

Vegetation Survey

Ruckle Park

Salt Spring Island



Prepared for: BC Ministry of Environment

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June 30, 2006

Cover picture: *Festuca elatior*, a native grass, in the Ruckle campground (photo: J. Brouard)

Executive summary

A vegetation survey was conducted in the campground portion of Ruckle Park in the latter half of June, 2006. Forty-eight quadrat plots were tallied, 12 incidences of rare plants were confirmed, and 900 m of 10 m wide transects were run. A total of 144 species were observed in plots, in transects, or nearby. While the park is dominated by exotic species, a surprisingly large number of native species were found; 82 of these species are believed to be native and 62 species are known to be exotic. Spread and density of exotic species are, on average, far greater than for native species.

The area's history (30 years of camping and day use) combined with the absence of a baseline survey makes meaningful assessment difficult. Communities have been homogenized to a considerable extent, apart from isolated occurrences of rare species. It seems likely that at least some of these rare species (e.g. *Limnanthes macounii*, *Psilocarphus tenellus*) have persisted because of, rather than despite, human influence. Human activity controls competition to some extent, and park use peaks after plants have already flowered and died.

Other species have almost certainly been dramatically reduced in density or extirpated as a result of human activity (e.g. *Camassia quamash*, *Dodecatheon hendersonii*); however some of these plants are beginning to make a reappearance in the fenced enclosure area. Recently instituted *Soliva* eradication techniques also appear to be affecting vegetation patterns; for example, *Brodiaea coronaria*, *Lomatium utriculatum* and *Orthocarpus pusillus* show strong recovery in burned areas.

Ten years after its first confirmed occurrence, the invasive weed *Soliva sessilis* is well established in this portion of the park. Eradication efforts have reduced density and minimized impacts on both people and rare species. Continued treatment on a regular basis is essential in order to avoid negative impacts on rare species as well as on human enjoyment.

If the campground is not completely closed for several years, eradication of *Soliva* will be impossible. Even if it is closed, eradication is unlikely. Spread within the park and to adjacent areas on the island will certainly occur if human use continues in the campground area. Transport to other, more distant areas is almost exclusively through tents and tarps. This can be significantly reduced through use of tent pads, although this benefit must be balanced against the effective loss of vegetated area to tent pads.

We do not believe that a partial closure of the campground would be an effective means of addressing the two main concerns, i.e. protection of rare native species and *Soliva* control. A partial closure would disrupt the stable environment (including human disturbance) that has existed for the past 30 years, without actively addressing the threat from *Soliva*. We recommend that:

- *Soliva* control efforts be continued for the foreseeable future;
- tent pads be established, and that camping be restricted to pads;
- the enclosure remain in place; and
- an active research program be initiated to assess species and vegetation community evolution and/or recovery in the enclosure.

Vegetation Survey, Ruckle Park Campground, 2006

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Appendices

Appendix 1. Species occurrences in quadrat plots

Appendix 2. Transect data

Vegetation Survey, Ruckle Park Campground, 2006

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Introduction

Camping and other recreational activities have occurred in Ruckle park since its establishment in 1974. A vegetation survey was undertaken in June 2006 within the campground and adjacent areas, covering approximately 6 ha of the south-eastern portion of Ruckle Park. The purpose of the survey was to identify and describe vegetation communities and to identify locations of rare or threatened species. Results will assist park personnel in planning future camping and day use patterns.

Method

This survey included four assessment components:

- quadrat plots (see Appendix 1),
- transects (see Appendix 2),
- rare species location, and
- casual observation.

Quadrat plots

Forty-eight quadrat plots were distributed among vegetation communities (short grass, long grass, disturbed, seepage, forest edge). Plot size was 0.5 m x 0.5 m. For each plot, a complete listing of vegetation was recorded by species (see Tables 1 and 2). GPS location was recorded for each plot (see Table 3) and plotted on the accompanying air photo (Figure 1), marked by a red "x" with the plot number adjacent. Species incidence and frequency are summarized in Tables 4 and 5.

