up to 1.8 meters tall. The leaves are oval, dark green and glossy. The small flowers are pale yellowish-green and grouped at the top of stems. The fruits are black, egg-shaped berries (Douglas *et al.* 2000).

Spurge-laurel impacts native ecosystems by changing plant community structure, directly shading and out-competing native plant species (GOERT 2003). Spurge-laurel likely changes soil chemistry and acidity, preventing the re-establishment of native species (GOERT 2003).

**Distribution**

Spurge-laurel is distributed throughout Trial Island, primarily in areas with shrubby vegetation. Although Spurge-laurel has been removed from many areas on Trial Island, a number of mature flowering plants remain scattered throughout the island. Many small plants were also found throughout the island, primarily in areas that had been formerly cleared.



Figure 4. Spurge-laurel on Trial Island (yellow lines indicate former distribution, red lines indicate plants observed during 2007 surveys)

**Recommended management**

It takes about 5 years for Spurge-laurel plants to mature and produce fruit (Webb pers. comm. 2008). Mature plants produce a large number of seeds, which birds and rodents rapidly spread to new areas (GOERT 2003). Little is known about the longevity of seeds in the seedbank, however, the largest flush of seedlings appears in the first two years with the number of new germinants rapidly declining after that time (Webb, pers. comm. 2008). Although the literature reports that Spurge-laurel plants resprout from cut stems (GOERT 2003) this has not been observed during restoration at Fort Rodd Hill Park: plants that did resprout were cut above the root collar (Webb pers. comm. 2008). The bark, sap and fruit contain chemicals that can cause skin irritation. Protective clothing and gloves should be worn during removal of Spurge-laurel (GOERT 2003).

Previous control of Spurge-laurel on Trial Island has removed many of the mature plants on Trial Island. Cut stems were not treated with herbicide (Barrett pers. comm. 2007) and some of the larger plants were either missed or re-sprouted from cut stems. It very easy to miss individual plants during control efforts due to the lack of brightly colored flowers as well as the shrubby habitat where they occur. For these reasons, Spurge-laurel persists on Trial Island, and repeated control will be required to eradicate it.

Spurge-laurel plants should be cut with loppers below the root collar (GOERT 2003; Webb pers. comm. 2008). The plants will grow prostrate so it is important to find the base and cut in the orange coloured root zone rather than the brown, bark covered stem (Webb pers. comm. 2008). The freshly cut stems of larger plants should be treated with triclopyr (Garlon®) to kill the root crown. Small plants and seedlings should be hand pulled (Conan Webb, pers comm.2008).

## 5. English hawthorn (*Crataegus monogyna*)

**Species description**

English hawthorn is a large shrub or tree that grows up to 10 meters tall. The branches have short, sharp spines and the bark is dark grey-brown and scaly. The leaves are deeply lobed (more than half way to the midrib) and the berries are bright red (Douglas *et al.* 1999b). English hawthorn’s deeply lobed leaves and red berries distinguish it from the native black hawthorn (*Crateagus douglasii*), which has irregularly toothed leaves and purplish-black berries (Douglas *et al.* 1999b).

English hawthorn impacts native ecosystems by changing plant community structure, directly shading and out-competing native plant species. English hawthorn also provides cover for invasive small mammals that graze native plants, and shelters other exotic plant species from grazing (GOERT 2003; Fairbarns 2005). English hawthorn may also hybridize with the native black hawthorn (GOERT 2003).

**Distribution**

Only a single English hawthorn shrub was found on the southern portion of Trial Island. Although the growth form is low and compact, the plant is mature, producing berries.



Figure 5. English hawthorn on Trial Island (2007)

**Recommended management**

English hawthorn is difficult to control because fruit eating birds and mammals spread the seeds. Although passing through a bird’s digestive tract increases germination, this process is not necessary for germination. Seed longevity is not known for this species (Cal-IPC 2008). The plants will re-sprout from cut stems and cut plants will also coppice from the roots (Banman pers. comm. 2005; Fairbarns 2005). No English hawthorn has been previously controlled on Trial Island (Fairbarns pers. comm. 2007).

