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Management For  
Rare, Threatened and Endangered Plant Species  
Of Trial Island Lighthouse Site

*Preliminary Report*

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BC PARKS  
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ISLAND DISTRICT

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## Table of Contents

Background .....	3
Plant Survey .....	6
Considerations.....	6
Methods.....	6
Results.....	6
May 23 Survey .....	6
Recommenations for Environmental Impact Reduction .....	8
Potential Impacts.....	8
Impact Avoidance .....	8
Impact Mitigation.....	8
Other Impacts of Lighthouse Management on Rare Species.....	11
Appendix: List of Vascular Plants .....	12

## **Background**

This project was carried out in order to assess the potential impacts of several planned construction activities on the status of vulnerable, threatened and endangered plant species occurring in the vicinity of the Trial Island lighthouse.

Much of Trial Island is included within an ecological reserve (E.R. #132) established to permanently protect the most outstanding assemblage of rare and endangered plant species in British Columbia. Information on the establishment of the reserve is recorded in Order-in-Council no. 1035, 1990.

The BC Conservation Data Centre (BC Ministry of Environment, Lands and Parks) tracks vulnerable, threatened and endangered plant species for the province. Species on their red list are candidates for legal designation as endangered or threatened species. Species on their blue list are either vulnerable rare taxa that could become candidates for the red list in the foreseeable future, or are suspected of being vulnerable, but definitive information is lacking at this time. There are 14 species of red- or blue-listed plants known from Trial Island. Some of these species have been evaluated from a national perspective by COSEWIC (The Committee on the Status of Endangered Wildlife in Canada) and rated as vulnerable, threatened, endangered throughout Canada. Other species await COSEWIC evaluation.

The rare plant species of Trial Island are largely associated with the open, windswept 'coastal prairie' ecosystem which covers much of the island. Many of these species were once also scattered along the Victoria waterfront prior to urbanization.

## Construction Activities

The Canadian Coast Guard is considering a number of construction projects associated with upkeep of the Trial Island lighthouse and associated facilities.

Three activities are planned for June. There will be a period of low tides in June, which will facilitate reconstruction of the existing dock area. The dock reconstruction will require access to a heavy lift helicopter. Two other projects (replacement of the flammable materials storage shed; removal/replacement of the engine room fuel storage tank) involving the helicopter will be occur at the same time to achieve efficiencies.

Three other projects will occur later in the summer, since they don't rely upon access to the helicopter. These projects involve:

- Refurbishing the Assistant Lightkeeper's residence,
- Repairing deteriorating concrete at the base of the light tower, and
- Decommissioning of fuel pipelines.

The dock reconstruction will involve:

- Stockpiling of materials for building concrete forms,
- Construction of the concrete forms, and
- Pouring of concrete

The concrete will be ferried from Cattle Point to Trial Island by helicopter and poured directly from the helicopter bucket into the concrete forms.

The flammable materials storage shed will be broken down and waste materials will be stockpiled on an adjacent paved surface and then slung out by helicopter. The existing concrete slab will be rebuilt. The 'footprint' of the rebuilt slab will extend no more than a metre from the existing footprint in any direction. The replacement shed is a pre-fabricated metal unit, which will be airlifted by helicopter and placed directly onto the rebuilt slab.

The existing fuel storage tank for the engine room is sited several metres from the engine room itself. This fuel tank and the associated fuel lines will be purged and the waste liquids removed. The tank will be uncoupled from its cradle and slung out by helicopter. The replacement tank will be slung by helicopter onto an old concrete pad adjacent to the engine room, and then manoeuvred into the engine room through a pre-cut opening. The existing walkway from the engine room to the Lightkeeper's residence may also be replaced, using existing footings. Future refuelling will be accomplished by slinging in fuel drums to the old concrete pad mentioned above, pumping their contents into the replacement fuel storage tank, and slinging out the emptied drums.