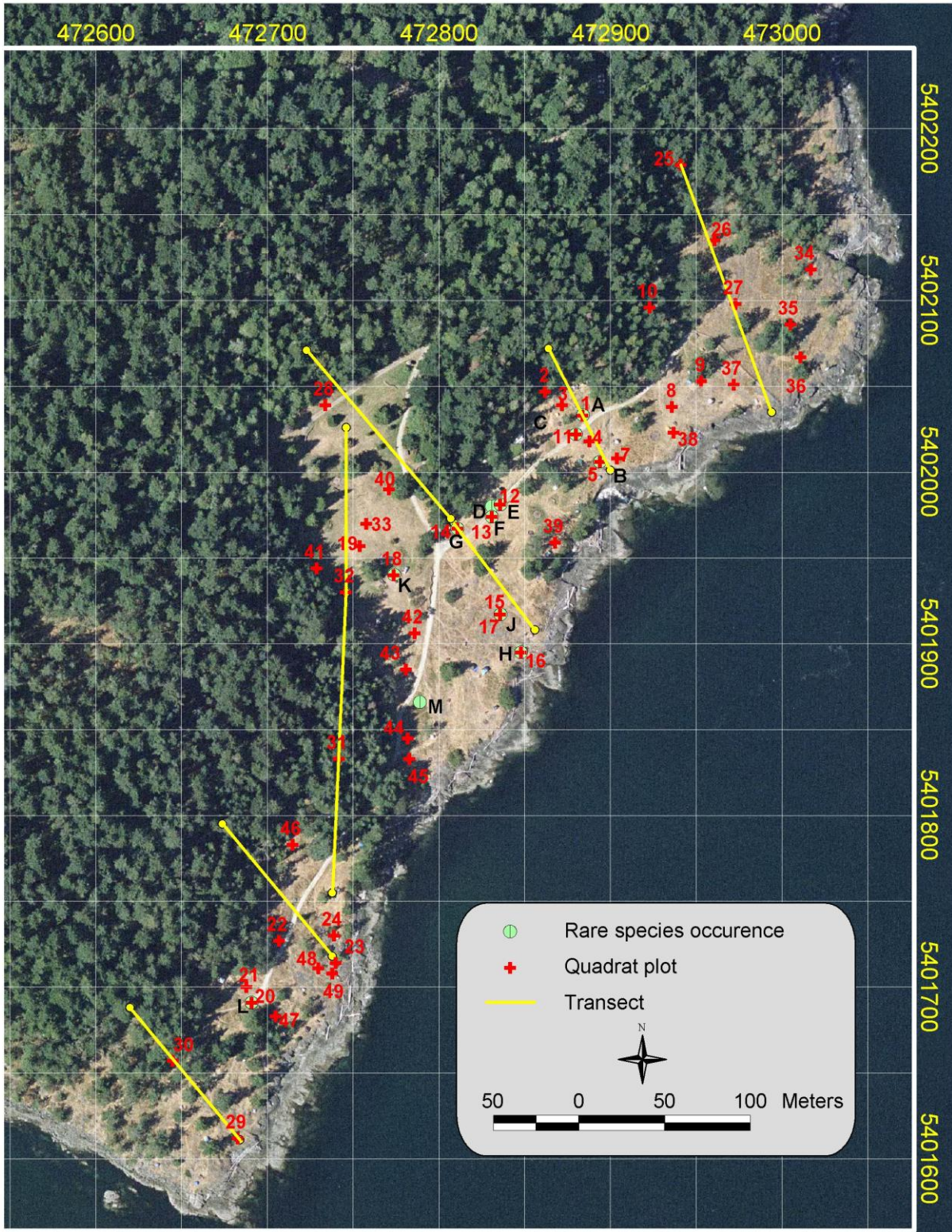


Figure 1. Locations of transects, quadrat plots and rare species occurrences

Transects

Eight transects were run, totaling approximately 900 m in length, as shown in Figure 1. GPS location was recorded for the start and stop point of each transect (see Table 6). Transects were assessed in 20 m lengths; the assessed area extended 5m on either side of the transect, so that each assessed area covered 200 m². Transects sampled all vegetation communities (short grass, long grass, disturbed, seepage, forest edge) . The assessed area covers approximately 15% of the 6 ha campground area.

Each 200 m² area was assessed as follows:

- Tree %; dominant or significant spp.
- Shrub %; dominant or significant spp.
- Herb %; dominant or significant spp.
- Other cover components (e.g. rock, path)
- Comments

See Appendix 2 for a complete listing of transect assessment data.

Rare species

GPS locations of populations of 12 rare species were recorded (see Table 7) and are shown in Figure 1 as green circles with Identification code letters adjacent.

Casual observation

During the course of the survey, a number of species were observed that did not occur either in quadrats or rare plots, or as dominant or significant species in transects. These species were included in the complete species listing in Table 1, but were not tallied in plot or transect listings.