The trunk of the only known tree should be cut close to the ground to prevent it from becoming a tripping hazard. This may be difficult given the rocky terrain where the shrub occurs. The freshly cut stems should be treated with triclopyr (Garlon®) to kill the root crown (Fairbarns 2005). The shrub should be removed as soon as possible to prevent English hawthorn from establishing in other locations on Trial Island.

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## 6. Himalayan blackberry (*Rubus discolor*)

**Species description**

Himalayan blackberry is a medium to tall shrub with branches that reach 2-5 meters long. It forms dense thickets and is armed with flattened, hooked prickles. The evergreen leaves are palmately compound (shaped like a hand). The flowers are white to pink with 5 petals and the fruits are large, tasty blackberries (Douglas *et al.* 1999b). Himalayan blackberry has bigger canes (5-15mm diameter) and a more upright growth form than the native trailing blackberry (*Rubus ursinus*), which has smaller canes (2-10 mm in diameter) and mainly trails along the ground (Douglas *et al.* 1999b).

Himalayan blackberry impacts native ecosystems by changing plant community structure, directly shading and out-competing native plant species. The dense thickets also provide cover for invasive small mammals that graze native plants (GOERT 2003; Cal-IPC 2008). It may also increase fuel loading, posing a fire hazard (Fairbarns 2005).

**Distribution**

There were previously only five mature Himalayan blackberry plants scattered throughout Trial Island. All mature plants have been removed during previous invasive species management. However, a seedbank and possibly seedlings remain next to where plants were removed. Dense thickets, which exclude all native vegetation, do not currently occur on Trial Island.



Figure 6. Location of mature Himalayan blackberry on Trial Island prior to 2007 surveys.

**Recommended management**

Dense stands of Himalayan blackberry can produce 7.000 to 13,000 seeds per square metre (Ca-IPC 2008). Himalayan blackberry is difficult to control because the seeds are widely dispersed by birds and mammals and passing through a digestive tract appears to enhance germination (GOERT 2003; Fairbarns 2005; Cal-IPC 2008). The seeds may persist in the soil for several years (GOERT 2003). Himalayan blackberry thickets spread quickly as the arching canes take root and plants will resprout from cut stems or from cane fragments (Fairbarns 2005; Cal-IPC 2008). New plants can also form from adventitious roots (Cal-IPC 2008). The spiny canes are unwieldy and unpleasant for volunteers to control.

Prior invasive species management has been highly successful at removing mature shrubs from Trial Island and none were observed during surveys in the winter of 2007. Although Himalayan Blackberry does not likely present a serious a threat to Garry oak ecosystems, it is easy to control because it has not yet heavily invaded Trial Island (Fairbarns and Kohler 2006).

Ongoing monitoring and control will be required to prevent re-establishment. All new Himalayan blackberry shrubs should be removed as they are encountered. Smaller plants should be pulled or removed using weed wrenches. Larger plants should be cut with loppers close to ground level with care taken to minimize the impact to adjacent native plants. The freshly cut stems should be treated with triclopyr (Garlon®) to kill the root crown. In order to prevent further infestation of Himalayan blackberry due to resprouting cane fragments, all cut material should be placed in bags and transported to the disposal site.

## 7. English holly (*Ilex aquifolium*)

**Species description**

English holly is a large shrub or small tree reaching up to 5 meters in height. The evergreen leaves are glossy, egg-shaped to oblong with stiff spine-like teeth. The flowers are inconspicuous with male and female often on different plants. The fruit are clusters of bright red berries (Douglas *et al.* 1998).

English holly has minimal impact in open meadow areas since the plant is not generally a vigorous colonizer of open habitat where most plant species at risk occur on Trial Island. English holly can alter the community structure of shrubby areas.