The Assistant Lightkeeper's residence will receive a new roof and windows, as well as substantial interior renovations. Building waste will be stockpiled and then removed by helicopter. New building materials will be slung in by helicopter and stockpiled for use. Scaffold will be build around the Assistant Lightkeeper's residence to facilitate safe repairs. The scaffolding will extend up to 2 m from the residence.

The light tower concrete repairs are minimal. Rusted areas will be scraped clean and power-washed, and then repaired with shot-crete or grouting.

Currently, fuel is piped between facilities in PVC pipelines, much of which lies above ground due to the extensive bedrock exposures in the lighthouse area. Much of this pipeline will be decommissioned by purging it, removing the aboveground sections, and removing or leaving buried sections.

- The pipeline bringing fuel to the Assistant Lightkeeper's residence will be decommissioned. The fuel tank currently supplying heating fuel to the residence may be retained and fuelled from drums slung directly to it. A new concrete base may be necessary to contain spills associated with re-fuelling the drum, or with failure in the drum itself. Alternatively, it may be replaced with a new double-hulled drum or the residence may be converted to electric heat.
- The pipeline connecting the existing engine room fuel storage tank to the engine room itself will be decommissioned.
- The future of other pipelines is to be determined.

## **Plant Survey**

### ***Considerations***

The many rare, threatened and endangered plant species already known for Trial Island vary considerably in their phenology; that is their seasonal development of shoots, flowers and fruits. Some species have already produced fruit and withered before others are evident.

### ***Methods***

Two survey styles were proposed: intensive surveys of sites likely to be heavily impacted by construction activities; and extensive surveys of areas where construction activity is likely to be, at most, light and of brief duration.

Two survey dates were planned. A late May survey was scheduled to locate early-season plants and identify risks associated with early June construction activities. A mid-June survey was scheduled to locate mid-season plants, particularly in construction zones associated with the late summer construction activities. Late summer surveys were not scheduled because there is there are no late-season species-at-risk known for Trial Island or similar areas in the Georgia Basin.

### ***Results***

#### **May 23 Survey**

Appendix 1 provides a list of 113 plant species found in the vicinity of the lighthouse during the May 23 survey. Most of these species are widespread and relatively abundant in and around southern Vancouver Island.

The absence of the globally-endangered, red-listed Golden Paintbrush (*Castilleja levisecta*) was notable, largely because it is well represented in meadow communities throughout much of Trial Island and was likely present and possibly abundant until the lighthouse lawns were established.

The following 9 significant plant taxa were encountered during the May 23 survey:

- Seaside Lotus - *Lotus formosissimus*
  - red-listed
  - Endangered in Canada
- Dense-flowered Lupine - *Lupinus densiflorus*
  - red-listed
- Bearpaw Sanicle - *Sanicula arctopoides*
  - red-listed
- Paintbrush Owl-clover - *Castilleja ambigua*
  - red-listed
- Creeping Wildrye - *Leymus triticoides*
  - red-listed
- Pearlwort - *Sagina decumbens*
  - blue-listed
- Spanish-clover - *Lotus unifoliatus*
  - blue-listed
- Canada Sandspurry - *Spergularia canadensis*
  - blue-listed
- Few-flowered Shootingstar - *Dodecatheon pulchellum* (Trial Island has poorly-described variety of limited distribution)

The proposed construction activities present a potential risk to *Lotus formosissimus*, *Lupinus densiflorus*, *Sanicula arctopoides*, *Castilleja ambigua*, *Leymus triticoides* and *Dodecatheon pulchellum*.

While outside the scope of this report, attention was also paid to the likely impacts of the lawnmowing practices. The lawn area currently supporting *Lupinus densiflorus* has benefitted greatly by deferred mowing. Deferring mowing until late June provides this rare annual species with an opportunity to germinate, grow, flower and set seed without disturbance. The fact that the area is then mowed for the balance of the season reduces competition from plants (particularly shrubs) which would otherwise outcompete the lupine and gradually diminish its population.

