

**Taylor's Checkerspot**  
**(*Euphydryas editha taylori*)**  
**on the**  
**Denman Island**  
**Settlement Lands**



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## 1. INTRODUCTION

Taylor's Checkerspot (*Euphydryas editha taylori*) is on the British Columbia provincial red-list, and is listed as **Endangered** under the federal *Species at Risk Act*. The species was thought to be extirpated from Canada, but was re-discovered in 2005 at one site on Denman Island by biologist Jenny Balke. Denman Island is currently the only known location for the species in Canada. Denman Island is located off the east coast of Vancouver Island, British Columbia (Figure 1).

Taylor's Checkerspot habitat in coastal British Columbia, Washington and Oregon is, from historical and modern records, typically open grassland with sparse vegetation and sufficient larval food plants. The larval foodplants are usually plantain species, with the most commonly used plantain being ribwort (*Plantago lanceolatum*) an introduced European species. Plants in the figwort family (Scrophulariaceae) are also Taylor's Checkerspot larval foodplants, and are critical foodplants for some populations of other coastal subspecies of *Euphydryas editha* in California. The common factor between plantain species and figworts is the presence of iridoid glycosides in the leaves; these chemicals are incorporated into the bodies of the caterpillars and adults, making them unpalatable to many potential predators such as birds.

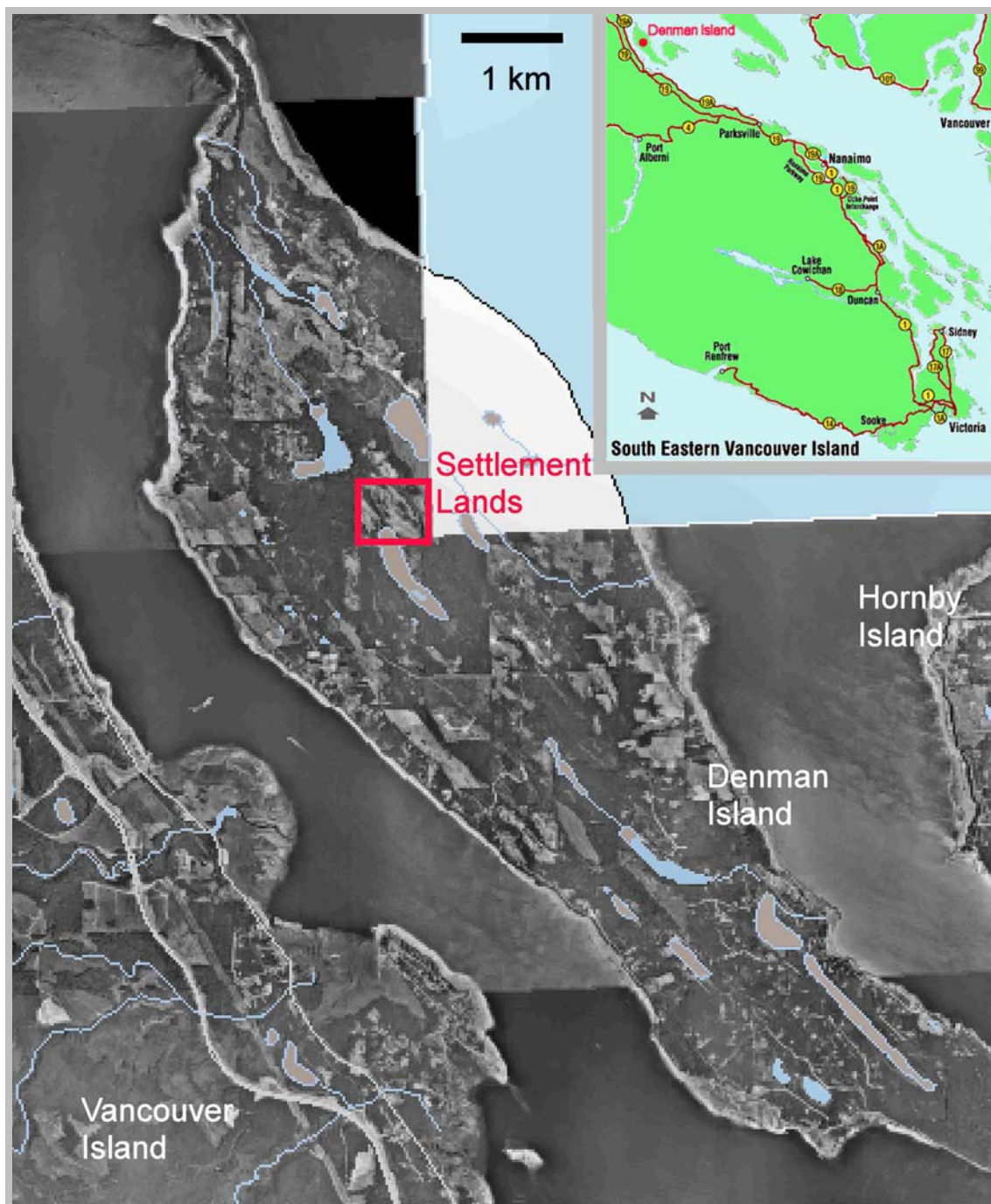
The Denman Conservancy Association Settlement Lands (= "Settlement Lands") on Denman Island (Figure 1) were logged through high grading in the 1930s, and then clear-cut via two passes completed in 2001. The lands form part of a block of protected lands serving as the headwaters of Beadnell Creek. A large wetland (Pickles Marsh) extends onto the property from the south and is bounded to the west, south and southeast by crown or protected lands including the Inner Island Nature Reserve, owned by Islands Trust Fund and managed by the Denman Conservancy Association. The area of the Settlement Lands is 160 ha.