**Distribution**

English holly is sparsely distributed on Trial Island largely in areas with shrubby vegetation. Most of the shrubs are small ranging from 0.5 to 1 meter in height.



Figure 7. English holly on Trial Island (2007)

**Recommended management**

Birds eat the English holly fruit and spread the berries to new areas. English holly can also resprout from cut stems. The plants lack of brightly colored flowers and the shrubby habitat make it very easy to miss individual plants.

English holly has been removed from many areas on Trial Island. Some larger plants remain and seedlings and seeds persist next to plants that have been removed. A cut-stem application of triclopyr (Garlon®) has been highly effective at killing the root crown. English holly persists in low numbers on Trial Island and repeated control will be required to eradicate it.

Although English holly does not likely present a serious a threat to Garry oak ecosystems, it is easy to control because it has not yet heavily invaded Trial Island (Fairbarns and Kohler 2006). English holly should continue to be removed as it is encountered. Trees should be cut close to the ground to prevent them from becoming a tripping hazard. The freshly cut stems should continue to be treated with herbicide.

## 8. Cotoneaster (*Cotoneaster* sp.)

**Species description**

Cotoneaster is a low shrub with spreading stems. The egg-shaped to circular leaves are dark green and shiny. Cotoneaster has small pink flowers and red berry-like fruits (Douglas *et al.* 1999b).

Cotoneaster shrubs affect native plant communities by changing community structure and competing with adjacent vegetation for light and nutrients.

**Distribution**

Only four Cotoneaster plants were observed on Trial Island during 2007 surveys, primarily in the central and southern portions of the island. Only one of the plants identified in earlier surveys was not located in 2007. All of the plants observed had berries but no seedlings were observed next to the shrubs.



Figure 8. Cotoneaster on Trial Island (Red dots indicate Cotoneaster plants observed during winter 2007 surveys, yellow dot indicates plant found during earlier survey)

**Recommended management**

The seeds of Cotoneaster are eaten and dispersed by birds; passing through the digestive system may enhance seed germination but is not required. Cotoneaster is able to produce seeds without fertilization (apomictically) (Cal-IPC 2008). The seeds do not appear to persist in the seedbank. Cotoneaster plants will also resprout from cut stems (GOERT 2003).

Although some Cotoneaster has been removed during previous invasive species management, the species has not been systematically targeted (Barrett pers. comm. 2007).

Although Cotoneaster does not likely present a serious a threat to Garry oak ecosystems, it is easy to control because it has not yet heavily invaded Trial Island (Fairbarns and Kohler 2006). Cotoneaster at known locations should be cut and the cut stems treated with herbicide to prevent the spread of berries and limit possible establishment in other locations on Trial Island. The stems should be cut with loppers and the cut stems treated with ticlopyr (Garlon®) to kill the root crown.

## 9. Common privet (*Ligustrum vulgare*)

**Species description**

Common privet is a deciduous shrub that grows up to 5 metres tall. The opposite leaves are dark-green, oblong to egg-shaped. The white or pale-purple flowers are clustered in terminal panicles. The 1-2 seeded fruits are black and hard (Douglas *et. al.* 1999a).

**Distribution**

There is only a single Common privet shrub on Trial Island located near the center of the island. The shrub produces berries, but no seedlings were observed next to the shrub.



Figure 9. Common privet on Trial Island (2007)

**Recommended management**

It is not known whether Common privet will resprout from cut stems. Birds likely eat the fruit and disperse the seeds.

Common privet has not been formerly controlled on Trial Island (Barrett pers. comm. 2007). Although Common privet does not likely present a serious a threat to Garry oak ecosystems, it is easy to control because it has not yet heavily invaded Trial Island.

The single shrub should be cut as close to the ground as possible and the cut stems treated with ticlopyr (Garlon®) in order to prevent the spread of berries and limit possible establishment in other locations on Trial Island. If other Common privet shrubs are found they should be removed in the manner described above.