Results

One hundred and forty-four species (see Tables 1 and 2) were observed within the approximately 6 ha campground area. Of these, 81 species occurred in quadrat plots and 76 occurred as significant native or dominant species in transects. Seven rare species were tallied. An additional 32 species were identified through casual observation within the campground area but outside plots and transects. Counts of quadrat occurrence by species are shown in Table 2 (maximum count = 48). Average number of quadrat occurrences for native species was 1.1 (range 0 - 12), while exotics occurred, on average, in 6.3 plots (range 0 - 25).

Table 1. Count of all observed species

| | trees & shrubs | forbs | grasses | ferns & fern allies | sedges & rushes | total |
|--------|----------------|-------|---------|---------------------|-----------------|-------|
| native | 23 | 44 | 7 | 5 | 3 | 82 |
| exotic | 3 | 33 | 26 | 0 | 0 | 62 |
| Total | 26 | 77 | 33 | 5 | 3 | 144 |

Table 2. Species listing and counts by quadrat

| Native species | form* | quadrat count |
|---|--------------|----------------------|
| <i>Abies grandis</i> | ts | 0 |
| <i>Acer macrophyllum</i> | ts | 0 |
| <i>Achillea millefolium</i> | f | 6 |
| <i>Achlys triphylla</i> | f | 0 |
| <i>Adenocaulon bicolor</i> | f | 0 |
| <i>Amelanchier alnifolia</i> | ts | 1 |
| <i>Arbutus menziesii</i> | ts | 0 |
| <i>Athyrium filix-femina</i> | fe | 0 |
| <i>Brodiaea coronaria</i> | f | 6 |
| <i>Bromus carinatus</i> | g | 0 |
| <i>Bromus sitchensis</i> | g | 0 |
| <i>Bromus vulgaris</i> | g | 1 |
| <i>Calandrinia ciliata var. menziesii</i> | f | 0 |
| <i>Camassia quamash</i> | f | 0 |
| <i>Cerastium arvense</i> | f | 2 |
| <i>Circaea alpina</i> | f | 0 |
| <i>Corallorhiza maculata</i> | f | 0 |
| <i>Danthonia californica</i> | g | 7 |
| <i>Deschampsia danthonoides</i> | g | 12 |
| <i>Elymus glaucus</i> | g | 0 |
| <i>Equisetum spp</i> | fa | 0 |
| <i>Eriophyllum lanatum</i> | f | 0 |
| <i>Erythronium oregonum</i> | f | 0 |
| <i>Festuca elatior</i> | g | 0 |
| <i>Gaultheria shallon</i> | ts | 0 |
| <i>Gnaphalium chilense</i> | f | 1 |
| <i>Goodyera oblongifolia</i> | f | 0 |
| <i>Grindelia integrifolia</i> | f | 0 |
| <i>Holodiscus discolor</i> | ts | 0 |
| <i>Isoetes nutallii</i> | fa | 1 |
| <i>Juncus bufonius</i> | sr | 2 |
| <i>Juncus occidentalis</i> | sr | 1 |
| <i>Limnanthes macounii</i> | f | 3 |
| <i>Lomatium utriculatum</i> | f | 0 |
| <i>Lonicera ciliosa</i> | ts | 0 |
| <i>Lonicera hispidula</i> | ts | 1 |
| <i>Luzula multiflora</i> | sr | 3 |
| <i>Mahonia nervosa</i> | ts | 0 |
| <i>Malus diversifolia</i> | ts | 2 |
| <i>Montia fontana</i> | f | 0 |
| <i>Montia perfoliata</i> | f | 0 |
| <i>Montia sibirica</i> | f | 0 |
| <i>Nemophila parviflora</i> | f | 0 |
| <i>Orthocarpus pusillus</i> | f | 6 |
| <i>Osmorhiza chilensis</i> | f | 0 |