The Denman Island Taylor's Checkerspot population, at the start of this project, was only known to occur on the Settlement Lands (Figure 1) in a young regenerating clear-cut, with apparently very few plantain plants or plants in the figwort family being present. A few instances of post-diapause larvae feeding on plantain had been observed by local biologists Jenny Balke, Andrew Fyson and J Thornton, but the abundance of plantain was clearly too low to support a population of the butterfly. The habitat was therefore very unusual for the species, and the predominant larval foodplants were unknown.

The primary objective of this project was to obtain critical information on Taylor's Checkerspot foodplant preferences, behaviour/biology, and population abundance within the area of the Denman Conservancy Association Settlement Lands.

## Figure 1. Denman Island Location

Base mosaic orthophoto from BC Government, accessed through the Fisheries and Oceans Canada GIS website.  
Inset Map from Government of British Columbia <http://www.th.gov.bc.ca/popular-topics/maps/2105-03-2.jpg>.



## 2. METHODS

### 2.1. Field Methods

A digital air photo and UTM coordinates of the corners of the property, provided by J Thornton of the Denman Conservancy Association, were used for initial project planning. The air photo was used to stratify the study area into “high”, “moderate”, “low”, and “nil” suitability habitat for Taylor’s Checkerspot through interpretation of vegetation types and the available information on Taylor’s Checkerspots. The field search effort was then based on the habitat suitability. The stratification was modified during the project, with the final results shown in the “Results and Discussion” section.

Field work was completed May 21-24, 2007 for adult butterfly and nectar source surveys, and July 5-8, 2007 for pre-diapause larvae and foodplant surveys. Surveys for flying adult butterflies were conducted between the hours of 09:00 – 16:00; the time period was extended later (to 17:00) on days that were sufficiently warm and sunny. Surveys for larvae were conducted under the same conditions as for the adult butterflies

#### 2.1.1. **Adult Butterflies and Adult Nectar Sources**

Modified “Pollard walk” transects were used to record adult locations throughout the project area, with exact UTM coordinates (NAD 83) recorded for sightings of all adult butterflies seen, not just Taylor’s Checkerspots. A Garmin GPS 76 was used. The accuracy was variable, but was usually less than 6 metres. The Pollard walk transects consisted of identifying and counting all butterflies seen within 3 m on each side of a transect route (i.e., a 6 m total transect width). Transects were generally oriented north-south, for easy navigation by GPS, but were frequently deviated from in response to topographic, vegetative, and weather conditions. Also, some female Taylor’s Checkerspots were opportunistically followed in an attempt to document oviposition. The overall result was a fairly random scatter of data points, rather than strict transect lines. Potential nectar sources were recorded when encountered. Specific numbers and densities of nectar sources were not recorded; it became apparent almost immediately that the time available would not permit this.