## 10. Non-native yew (*Taxus* sp.)

**Species description**

Non-native yew are small coniferous shrubs with pointed, evergreen needles. The shrubs on Trial Island are all approximately 1 metre tall.

**Distribution**

Only three non-native yew shrubs were observed on Trial Island in scattered locations. The shrubs are immature probably have not yet flowered or fruited. No seedlings were observed next to the plants.



Figure 10. Non-native yew on Trial Island (2007)

**Recommended management technique**

To date, no yews have been removed during previous invasive species removal (Barrett pers. comm. 2007).

Although the species does not appear to be highly invasive, the three existing shrubs should be removed as soon as possible to prevent them from flowering and fruiting and potentially spreading to other parts of Trial Island. Yew is easily controlled by cutting plants below the root crown (Fairbarns and Kohler 2006).

# Monitoring and Future Invasive Species Control

Although much excellent work has already been completed on Trial Island, invasive species control will require ongoing monitoring and maintenance in order to be successful. Plants will continue to germinate from the soil seed bank and re-invade previously cleared areas. There will be increased recruitment of both Scotch broom and Gorse following the removal of established plants due to the decrease in competition for resources (light and nutrients) as well as the increased soil disturbance (creates favourable germination microsites) (GOERT 2003). Invasive shrub recruitment is expected to peak over the next three years and gradually decline over a 20-year period (Fairbarns 2007). Spurge-laurel recruitment is expected to decline rapidly after two years (Webb pers. comm. 2008). After the first three years, removal of all species of young plants is expected to be less labour-intensive than removal of adult plants (Fairbarns 2007).

Trial Island should be surveyed during the summer when Scotch broom and Gorse are in bloom to locate any remaining flowering-size plants. These plants should be flagged for later removal during the dormant season. All invasive species removal should continue to be done between August to October to minimize impacts to native vegetation, in particular species at risk on the island (Appendix 1).

In order to effectively control the large range of invasive species targeted by this management plan, Trial Island should be divided into management sections for invasive plants (Figure 11). Each section should be thoroughly surveyed just prior to management to identify the locations of known invasive species and to determine whether there has been recruitment of previously removed species. Trial Island should also be monitored to detect any new invasive species, such as Carpet burweed (*Soliva sessillis*), which can be very difficult to eradicate once established (Invasive Plant Council of BC 2006).



|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** | **K** |
| English ivy |  | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Scotch broom | √ |  | √ | √ | √ | √ | √ | √ |  | √ |  |
| Gorse |  |  |  | √ |  | √ | √ |  |  |  |  |
| Spurge-laurel | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| English hawthorn |  |  |  |  |  |  |  |  |  |  | √ |
| Himalayan blackberry | √ | √ |  |  |  |  |  | √ | √ |  |  |
| English holly |  | √ |  |  |  |  | √ | √ |  |  |  |
| Cotoneaster |  |  |  |  |  | √ | √ | √ |  |  |  |
| Common privet |  |  |  |  |  | √ |  |  |  |  |  |
| Non-native yew |  |  |  |  |  | √ |  | √ |  |  |  |

Figure 11. Monitoring areas on Trial Island

Temporary flagging/marking by a botanist is recommended to orient crews to the location of species at risk. A botanist should remove invasive plants adjacent to species at risk to minimize negative impacts to rare plants.

A crucial component of the invasive species management is the ongoing monitoring of species at risk to ensure that that they are not negatively impacted by the control measures (Fairbarns 2007). All COSEWIC-listed plant species, in addition to species that have status reports currently being prepared, should be assessed. The monitoring should be used to determine changes in the area of extent of each species, any change in the number of flowering shoots and evidence of physical damage from the work conducted. Permanent plots placed in representative areas within known occurrences should be established to collect baseline data on the number of flowering shoots (Fairbarns pers. comm. 2008). Plot size will vary with the species studied. Data should be collected annually.