| Introduced species | form* | quadrat count |
|--------------------------------|--------------|----------------------|
| <i>Agrostis gigantea</i> | g | 23 |
| <i>Agrostis tenuis</i> | g | 9 |
| <i>Aira caryophyllea</i> | g | 17 |
| <i>Aira praecox</i> | g | 16 |
| <i>Anthoxanthum odoratum</i> | g | 16 |
| <i>Anthriscus scandicina</i> | f | 0 |
| <i>Aphanes arvensis</i> | f | 1 |
| <i>Aphanes microcarpa</i> | f | 2 |
| <i>Bellis perennis</i> | f | 12 |
| <i>Bromus hordeaceus</i> | g | 19 |
| <i>Bromus mollis</i> | g | 0 |
| <i>Bromus rigidus</i> | g | 1 |
| <i>Bromus sterilis</i> | g | 4 |
| <i>Cerastium semidecandrum</i> | f | 3 |
| <i>Cerastium vulgare</i> | f | 2 |
| <i>Cirsium arvense</i> | f | 1 |
| <i>Cirsium vulgare</i> | f | 2 |
| <i>Cynosurus cristatus</i> | g | 10 |
| <i>Cynosurus echinatus</i> | g | 25 |
| <i>Dactylis glomerata</i> | g | 6 |
| <i>Daucus carota</i> | f | 4 |
| <i>Epipactis helleborine</i> | f | 0 |
| <i>Erodium cicutarium</i> | f | 1 |
| <i>Festuca arundinacea</i> | g | 0 |
| <i>Festuca gigantea</i> | g | 1 |
| <i>Festuca pratensis</i> | g | 0 |
| <i>Festuca spp</i> | g | 1 |
| <i>Galium aparine</i> | f | 2 |
| <i>Geranium molle</i> | f | 4 |
| <i>Geranium pusillum</i> | f | 7 |
| <i>Holcus lanatus</i> | g | 16 |
| <i>Hordeum brachyantherum</i> | g | 0 |
| <i>Hypochaeris radicata</i> | f | 25 |
| <i>Ilex aquifolium</i> | ts | 0 |
| <i>Lactuca muralis</i> | f | 1 |
| <i>Leontodon taraxacoides</i> | f | 4 |
| <i>Lolium perenne</i> | g | 23 |
| <i>Moenchia erecta</i> | f | 9 |
| <i>Myosotis discolor</i> | f | 3 |
| <i>Parentucellia viscosa</i> | f | 0 |
| <i>Plantago lanceolata</i> | f | 21 |
| <i>Poa annua</i> | g | 14 |
| <i>Poa bulbosa</i> | g | 1 |
| <i>Poa compressa</i> | g | 1 |
| <i>Poa pratensis</i> | g | 11 |

| Native species | form* | quadrat count |
|--|-------|---------------|
| <i>Perideridia gairdneri</i> | f | 2 |
| <i>Plagiobothrys scouleri</i> | f | 4 |
| <i>Plantago bigelowii</i> | f | 4 |
| <i>Polystichum munitum</i> | fe | 0 |
| <i>Prunus emarginata</i> | ts | 0 |
| <i>Prunus virginiana</i> | ts | 0 |
| <i>Pseudotsuga menziesii</i> | ts | 0 |
| <i>Psilocarphus tenellus</i> | f | 1 |
| <i>Pteridium aquilinum</i> | fe | 1 |
| <i>Quercus garryana</i> | ts | 1 |
| <i>Ranunculus occidentalis</i> | f | 3 |
| <i>Rosa gymnocarpa</i> | ts | 0 |
| <i>Rosa nutkana</i> | ts | 2 |
| <i>Rubus leucodermis</i> | ts | 0 |
| <i>Rubus parviflora</i> | ts | 0 |
| <i>Rubus ursinus</i> | ts | 8 |
| <i>Rumex salicifolius</i> | f | 0 |
| <i>Sanicula crassicaulis</i> | f | 1 |
| <i>Satureja douglasii</i> | f | 1 |
| <i>Sedum lanceolatum subsp. nesioticum</i> | f | 0 |
| <i>Sedum spathulifolium</i> | f | 0 |
| <i>Spiranthes romanzoffianum</i> | f | 1 |
| <i>Stachys cooleyae</i> | f | 0 |
| <i>Symphoricarpos albus</i> | ts | 2 |
| <i>Taxus brevifolia</i> | ts | 0 |
| <i>Thuja plicata</i> | ts | 0 |
| <i>Tiarella trifoliata</i> | f | 0 |
| <i>Trientalis latifolia</i> | f | 0 |
| <i>Trifolium depauperatum</i> | f | 0 |
| <i>Trifolium microcephalum</i> | f | 0 |
| <i>Trifolium oliganthum</i> | f | 4 |
| <i>Trifolium variegatum</i> | f | 2 |
| <i>Trifolium willdenovii</i> | f | 0 |
| <i>Trillium ovatum</i> | f | 0 |
| <i>Triteleia hyacinthina</i> | f | 1 |
| <i>Tsuga heterophylla</i> | ts | 0 |
| <i>Vaccinium parvifolium</i> | f | 0 |

| Introduced species | form* | quadrat count |
|---------------------------|-------|---------------|
| <i>Rosa canina</i> | ts | 0 |
| <i>Rubus laciniatus</i> | ts | 0 |
| <i>Rumex acetosella</i> | f | 10 |
| <i>Sherardia arvensis</i> | f | 3 |
| <i>Silene gallica</i> | f | 4 |
| <i>Soliva sessilis</i> | f | 1 |
| <i>Sonchus arvensis</i> | f | 1 |
| <i>Spergularia rubra</i> | f | 0 |
| <i>Stellaria media</i> | f | 3 |
| <i>Trifolium dubium</i> | f | 24 |
| <i>Trifolium hybridum</i> | f | 5 |
| <i>Urtica dioica</i> | f | 0 |
| <i>Veronica arvensis</i> | f | 2 |
| <i>Vicia sativa</i> | f | 5 |
| <i>Vulpia bromoides</i> | g | 13 |
| <i>Vulpia myuros</i> | g | 4 |
| <i>Vulpia pacifica</i> | g | 0 |

