Helliwell Provincial Park – Taylor’s Checkerspot Vegetation Assessment

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Introduction

This brief report and accompanying datasets presents the results of a vegetation assessment in Helliwell Provincial Park on Hornby Island, BC. The purpose of the assessment was to describe and map host plants and other vegetation characteristics for use in recovery planning for Taylor’s Checkerspot (Euphydryas editha ssp. taylori), an endangered butterfly that occurred in the park historically. The close association between Taylor’s Checkerspot and open meadow communities that support plants used for larval feeding and adult nectaring emphasizes the importance of understanding vegetation patterns in recovery planning. The assessment of current vegetation is supplemented with a review of vegetation change using air photos.

This was primarily a data collection project and only preliminary analysis was undertaken to summarize or understand vegetation patterns or other information. Data is presented as series of appendices showing mapped information on vegetation. Spatial datasets are also provided. Further analysis will be undertaken in 2008.

Methods

The assessment consisted of four tasks:

1) Comparison of orthorectified historic air photos to document broad-scale changes in forest and meadow communities in the park;
2) Mapping of Garry oak trees in the western portion of the park, as well as isolated Douglas-fir trees in open meadow areas;
3) Repeated measurement of vegetation characteristics in 89 plots located in open meadow communities; and
4) Supplemental mapping of the distribution and abundance of larval host plants and adult nectar plants used by Taylor’s checkerspot.

1. Historic Air Photos Assessment. An air photo series covering the period 1931–2006 was created to better understand the long-term changes in vegetation in the park, particularly the increase in Douglas-fir forest and the loss of open meadows. Air photos were obtained from the UBC Geographic Information Centre, National Air Photo Library, Islands Trust, and the Ministry of Environment. Other than the 2002 photo which was already orthorectified and was used as a georeferenced base, all photos were scanned and orthorectified in Global Mapper. Rectification used stable vegetation, intertidal, or cultural features to define fixed points. The series includes photos from 1931, 1944, 1952, 1964, 1971, 1975, 1980, 1981, 1988, 1996, 2002, and 2006. Joseph Carey’s 1875 survey map showing edge of the “grassy hills” is included for reference.

Product: Detailed analysis of the habitat change has not been completed but the entire photo series is provided in Appendix 1 for visual interpretation. Georeferenced TIFF images are provided for all photos.

2. Mapping of Garry Oak and Douglas-fir Trees. To better assess tree encroachment and the location of historic meadows, the locations of Garry oak and Douglas-fir trees were measured. The loss of meadow habitat from tree encroachment was identified as one of the
causes of the decline and subsequent extirpation of the Taylor’s checkerspot population (Miskelly, 2004). As well, the location of Garry oak trees is an indicator of the extent of open meadows before Douglas-fir became more prevalent in the park.

Tree locations were mapped as individual points or as patches using a combination of GPS coordinates (handheld) and distance and bearing measurements from known plot locations. Distance and bearing measurements were converted to UTM coordinates using trigonometry and the known location of plots. The condition of Garry oaks was recorded (live, dead, dead and down) as were the number (for patches), circumference, and diameter of Douglas-fir trees. Fleming (2007) describes survey methods and summarizes some of the spatial patterns of tree encroachment (see Fleming, 2007; Appendices 5 and 6).

Product: Appendix 2 shows the location of Garry oak trees in the southern portion of the park and Douglas-fir trees in open meadow areas. Shapefiles are also provided.

3. Vegetation Plots. As part of the recovery planning undertaken by Fleming (2007), a series of 206 plots on 31 transects were situated in open meadow areas and a portion of the adjacent forest in the southwestern portion of the park (see Appendix 3 for plot locations). Transects were placed 50 m apart on a bearing of 185° commencing at the southern edge of the bluffs. Plots were located every 30 m along each transect; the number of plots ranged from 3–13 per transect with a maximum transect length of 420 m. Plot location was measured using a handheld GPS and occasionally using a distance tape from nearby plots. Steel pins and washers were used to permanently mark plot location. More information on methods is provided on Pages 18 and 19 of Fleming (2007).

Plot naming was modified for the vegetation assessment; transect number remained the same but plots were named alphabetically starting nearest the bluff edge (e.g., Fleming’s Transect 2, Plot 2 is renamed Plot 2B).

Vegetation characteristics were measured in 86 plots in open meadow or forest edge communities in the Spring and Summer of 2007. Fleming (2007) had proposed using 1 m² plots nested in 5 m² plot for vegetation assessment, however, only the 1 m² plots were used for assessing vegetation. Each plot was located on the northeast side of the plot pin.

Each plot was visited in April (17, 23, 25), June (3–4), and July (9–10) 2007 to measure vegetation through the period of use by adult and pre-diapause Taylor’s Checkerspots. The following parameters were measured using standard visual assessment methods (see Appendix 3 for a complete list): (1) general vegetation characteristics such as total vegetation cover, graminoid (grass, sedge, some lilies) cover, rock cover, and bryophyte cover; (2) the cover of known larval host plants for checkerspot butterflies (Plantago lanceolata (ribwort plantain), Collinsia parviflora (small-flowered blue-eyed Mary), Castilleja miniata (scarlet paintbrush), etc.) and (3) the presence and abundance of flowers such as Lomatium utriculatum (spring-gold), Hypochaeris radicata (hairy cat’s-ear), and Camassia quamash that may be used as a nectar source for adult checkerspots. Each plot was also photodocumented with a 1 m² steel square for scale. A small number of plots could not be relocated in the field which reduced comparability of some plots; similarly photos also were mislabeled or missed for a small number of plots.