The precise UTM coordinates of known or possible adult butterfly nectar sources (flowers) were also recorded. Potential adult nectar sources were any plant in flower at that time, except for Scotch broom (*Cytisus scoparius*). Scotch broom is seldom used as a nectar source by any butterfly (personal experience), and the one observed attempt at nectaring on it by a Taylor’s Checkerspot (Figure 10) was brief and apparently unsuccessful. Salal (*Gaultheria shallon*) was in flower and was abundant throughout the Settlement Lands; however no attempt at nectaring on it by a Taylor’s Checkerspot was observed. It is therefore likely that it is not an important nectar source for that species, although I have in the past noted small butterflies such as Western Elfins (*Incisalia iroides*) nectaring on it.

#### 2.1.2. **Larvae and Larval Foodplants**

Plantain (*Plantago* spp.) and some thyme-leaved speedwell (*Veronica serpyllifolia*) potential larval foodplant occurrences were recorded as part of the adult butterfly surveys (above). Vernal pool/wetland areas, characterized by the presence of tall sedges and rushes, were specifically searched for and examined for larval foodplants, larval webs, and larvae. The remaining “dry” areas were searched by repeating the coverage of the areas searched for adults, to determine if

any larvae could be found outside vernal pools/wetlands. Specific numbers and densities of larval foodplants were not recorded beyond qualitative statements; it became apparent almost immediately that the time available would not permit this.

The precise UTM (NAD 83) coordinates of all Taylor's Checkerspot larvae seen were recorded using a Garmin GPS 76. The coordinates of all individual plants or groups of plantain, American brooklime (*Veronica beccabunga* var. *americana*), and thyme-leaved speedwell were recorded. The exceptions to this were the plantain in the old orchard is continuous throughout the grass area, and hence only representative coordinates were recorded. Similarly, American brooklime is continuous throughout the larger wetland areas, and hence only representative coordinates were recorded.

### **2.1.3. Photographs**

Large numbers of photographs (348) were taken of adult checkerspots, larval checkerspots, plants, and habitat using a Nikon D50 digital camera. A subsample of those photographs is provided in this report; the remainder have been burned onto an accompanying compact disc.

## **2.2. Database and Mapping**

All the field data was entered into a database, resulting in 564 georeferenced project notes, available as an Excel spreadsheet. The database was edited and used to produce an ArcView 9.2 shape file for mapping. The maps were produced using ArcView 9.2.



### 3. RESULTS AND DISCUSSION

#### 3.1. Habitat Stratification

The Settlement Lands were stratified into polygons of similar vegetation types. These polygons and vegetation types are listed in Table 1, together with assessments of the suitability of each polygon as Taylor's Checkerspot habitat. In most cases the capability is similar to the present suitability; notes regarding this are given under "Comments" in Table 1. Figure 18 shows the polygons.

**Table 1. Habitat Suitability for Taylor's Checkerspot Larvae and Adults**

POLYGON #	VEGETATION TYPE	CHECKERSPOT SUITABILITY		CHECKERSPOT USE	COMMENTS
		LARVAE	ADULTS		
1	Forested	Nil	Nil		
2	Forested	Nil	Nil		
3	Forested	Nil	Nil		
4	Grass, sedges, shrubs	Nil	Low	Nectaring	
5	Forested	Nil	Nil		
6	Sedge wetland – overgrazed	Low	Low	Larval growth	Capability moderate if cattle excluded; better in dry years
7	Sedge wetland	Moderate	Low	Larval growth	More suitable in dry years
8	Old orchard, fir ingress	Low	Low	Post-diapause foodplants?	Needs further research to confirm use
9	Hardhack swamp	Low	Nil	Larval growth	Mowing edges of hardhack might produce reproductive habitat
10	Crabapple/hardhack swamp	Nil	Low	Nectaring	
11	Shrubby north slope	Nil	Low	Nectaring	
12	Moderately open clearcut	Nil	Moderate	Basking, nectaring, mating	Potential to convert to dry meadow through mowing
13	Sedge wetland	Moderate	Nil	Larval growth	More suitable in dry years
14	Sedge wetland	High	Nil	Larval growth	
15	Moderately open clearcut	Nil	Moderate	Basking, nectaring, mating	Potential to convert to dry meadow through mowing
16	Moderately open clearcut	High	Moderate	Larval growth; basking, nectaring, mating	Convert to low shrub meadow through mowing
17	Forested	Nil	Nil		
18	Forested	Nil	Nil		
19	Shrub north slope	Nil	Low	Nectaring	
20	Forested	Nil			
21	Forested	Nil			
22	Shady clearcut	Nil	Nil		
23	Moderately open clearcut	Nil	Moderate	Basking, nectaring, mating	Does not appear to be used – too far from reproductive areas?
24	Shrubs and trees	Nil	Nil		
25	Drained wetland – overgrazed	Moderate	Moderate	Larval growth; basking, nectaring, mating	Capability high for larvae and adults if cattle excluded
26	Shrub and trees in gully	Nil	Nil		