*** Form key**

ts = tree or shrub

f = forb

fe = fern

fa = fern-ally

g = grass

Quadrat plots

UTM locations, date of assessment, and location comments for the 48 quadrat plots (numbered 1 - 49; no plot 6) are shown in Table 3; they are also plotted on the accompanying air photo (Figure 1).

Table 3. Quadrat plot locations and descriptions

| Plot | E | N | date | location comments |
|------|--------|---------|----------|---|
| 1 | 472884 | 5402033 | 06.06.14 | Disturbed; short grass |
| 2 | 472862 | 5402047 | 06.06.14 | forest edge |
| 3 | 472872 | 5402039 | 06.06.14 | short grass |
| 4 | 472888 | 5402018 | 06.06.14 | short grass |
| 5 | 472894 | 5402006 | 06.06.14 | long grass |
| 6 | | | | NO PLOT |
| 7 | 472904 | 5402008 | 06.06.14 | long grass |
| 8 | 472936 | 5402038 | 06.06.14 | shallow soil; short grass |
| 9 | 472953 | 5402053 | 06.06.14 | Near burn patch; short grass |
| 10 | 472923 | 5402096 | 06.06.14 | Forest clearing |
| 11 | 472880 | 5402022 | 06.06.14 | Grassy seepage zone |
| 12 | 472836 | 5401981 | 06.06.14 | Vernal seepage <i>Limnanthes</i> rare spp. |
| 13 | 472831 | 5401974 | 06.06.14 | Vernal seepage - culvert <i>Limnanthes</i> rare spp. <i>Triteleia</i> culvert |
| 14 | 472811 | 5401967 | 06.06.14 | By water pump <i>Limnanthes</i> ; short grass |
| 15 | 472836 | 5401917 | 06.06.14 | seepage , <i>Limnanthes</i> , same seepage area and UTM as 17 |
| 16 | 472848 | 5401895 | 06.06.14 | Seepage from road to ocean, <i>Limnanthes</i> |
| 17 | 472836 | 5401917 | 06.06.14 | <i>Isoetes</i> seepage 25 to 30 m x 1m wide 50% bare ground |
| 18 | 472774 | 5401940 | 06.06.14 | Mowed meadow group campsite <i>Limnanthes</i> |
| 19 | 472754 | 5401957 | 06.06.14 | Group campsite table #3 |
| 20 | 472691 | 5401691 | 06.06.14 | End of road - bare gravel road |
| 21 | 472688 | 5401700 | 06.06.14 | short grass and moss |
| 22 | 472707 | 5401727 | 06.06.14 | Forest edge |
| 23 | 472740 | 5401714 | 06.06.14 | short grass near ocean |
| 24 | 472739 | 5401730 | 06.06.14 | short grass |
| 25 | 472941 | 5402179 | 06.06.24 | 80% cover, Garry Oak/D-f |
| 26 | 472961 | 5402135 | 06.06.24 | light shade, D-f/ Garry Oak |
| 27 | 472973 | 5402098 | 06.06.24 | open |
| 28 | 472734 | 5402039 | 06.06.24 | |
| 29 | 472683 | 5401612 | 06.06.30 | open |
| 30 | 472645 | 5401657 | 06.06.30 | 7% shade; D-f, Garry Oak |
| 31 | 472742 | 5401833 | 06.06.30 | dense shade |
| 32 | 472746 | 5401930 | 06.06.30 | |
| 33 | 472758 | 5401970 | 06.06.30 | mowed and dry; hard to ID grasses |
| 34 | 473017 | 5402118 | 06.07.02 | exclosure; thin soil; short grass |
| 35 | 473005 | 5402086 | 06.07.02 | exclosure; edge of shrub clump |
| 36 | 473011 | 5402067 | 06.07.02 | exclosure; very thick tall grass; open |
| 37 | 472972 | 5402051 | 06.07.02 | on lightly-used path |
| 38 | 472937 | 5402023 | 06.07.02 | on edge of fire ring |
| 39 | 472868 | 5401959 | 06.07.02 | on edge of bluff at shore; nr shrubs |
| 40 | 472771 | 5401990 | 06.07.02 | in shade of tree clump |
| 41 | 472729 | 5401944 | 06.07.02 | |
| 42 | 472786 | 5401906 | 06.07.02 | beside recycling/garbage; very trampled |
| 43 | 472781 | 5401885 | 06.07.02 | |
| 44 | 472782 | 5401845 | 06.07.02 | long grass |
| 45 | 472783 | 5401833 | 06.07.02 | short grass |
| 46 | 472715 | 5401783 | 06.07.02 | partial shade under huge D-f |