## Recommendations for Environmental Impact Reduction

### **Potential Impacts**

The major construction risks are associated with stockpiling of raw materials and construction debris associated with:

- construction of the dock, and
- repairs to the Assistant Lightkeeper's residence.

### **Impact Avoidance**

Impacts can be reduced by piling raw materials and construction materials in a manner which minimizes soil compaction, and by directing activities away from existing populations of rare species. Key Locations are shown in Figure 1.

The impacts of stockpiles associated with dock construction can be minimized by building a base of large-diameter timbers resting only on rock surfaces, and stockpiling materials on this base. This would avoid soil compaction. Care should be taken to avoid any construction activity in the vicinity of the small population of *Leymus triticoides* (figure 1) near the dock. The nearby population of *Castilleja ambigua* (figure 1) benefits from light disturbances which create a suitable seedbed and restrict competition from larger, more aggressive plants. Heavy disturbance (including heavy foot traffic) will damage the *Castilleja ambigua* population.

The impacts of stockpiles associated with renovations to the Assistant Lightkeeper's residence can be minimized by building a base of large-diameter timbers resting only on the sidewalk, and stockpiling materials on this base, again to avoid soil compaction. Heavy foot traffic should be avoided on the east side of the house.

The scaffolding used to renovate the Assistant Lightkeeper's residence should be sited to protect young germinants (figure 1) of the rare annual *Sanicula arctopoides*. These were found along the southwest corner of the residence, and likely occur along the east and southeast corners as well (figure 1). Foot traffic should be directed away from these areas as much as possible.