### 3.2. Taylor's Checkerspot Nectar Sources

Taylor's Checkerspot was recorded nectaring on two plant species (trailing blackberry and woodland strawberry), plus a failed brief attempt to nectar on Scotch broom, on the Settlement Lands. In addition, on private land nectaring was observed on creeping buttercup (*Ranunculus repens*) and there was one prolonged occurrence of feeding on mud (Table 2; Fig. 2 – 10). Since Scouler's popcornflower (*Plagiobothrys scouleri*) does not occur on the Settlement Lands, trailing blackberry (*Rubus ursinus*), woodland strawberry (*Fragaria vesca*), and buttercup (*Ranunculus* spp.) are the primary adult nectar sources. They are common and widely distributed across the Settlement Lands (Figure 19). Mud is of course a non-nectar food source.

The common and scientific names of the plants mentioned in this report are listed in Table 3.

**Table 2. Taylor's Checkerspot Nectaring Records**

Nectar Source	Record# (separate Excel spreadsheet)
trailing blackberry	123, 330, 356, 414
woodland strawberry	120, 178, 183, 193, 196, 228
Scouler's popcornflower	420
creeping buttercup	419
Scotch broom (failed)	110
mud	416

**Figure 2. Trailing blackberry**



**Figure 3. Woodland strawberry**



**Figure 4. Scouler's popcornflower**





**Figure 5. Taylor's Checkerspot nectaring on Scouler's popcornflower**



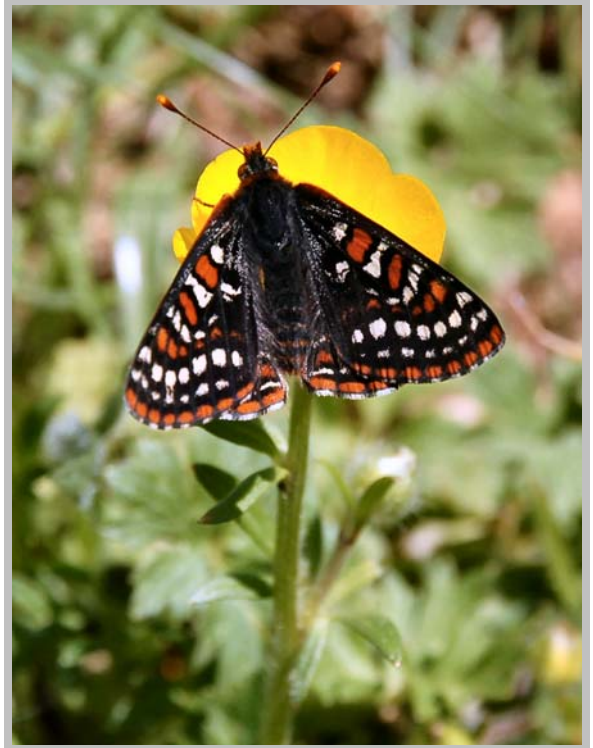
**Figure 6. Taylor's Checkerspot nectaring on woodland strawberry**



**Figure 7. Taylor's Checkerspot nectaring on Trailing Blackberry**



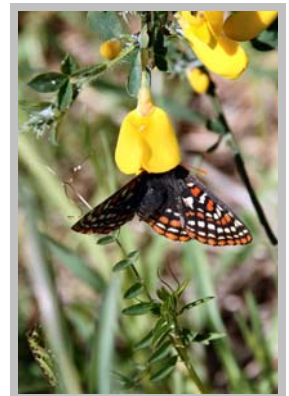
**Figure 8. Taylor's Checkerspot nectaring on buttercup**