# Disposal of Invasive Species

Removing invasive species during the dormant season helps limit the spread of English ivy, Scotch broom, Gorse, Spurge-laurel, and Himalayan blackberry which have already dispersed their seeds and/or fruit. However, many invasive shrubs on Trial Island (English hawthorn, English holly, Cotoneaster and Common privet) retain their berries and are easily spread to new locations. Preventing the spread of berries by transporting cut material in bags is key to limiting future invasion on Trial Island.

Many of the invasive woody species found on Trial Island are easily spread by cut stem or root fragments which re-sprout (e.g. English ivy, Gorse, Spurge-laurel and Himalayan blackberry). All cut material should be placed in bags for transport to the disposal site.

To date, invasive species have been piled in a rocky outcrop area on the east side of the island to be burned at a later date by BC Parks staff. During the winter 2007 survey, this pile was very large and had accumulated for several years. It is critical that invasive species be disposed of yearly to avoid smothering the underlying vegetation and prevent re-sprouting of cut stem and root fragments.

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# Appendix 1. List of Species at Risk on Trial Island

(Used with permission from Fairbarns and Kohler 2006)

| **Latin Name** | **English Name** | **COSEWIC Status** | **Provincial Rank and Listing** | **Global Rank** |
| --- | --- | --- | --- | --- |
| **Mosses** | | | | |
| *Entosthodon fascicularis* | Banded cord-moss | Special Concern | S2-Red | G4G5 |
| **Vascular Plants** | | | | |
| *Castilleja levisecta* | Golden paintbrush | Endangered | S1-Red | G1 |
| *Lotus formosissimus* | Seaside birds-foot lotus = Seaside bird’s-foot trefoil | Endangered | S1-Red | G5 |
| *Lupinus densiflorus* var*. densiflorus* | Dense-flowered lupine | Endangered | S1-Red | G5T4 |
| *Orthocarpus bracteosus* | Rosy owl-clover | Endangered | S1-Red | G3? |
| *Sanicula arctopoides* | Bear’s-foot sanicle =  Snake-root sanicle | Endangered | S1-Red | G5 |
| *Silene scouleri* ssp. *grandis* | Coastal Scouler’s catchfly | Endangered | S1-Red | G5TNRQ |
| *Limnanthes macounii* | Macoun’s meadowfoam | Threatened | S3-Blue | G3 |
| *Sanicula bipinnatifida* | Purple sanicle | Threatened | S2-Red | G5 |
| *Sericocarpus rigidus = Aster curtus* | White-top aster | Threatened | S2-Red | G3 |
| *Castilleja victoriae* | Victoria owl-clover | Status report in progress | [proposed for ranking as S1] | [proposed for ranking as G1] |
| *Ranunculus californicus* | California buttercup | Status report in progress | S2-Red | G5 |
| *Alopecurus carolinianus* | Carolina meadow-foxtail |  | S2-Red | G5 |
| *Crassula aquatica* | Pigmyweed |  | S3-Blue | G5 |
| *Isoetes nuttallii* | Nuttall’s quillwort |  | S3-Blue | G4? |
| *Lotus unifoliolatus* var. *unifoliolatus* | Spanish-clover |  | S2S3-Blue | G5T5 |
| *Piperia elegans* | Elegant rein orchid |  | S3-Blue | G4 |
| *Polygonum paronychia* | Black knotweed |  | S3-Blue | G5 |
| *Spergularia macrotheca* | Beach sand-spurry |  | S2S3-Blue | G5 |
| **Butterflies** | | | | |
| *Coenonympha california insulana* | Common ringlet, *insulana* subspecies |  | S2-Red | G5T3T4 |
| *Euphydryas editha taylori* | Taylor’s checkerspot = Edith’s checkerspot, *taylori* subspecies | Endangered  (extirpated from Trial Island) | SH-Red | G5T1 |