| Plot | E | N | date | location comments |
|------|--------|---------|----------|-------------------|
| 47 | 472705 | 5401683 | 06.07.02 | medium grass |
| 48 | 472730 | 5401711 | 06.07.02 | long grass |
| 49 | 472738 | 5401708 | 06.07.02 | |

Within the 48 established plots, totalling 12 m², 81 species were observed (see Table 4).

Table 4. Species counts in quadrat plots

| | trees & shrubs | forbs | grasses | ferns & fern allies | sedges & rushes | total |
|--------------|----------------|-----------|-----------|---------------------|-----------------|-----------|
| native | 7 | 17 | 3 | 2 | 3 | 32 |
| exotic | 0 | 28 | 21 | 0 | 0 | 49 |
| Total | 7 | 45 | 24 | 2 | 3 | 81 |

Within the plots, 486 species incidences were observed (see Table 5). Some species were observed many times, while others occurred in a single plot.

Table 5. Incidence counts in quadrat plots

| | trees & shrubs | forbs | grasses | ferns & fern allies | sedges & rushes | total |
|---------------|----------------|------------|------------|---------------------|-----------------|------------|
| native | 17 | 48 | 20 | 2 | 6 | 93 |
| exotic | 0 | 162 | 231 | 0 | 0 | 393 |
| Total | 17 | 210 | 251 | 2 | 6 | 486 |

A cluster analysis (see Figure 2) was performed on the native species presence/absence data from the 48 plots (see Appendix 1 for data). A value of 0.5 was used for “near” sightings. (Note that plot 6 does not exist; “0”s were entered for all species in this data line for analysis purposes.) Some plot groupings appear to be significant, such as plots 11 and 12, which are in similar habitats but geographically separated, or 19, 33 and 44, which are in long grass sites (although one was mowed); further analyses might be warranted. It is however possible that the data set is too sparse; a larger number of quadrat plots could perhaps be expected to yield more meaningful results.