**Figure 9. Taylor's Checkerspot feeding on mud**



**Figure 10. Taylor's Checkerspot attempting to nectar on Scotch broom**



**Table 3. Plant Species Mentioned in Text and Database**

<b>Common Name</b>	<b>Latin Name</b>
American brooklime	<i>Veronica beccabunga var. americana</i>
American vetch	<i>Vicia americana</i>
bicolored flaxflower	<i>Linanthus bicolor</i>
black medic	<i>Medicago lupulina</i>
black raspberry	<i>Rubus leucodermis</i>
bog St. John's-wort	<i>Hypericum anagalloides</i>
bracken fern	<i>Pteridium aquilinum</i>
broad-leaved starflower	<i>Trientalis latifolia</i>
buttercup	<i>Ranunculus spp.</i>
Canada thistle	<i>Cirsium arvense</i>
chickweed	<i>Stellaria media</i>
common foxglove	<i>Digitalis purpurea</i>
common plantain	<i>Plantago major</i>
common rush	<i>Juncus effusus</i>
crab apple	<i>Malus fusca</i>
creeping buttercup	<i>Ranunculus repens</i>
cultivated apple	<i>Malus sp.</i>
cultivated rose	<i>Rosa sp.</i>
domestic cherry	<i>Prunus sp.</i>
English daisy	<i>Bellis perennis</i>
hairy cat's-ear	<i>Hypochaeris radicata</i>
Himalayan blackberry.	<i>Rubus discolor</i>
large-leaved avens	<i>Geum macrophyllum</i>
marsh skullcap	<i>Scutellaria galericulata</i>
musk-flower	<i>Mimulus moschatus</i>
Nootka rose	<i>Rosa nutkana</i>
oxeye daisy	<i>Leucanthemum vulgare</i>
red columbine	<i>Aquilegia formosa</i>
red raspberry	<i>Rubus idaeus</i>
ribwort	<i>Plantago lanceolatum</i>
salal	<i>Gaultheria shallon</i>
salmonberry	<i>Rubus spectabilis</i>
Scotch broom	<i>Cytisus scoparius</i>
Scouler's popcornflower	<i>Plagiobothrys scouleri</i>
sedge	<i>Carex sp.</i>
self-heal	<i>Prunella vulgaris</i>
small-flowered forget-me-not	<i>Myosotis laxa</i>
small-flowered nemophila	<i>Nemophila parviflora</i>
thyme-leaved speedwell	<i>Veronica serpyllifolia</i>
trailing blackberry	<i>Rubus ursinus</i>
twinflower	<i>Linnaea borealis</i>
vanilla-leaf	<i>Achlys triphylla</i>
western trumpet honeysuckle	<i>Lonicera ciliosa</i>
woodland strawberry	<i>Fragaria vesca</i>
yerba buena	<i>Satureja douglasii</i>

### 3.3. Taylor's Checkerspot Adults

A total of 88 adult Taylor's Checkerspot sightings were made over a four day period on the Settlement Lands (71 records, with 1 to 4 seen at one time). If it is assumed that the number represents half the adults in flight at that time, and that half of the total adult population was in flight during that part of the flight season, then the total population size for the Settlement Lands in 2007 was about 350 adults. The accuracy of these assumptions is unknown.

Adult Taylor's Checkerspot butterflies were found in two parts of the Settlement Lands – a small population in a limited area of the northeast corner (**the “orchard” population**), and a larger, more widespread population in the northwest quarter (**the “Central Road” population**) (Figure 18). It is notable that no checkerspots were seen in Polygon 23 despite it being apparently suitable for use by adults of the Central Road population; this may indicate that it is too far from the reproductive habitat of Polygons 13, 14, and 16.

### 3.4. Taylor's Checkerspot Larval Foodplants

I considered five plants present on the Settlement Lands to be possible pre-diapause larval foodplants. These are *Plantago* species (*P. lanceolatum*; *P. major*), which have been recorded as post-diapause larval foodplants (Jenny Balke, pers. comm.), and three species (*Veronica serpyllifolia*; *V. beccabunga* var. *americana*; *Mimulus moschatus*) in the figwort family, Scrophulariaceae. American brooklime (*V. beccabunga* var. *americana*) was not even noticed in the field until the first larval web was found; it was only after this that the plant was identified and recognized as a potential larval foodplant that is common and widespread in wet habitats. The potential and actual larval foodplants and the reproductive habitat are shown in Figures 11 to 17, and mapped in Figures 18 and 20.

#### Veronica species

Larvae (Instars I to III) were found on two plant species – American brooklime was used at 14 sites, thyme-leaved speedwell at 6 sites, and both *Veronica* species at 1 site (Table 4). The larval webs are much better developed on American brooklime than on thyme-leaved speedwell, apparently because of the more open (rather than compact) structure of the leaves of the American brooklime.