All vegetation data was linked to the spatial coordinate data from a handheld GPS and
entered into Arcview 3.2 for mapping. Plot photos were not linked and are available as named images in a separate folder.

Product: Appendix 3 provides maps depicting a selected group of vegetation parameters, as well as all data collected. Data is provided as shapefiles and database files, as well as in Excel format. Photos are provided as jpeg images. Examples of plot photos are provided in Appendix 3.

4. Host Plant Mapping. We used polygon mapping methods to provide supplemental information on the distribution and abundance of larval host plants and adult nectar plants. Initial observations indicated that host and nectar plants for Taylor’s Checkerspot are often patchily distributed which makes plot-based assessment methods less effective in measuring distribution and abundance. Mapping was carried out by walking linear transects perpendicular to the coastline 25 m apart on 4–5 June, 2007 by Patrick Lilley. Contiguous patches of target species detected visually were mapped onto colour airphotos. Where appropriate, average abundance within a patch was estimated using a four-category scale ranging from sparse (<2 plants/m²) to very abundant (>30 plants/m²). Field mapping was transferred to Arcview 3.2 for mapping.

Two groups of plants were targeted in the surveys: (1) potential plants providing food sources for pre- or post-diapause checkerspot larvae and (2) potential flowering plants that could provide nectar sources for adults. Some species are both. Species selected for mapping were based on previous observed or known relationships with Taylor’s Checkerspot at this site prior to extirpation in 1995, documented relationships elsewhere within its range, or known biochemical preferences of this species.

Potential larval host plants:
1. *Plantago lanceolata* (ribwort plantain)
2. *Castilleja miniata* (scarlet paintbrush)
3. *Mimulus guttatus* (yellow monkey-flower)
4. *Lonicera hispidula* (hairy honeysuckle)
5. *Plectritis congesta* (sea blush)
6. *Collinsia parviflora* (small-flowered blue-eyed Mary)

Potential adult nectar sources:
1. *Lomatium utriculatum* (spring-gold)
2. *Eriophyllum lanatum* (woolly sunflower)
3. *Rubus ursinus* (trailing blackberry)

Note, that some plants such as sea blush and small-flowered blue-eyed Mary may be both larval host plants and adult nectar sources.

Several plant species not specifically targeted in the surveys were also noted for botanical interest: *Allium amplectens* (slimleaf onion), *Dodacatheon pulchellum* (pretty shooting star), *Fritillaria affinis var. affinis* (chocolate lily), and *Opuntia fragilis* (brittle prickly-pear cactus).

Product: Appendix 4 provides a summary of polygon based mapping for a selected group of species; species that were rare in the park are not included in the data output. All polygon mapping is also provided as shapefiles.
References


Summary of Data Products

Datasets include:


Appendix 2. Distribution of Garry oak and isolated Douglas-fir trees: maps and spatial data.

Appendix 3. Vegetation plot data and photos: selected maps, parameter lists, example photos, and complete spatial data.

Appendix 4. Polygon data for larval host plants and adult nectar plants: selected maps and complete spatial data.

Appendix 5. Site photos (non-plot photos of general vegetation) and old Taylor’s checkerspot photos from May 1994.
Appendix 1.

Historic Air Photo Series
Appendix 1. 1931 air photo
Appendix 1. 1944 air photo
Appendix 1. 1952 air photo
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Appendix 1. 1981 air photo
Appendix 1. 1988 air photo
Appendix 1. 1996 air photo
Appendix 1. 2002 air photo
Appendix 2.

Garry Oak and Douglas-fir Trees
Appendix 3.

Vegetation Monitoring Plots
Appendix 1a. Study area

- Plots sampled April-July 2007
- Uns ampwed forest plots

Appendix 3a. Vegetation monitoring plots

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Appendix 3b. Graminoid cover in vegetation monitoring plots
Appendix 3c. Broad-leaved forb cover in vegetation plots

Legend
- Low forb cover (<5%)
- High forb cover (>30%)

Helliwell Provincial Park

Helliwell Provincial Park - Taylor's Checkerspot Vegetation Assessment (2007)
Appendix 1a. Study area

Appendix 3d. Bryophyte cover in vegetation plots

Legend
- Low bryophyte cover (<10%)
- High bryophyte cover (>80%)

Helliwell Provincial Park - Taylor's Checkerspot Vegetation Assessment (2007)
Appendix 3e. *Plantago lanceolata* cover in vegetation plots

Helliwell Provincial Park - Taylor's Checkerspot Vegetation Assessment (2007)
Appendix 3f. *Lomatium utriculatum* flowers in vegetation plots
Appendix 3g. *Hypochaeris* flowers in vegetation plots

Legend
- Low *Hypochaeris* flowers (1)
- High *Hypochaeris* flowers (3-8)

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Appendix 3h. *Camassia* flowers in vegetation plots
Appendix 4.

Host and Nectar Plant Polygons
Appendix 1a. Study area

Helliwell Provincial Park - Taylor's Checkerspot Vegetation Assessment (2007)

Legend
- Sparse (<2 plants /m²)
- Low (2-10 plants /m²)
- Medium (11-30 plants /m²)
- High (>30 plants /m²)

Appendix 4a. *Plantago lanceolata* polygons
Appendix 1a. Study area

Appendix 4b. *Lomatium utriculatum* polygons

Legend
- Low (1-10 plants /m²)
- Medium (>10 plants /m²)

Helliwell Provincial Park - Taylor's Checkerspot Vegetation Assessment (2007)
Appendix 1a. Study area

Appendix 4c. *Castilleja miniata* patches (sparse)

Legend

- *Castilleja miniata* patches