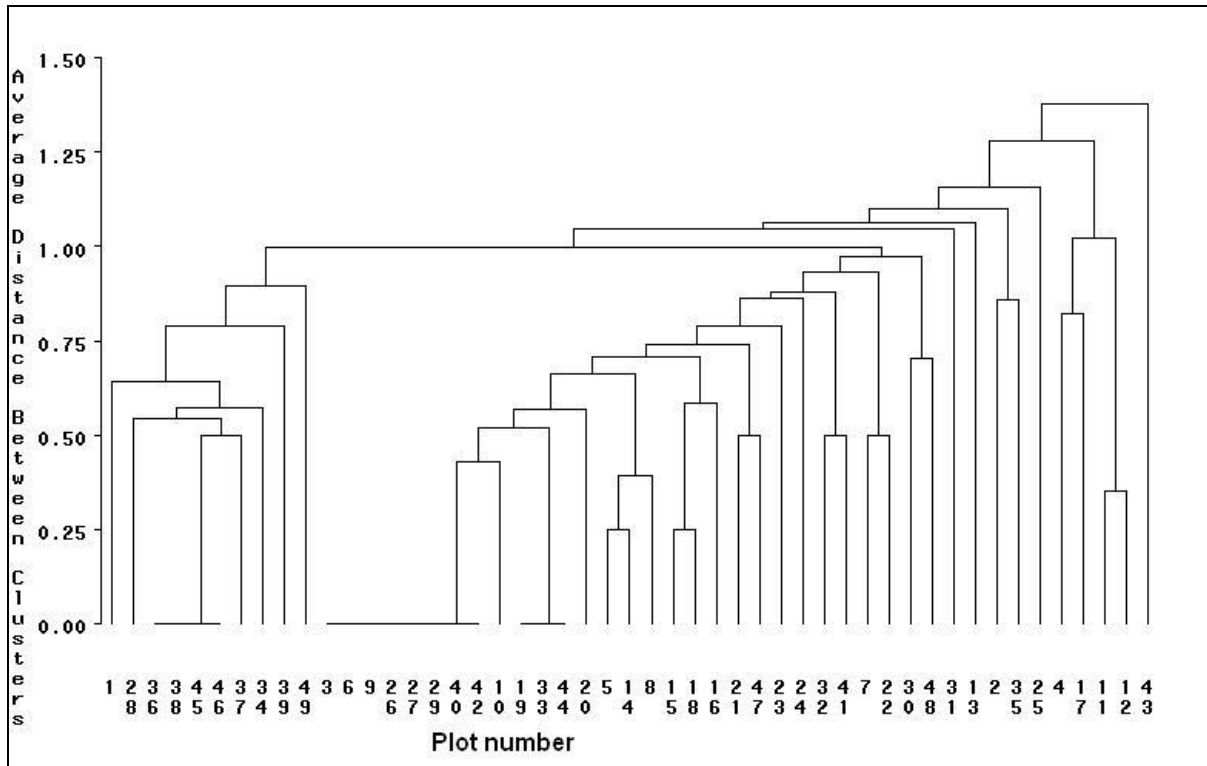


Figure 2. Tree diagram from cluster analysis: native species data from quadrat plots

Transects

UTM locations for the eight transects are shown in Table 6; they are also plotted on the accompanying air photo (Figure 1).

Table 6. Transect locations

| Transect | Start | | Stop | |
|----------|--------|---------|--------|---------|
| 1 | 472941 | 5402179 | 472994 | 5402035 |
| 2 | 472900 | 5402001 | 472864 | 5402072 |
| 3 | 472856 | 5401908 | 472809 | 5401970 |
| 4 | 472807 | 5401973 | 472723 | 5402071 |
| 5 | 472684 | 5401611 | 472620 | 5401688 |
| 6 | 472738 | 5401718 | 472674 | 5401795 |
| 7 | 472738 | 5401755 | 472746 | 5401930 |
| 8 | 472746 | 5401930 | 472746 | 5402026 |

Within transect plots, 76 species were considered to be either dominant species (native or exotic) or significant native species (see Appendix 2).

Rare species

Twelve plots containing a total of seven rare or locally interesting species were identified and mapped (see Table 7 and accompanying map).

Table 7. Rare species occurrences

| plot | E | N | species | area (est) | |
|------|--------|---------|--|------------|-----------------------------------|
| A | 472884 | 5402033 | <i>Trifolium depauperatum</i> | 4 sq m | disturbed short grass |
| B | 472894 | 5402006 | <i>Juncus occidentalis</i> | 5 sq m | long grass, shallow soil, seepage |
| C | 472880 | 5402022 | <i>Limnanthes macounii</i> | 6 sq m | vernal seepage |
| D | 472831 | 5401980 | <i>Psilocarphus tenellus</i> | 1 sq m | heavily disturbed; gravel road |
| E | 472836 | 5401981 | <i>Limnanthes macounii</i> | 6 sq m | vernal seepage |
| F | 472831 | 5401974 | <i>Limnanthes macounii</i> | 4 sq m | vernal seepage |
| G | 472811 | 5401967 | <i>Limnanthes macounii</i> | 6 sq m | short grass nr old pump |
| H | 472848 | 5401895 | <i>Limnanthes macounii</i> | 4 sq m | vernal seepage nr ocean |
| J | 472836 | 5401917 | <i>Isoetes nutallii</i> , <i>Limnanthes macounii</i> | 40 sq m | vernal seepage |
| K | 472774 | 5401940 | <i>Limnanthes macounii</i> | 5 sq m | vernal seepage; mowed |
| L | 472691 | 5401691 | <i>Psilocarphos tenellus</i> | 4 sq m | heavily disturbed; gravel road |
| M | 472789 | 5401866 | <i>Luzula multiflora</i> *, <i>Spiranthes romanzoffianum</i> ** | 10 sq m | long grass |

* local variant differing in appearance and habitat from elsewhere

** locally rare

Observations and discussion

Native, exotic and rare species

More native species than exotics were observed in this survey (82 vs 62). However the abundance of exotics was more than four times that of natives in quadrat plots, with 393 vs 93 recorded incidences. Thus the average number of quadrat occurrences for native species was 1.1 (range 0 - 12), while exotics occurred, on average, in 6.3 plots (range 0 - 25). Exotics clearly dominate the open areas of the park, and plant communities have been homogenized to a considerable extent, apart from isolated occurrences of rare species.