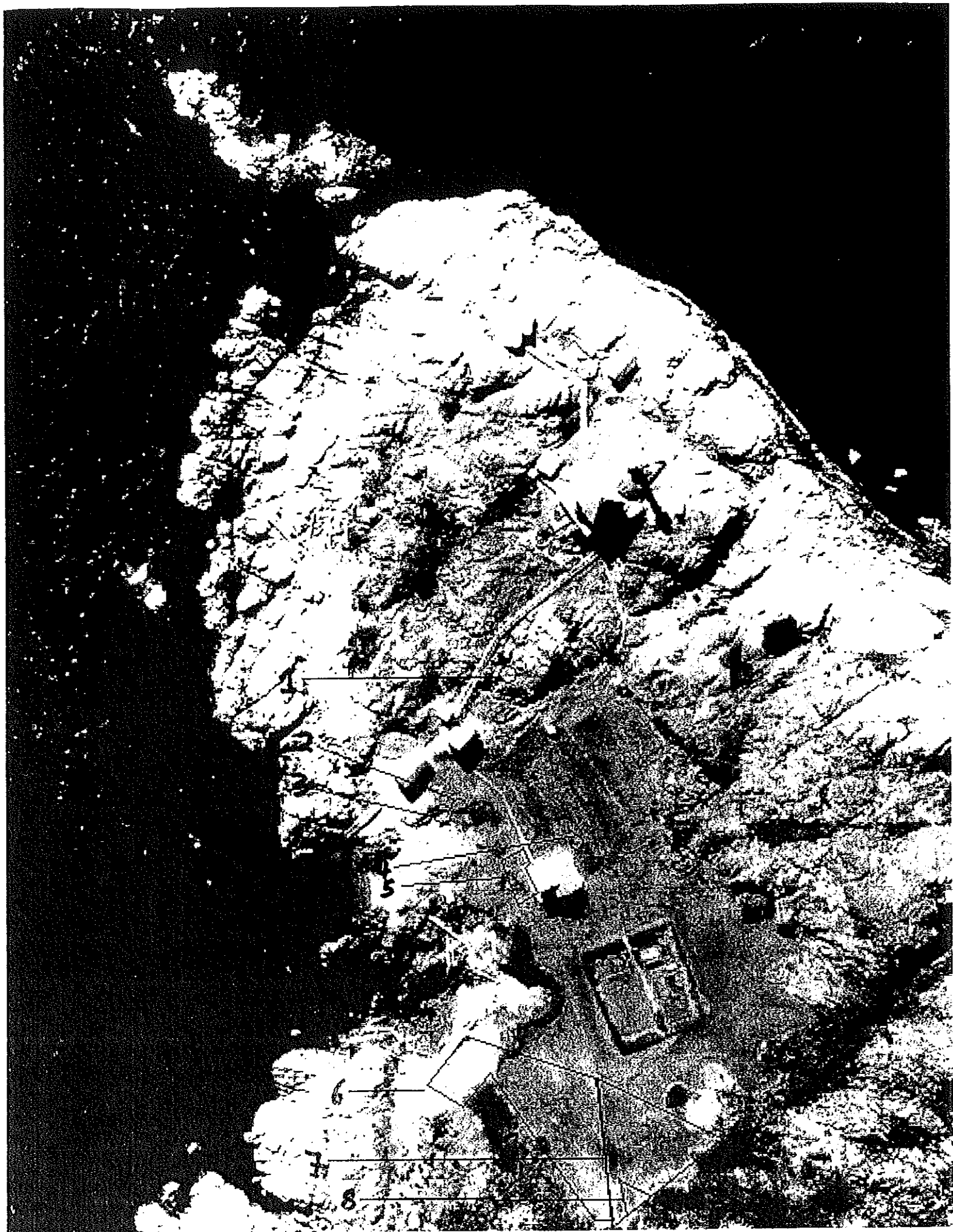
### **Impact Mitigation**

If the preceding recommendations for impact avoidance are followed carefully, there is little need for mitigation activities. Otherwise, effective measures for mitigation will be expensive and their efficacy questionable. Soil compaction cannot be reversed without creating even more serious impacts. Rare perennial species can be salvaged and replanted but there is a considerable risk of mortality. Seed can be collected from rare annual species, it can be germinated in nursery conditions, and transplants can be re-introduced to damaged sites. The germination requirements are not known for several species, and transplants may suffer a high rate of mortality.



### Key Locations

1. *Lotus formosissimus*
2. *Castilleja ambigua*
3. *Leymus triticoides*
4. *Sanicula arctopoides* – germinants
5. Other *Sanicula arctopoides* threatened by renovations
6. *Lupinus densiflorus*
7. Lawn area recommended for lighter mowing regime
8. *Dodecatheon pulchellum*



### ***Other Impacts of Lighthouse Management on Rare Species***

The greatest impacts of current lighthouse operations on rare, threatened and endangered plant species are associated with maintenance of lawns around the facilities. Elsewhere on Trial Island, the relatively level soils underlying the lawns are favoured by a number of rare species. It seems likely that many rare species were adversely impacted when the lawns were created. Some of these impacts may be irreversible, however populations of *Lupinus densiflorus*, *Sanicula arctopoides* and *Dodecatheon pulchellum* are likely to increase if mowing is deferred until mid June over an area indicated in figure 1. If areas of the lawn are protected from any further mowing (figure 1), they may eventually support populations of *Lotus formosissimus* and *Castilleja levisecta*. The small population of *Lotus formosissimus* (figure 1) adjacent to the walkway between the Lightkeeper's residence and the workshed has survived mowing, but if mowing stops on this small spot the plants will likely increase in vigor and number.

The inadvertent introduction of a number of non-native plant species has had a profound impact on the native flora of southeastern Vancouver Island. Introduced grasses including Orchard Grass (*Dactylis glomerata*), Yorkshire Fog (*Holcus lanatus*), Sweet Vernal Grass (*Anthoxanthum odoratum*) and Kentucky Bluegrass (*Poa pratensis*) have aggressively replaced native plant communities in virtually all meadow areas. Introduced ornamentals including Broom (*Cytisus scoparius*), Spurge-laurel (*Daphne laureola*), Gorse (*Ulex europaeus*), Holly (*Ilex* sp.) and Ivy (*Hedera helix*) have also impacted meadow communities as well as shrub thickets and forest edges. Currently, there are no effective means to control the non-native grasses or ivy without having even greater impacts on the remaining vestiges of the natural plant communities. Mechanical and chemical treatments can be used to control the gorse, broom and holly. Volunteer groups occasionally visit Trial Island to cut back these species, and the Canadian Coast Guard may be able to control the spread of these weeds by active co-operation with these volunteer groups.

Evidence suggests that the Trial Islands may have been traditional camas-gathering areas for local First Nations. These gatherers certainly used fires to improve camas growth on some of their harvest areas and this practice may have extended to Trial Island, although the evidence is far from conclusive. If fire was formerly used as a tool, abandonment of this practice may have shifted the ecological balance favouring woodland expansion at the expense of meadow communities. This hypothesis will remain speculative until better evidence is found. Recommendations to re-introduce fire as a 'natural' disturbance on Trial Island should be treated with caution. Wildfire was unlikely to have played a significant role on Trial Island due to the rarity of lightning strikes in the Victoria area and the sea barrier which protected the island from fires burning on Vancouver Island itself.

## Appendix: List of Vascular Plants

Pteridophytes

Pteridopsida

Dennstaediaceae

*Pteridium aquilinum* (L.) Kuhn

Angiospermae

Monocotyledoneae

Cyperaceae

*Carex brevicaulis* Mack.

*Carex lyngbyei* Hornem.

*Carex obnuta* Bailey

Iridaceae

*Iris* sp.

*Sisyrinchium idahoense* Bickn.

Juncaceae

*Juncus arcticus* Willd.

*Luzula multiflora* (Ehrh.) Lej.

Liliaceae

*Allium acuminatum* Hook.

*Allium cernuum* Roth. in Roem.

*Brodiaea coronaria* (Salisb.) Engl.

*Camassia leichtlinii* (Baker) S. Wats.

*Camassia quamash* (Pursh) Greene var. *maxima* (Gould) Boivin

*Erythronium oreganum* Appleg.

*Fritillaria affinis* (Schultes) Sealey

*Narcissus pseudonarcissus* L.

*Scilla nonscripta* (L.) Hoffmans. & Link.

*Triteleia hyacintha* (Lindl.) Greene

*Zygadenus venenosus* S. Wats. var. *venenosus*

Orchidaceae

*Spiranthes romanzoffiana* Cham.

Poaceae

*Agrostis stolonifera* L.

*Aira caryophyllea* L.

*Aira praecox* L.

*Anthoxanthum odoratum* L.

*Bromus hordeaceus* L. ssp. *hordeaceus*

*Bromus pacificus* Shear

*Bromus sitchensis* Trin.

*Bromus sterilis* L.

*Cynosurus echinatus* L.

*Dactylis glomerata* L.

*Danthonia californica* Boland.

*Deschampsia cespitosa* (L.) Beauv. ssp. *cespitosa*

*Distichlis spicata* (L.) Greene var. *spicata*

*Festuca rubra* L.

*Holcus lanatus* L.

*Hordeum brachyantherum* Nevski

*Leymus triticoides* (Buckl.) Pilger

*Lolium perenne* L.

*Poa annua* L.

*Poa bulbosa* L.

*Poa compressa* L.

*Poa pratensis* L.

*Puccinellia pumila* (Vasey) A.S. Hitchc.