The timing of this survey (second half of June) made it very difficult to identify plants that had finished flowering; some winter annuals had already completed their life cycles and were missed in the survey. Mowed areas were also very difficult to assess, particularly for grasses.

The absence of a baseline vegetation survey as originally included in the 1986 Management Plan (Morris, 1986) makes it impossible to assess time trends in individual species or communities. Morris had included "prepare a Vegetation Management Plan with special emphasis on the grassland communities" as an action item in this plan. The area's history of disturbance combined with the absence of a baseline survey makes meaningful assessment difficult.

Since the whole area has been extensively disturbed for the past 30 years, it seems clear that the rare species that remain in relative abundance can support disturbance at current levels. Some species of light-demanding winter annual species clearly thrive under the heavily disturbed and invasive-infested conditions that exist in the Ruckle Park campground. It seems likely that at least some of these rare species have persisted because of, rather than despite, human influence; use patterns are heaviest when plants have already flowered and died, and human use controls competition to some extent. On consideration, it seems possible that the heavy human use (camping, hiking, mowing) keeps competition from shrubs and exotic grasses at a relatively low level. Furthermore, the period of active growth and reproduction of plants such as winter annuals has largely been completed by the time heavy human disturbance begins, so physical damage to some native plants is largely avoided. Thus species such as *Limnanthes macounii* and *Psilocarphus tenellus* apparently not only tolerate the heavy human use, but have come to depend on it to remain competitive. Human activity may partially offset the effects of invasive species. This is exemplified by the thriving population of *Limnanthes macounii* in a heavily used campsite near the shore (see Figure 3). The first picture was taken in early April, before the camping season began; the second was in late June, when the site was heavily disturbed, but the plants had already completed their life cycle. Another dramatic example is provided by a clump of *Psilocarphus tenellus* (see Figure 4), growing on a heavily traveled roadway/walking path. This picture was taken at the end of July.



Figure 3. *Limnanthes macounii* in a campsite in early April (prior to start of camping season), and again in late June; note “nutlets” at centre



Figure 4. *Psilocarphus tenellus* on heavily used roadway, June 2006

It is impossible to ascertain what other rare species formerly occurred in this area. Those species that do not tolerate high disturbance levels will have been dramatically reduced in density or extirpated as a result of continuous human activity over 30 years (e.g. *Camassia quamash* and *Dodecatheon hendersonii*). Some of these plants, however, are beginning to make a reappearance in the fenced exclosure area. Recently instituted *Soliva* eradication techniques also appear to be affecting vegetation patterns; e.g. *Brodiaea coronaria*, *Lomatium utriculatum* and *Orthocarpus pusillus* show strong recovery in burned patches.

***Soliva sessilis* control**

Ten years after its first confirmed occurrence in the park, *Soliva* is present and well established throughout the surveyed area (ISSES and FOSP, 2006), although density varies; the SE shoreline area is more heavily infested than inland areas. Eradication and control efforts have effectively reduced density, and consequently minimized impacts on both people and rare species. If control efforts were to be discontinued, the species would rebound quickly with possibly disastrous effects. If the campground is not completely closed, eradication of *Soliva* will be impossible; even if it were closed, eradication would be difficult. Spread within the park and to adjacent areas on Salt Spring Island is inevitable, if human use continues in the campground area.

Spread of *Soliva* to other more distant areas is largely through seed transfer on tents and tarps. By eliminating contact between the ground and tents and tarps, this method of transport of *Soliva* seeds can be significantly reduced. This can be effected through construction of tent pads, although benefits must be balanced against the effective loss of vegetated area. A survey of potential tent pads sites should be done in early spring to identify occurrences of, and suitable habitat for, rare species.

Recommendations

We do not believe that a partial closure of the campground would be an effective means of addressing the two main concerns, i.e. protection of rare native species and *Soliva* control. A partial closure would disrupt the stable environment (including human disturbance) that has existed for the past 30 years, without eliminating the threat from *Soliva*. We recommend that:

- *Soliva* eradication efforts be continued for the foreseeable future;
- tent pads be established, and that camping be restricted to pads;
- the enclosure remain in place; and
- an active research program be initiated to assess species and vegetation community evolution and/or recovery in the enclosure.

References

- Morris, J.R. 1986.** Ruckle Provincial Park Master Plan. Ministry Of Lands, Parks and Housing, Parks & Outdoor Recreation Division, South Coast Region. 69 pp.
- Island Stream and Salmon Enhancement Society and Friends of Saltspring Parks (ISSES and FOSP). 2006.** Burweed Eradication Project – Ruckle Provincial Park. 2005-2006 Final Report. Prepared for BC Parks. 17 pp.