*Vulpia bromoides* (L.) S.F. Gray

*Vulpia microstachys* (Nutt.) Munro in Benth. var. *pauciflora* (Scribn. in Beal) Lonard & Gould  
*Vulpia myuros* (L.) Gmel. var. *hirsuta*

Dicotyledoneae

Apiaceae

*Conioselinum pacificum* (S. Wats.) Coult. & Rose  
*Lomatium nudicaule* (Pursh) Coult. & Rose  
*Lomatium utriculatum* (Nutt. in T. & G.) Coult. & Rose  
*Petroselinum crispum* (P. Mill.) Hill  
*Sanicula arctopoides* Hook. & Arn.  
*Sanicula crassicaulis* Poepp. in DC. var. *crassicaulis*

Apocynaceae

*Apocynum androsaemifolium* L.  
*Vinca major* L.

Araliaceae

*Hedera helix* L.

Asteraceae

*Achillaea millefolium* L.  
*Grindelia integrifolia* DC.  
*Hypochaeris radicata* L.  
*Leontodon taraxacoides* (Vill.) Merat  
*Sonchus asper* (L.) Hill  
*Sonchus oleraceus* L.  
*Taraxacum officinale* Weber in Wiggers

Berberidaceae

*Mahonia aquifolium* (Pursh) Nutt.

Brassicaceae

*Cheiranthus* sp. (cultivar)

Caprifoliaceae

*Symphoricarpos albus* (L.) Blake

Caryophyllaceae

*Cerastium arvense* L.  
*Cerastium holosteoides*  
*Cerastium pumilum*  
*Cerastium semidecandrum* L.  
*Moenchia erecta* (L.) Gaertn., Mey. & Scherb. Var. *erecta*  
*Sagina* sp.  
*Silene gallica* L.  
*Spergularia canadensis* (Pers.) G. Don

Crassulaceae

*Sedum album* L.

Ericaceae

*Arctostaphylos uva-ursi* (L.) Spreng.  
*Gaultheria shallon* Pursh

Fabaceae

*Cytisus scoparius* (L.) Link.  
*Lathyrus japonicus* Willd. var. *maritimus* (L.) Kartesz & Gandhi  
*Lotus formosissimus* Greene  
*Lotus micranthus* Benth.  
*Lotus unifolius* (Hook.) Benth. var. *unifolius*  
*Lupinus bicolor* Lindl. ssp. *bicolor*  
*Lupinus densiflorus* Benth. var. *densiflorus*  
*Trifolium dubium* Sibth.  
*Trifolium pratense* L.  
*Vicia americana* Muhl. in Willd.  
*Vicia hirsuta* (L.) S.F. Gray

Fagaceae

*Quercus garryana* Dougl.

Geraniaceae

*Erodium cicutarium* (L.) L'Her. In Alt.

*Geranium molle* L.

*Geranium pusillum* L.

Oleaceae

*Ligustrum vulgare* L.

Orobanchaceae

*Orobanche uniflora* L.

Papaveraceae

*Eschscholtzia californica* Cham. in Nees

Plantaginaceae

*Plantago elongata* Pursh

*Plantago lanceolata* L.

*Plantago maritima* L. ssp. *juncooides* (Lam.) Hult.

Plumbaginaceae

*Armeria maritima* (Mill.) Willd.

Polygonaceae

*Rumex acetosella* L.

Primulaceae

*Dodecatheon pulchellum* (Raf.) Merrill

Rosaceae

*Amelanchier alnifolia* (Nutt.) Nutt.

*Aphanes occidentalis* (Nutt.) Rydb.

*Cotoneaster* sp.

*Fragaria vesca* L.

*Rosa nutkana* Presl

*Rubus ursinus* Cham. & Schlecht. ssp. *macropetalus* (Dougl. in Hook.) Taylor & MacBryde

*Sorbus* sp.

Rubiaceae

*Galium boreale* L.

*Sherardia arvensis* L.

Salicaceae

*Populus tremuloides* Bartram var. *vancouveriana* (Trel.) Sarg.

*Salix hookeriana* Barratt in Hook.

Scrophulariaceae

*Orthocarpus bracteosus* Benth.

*Orthocarpus castillejooides* Benth

*Orthocarpus pusillus* Benth.