The use of thyme-leaved speedwell as a larval foodplant was first detected by Nick Page in a concurrent inventory project on Denman Island; the use of American brooklime was discovered by Jenny Balke and me during a visit to the private land site which has a high density of adult Taylor's Checkerspots. The purpose of the private land visit was specifically to determine a larval foodplant, to provide a higher probability of detecting larvae for the relatively low density population of the Settlement Lands.

Once I knew which plants to look for, it rapidly became apparent that the reproductive habitat is vernal pools and vernal sedge/rush wetlands. Despite this, all the area that was searched in May for adults was again searched in July for larvae, to ensure the correctness of the conclusion of the habitat being vernal pools/wetlands.

**Table 4. Taylor's Checkerspot Pre-Diapause Larval Foodplants**

Larval foodplant	Record #
American brooklime	423, 451, 452, 456, 466, 521, 522, 523, 525, 528, 533, 549, 453, 560
Thyme-leaved speedwell	504, 505, 506, 507, 564; 548
American brooklime and thyme-leaved speedwell	563

The young larvae are highly sensitive, and drop to the ground at the slightest disturbance. Therefore the number of larvae present at each site was not counted, because of the risk of injury or displacement of the larvae. Crude estimates of numbers suggested that 30-60 larvae form each Instar I web (each web being formed by the larvae from one cluster of eggs), with several of the sites apparently having had more than one cluster of eggs. If it is simplistically assumed that each site had about 50 larvae, then the 21 larval sites totalled over 1,000 larvae.

Common foxglove is present on the Settlement Lands, and is also in the Scrophulariaceae, but I do not consider it to be a likely pre-diapause larval foodplant because of its thick, hairy leaves. Despite this, about half of all foxglove plants on the Settlement Lands were examined for larvae (with none found), under the precautionary principle. Foxglove should be monitored for post-diapause larval use, when larvae may be large enough to overcome the leaves' physical barriers.

### **Plantago species**

There is very little plantain on the Settlement Lands, with the exception of a high density area in the grass of the old orchard (Figure 20). The dense grass in the old orchard made detection of larvae using plantain very problematic; hence another private land site was visited to ascertain the use of plantain.

The private land, on which adult checkerspots occurred in May, consists of a recent clearcut with a network of dirt/gravel roads (data records 478 to 517). The main road, which leads to the residence, has a very high density of *Plantago* (*P. lanceolatum* and *P. major*) along the sides and in the centre. Plantain is also present in adjacent wider areas where the ground had been scraped with a bulldozer during logging, and lesser amounts occur along the other roads. Very little plantain occurs elsewhere in the clearcut.

I meticulously searched 625 metres of the main road and 565 metres of the other roads (total 1.2 km), with the average width of the area with plantain estimated as 2.5 metres, for a total area of about 3,000 m<sup>2</sup>. I examined all plantain plants (almost all of which were readily visible) at an average walking speed of 2 m/sec, without finding any larval webs or larvae, or any feeding damage even potentially attributable to checkerspot larvae.

I also searched a wet area within the private land clearcut, consisting of a complex of vernal pools and sedge/rush wetlands. I easily found four sites with larval webs and numerous larvae, all feeding on thyme-leaved speedwell. Most significantly I detected one site by spotting frass scattered on the broad leaves of a common plantain plant. The plantain was growing in the middle of a patch of thyme-leaved speedwell – the speedwell was being devoured, and the larvae were walking back and forth across the plantain, but the plantain was not even nibbled (the leaf damage that was present had brown edges, indicating that the damage had occurred weeks before).

The conclusions from the private land site are:

- (1) thyme-leaved speedwell is used as a foodplant by pre-diapause larvae;
- (2) plantain is not used as a foodplant by pre-diapause larvae; and
- (3) there is no indication that oviposition occurs on plantain.

These observations explain the existence of the Settlement Lands population of Taylor's Checkerspot despite only a nominal amount of plantain being present – plantain is not used as a foodplant by pre-diapause larvae. It is also reasonable to hypothesize that plantain is seldom used by post-diapause larvae; perhaps only in the absence of *Veronica* species. *Veronica* species are the only pre-diapause larval foodplant, and perhaps the primary post-diapause larval foodplant, used on the Settlement Lands.



**Figure 11. American brooklime**



**Figure 12. Thyme-leaved speedwell**



**Figure 13. Ribwort**



**Figure 14. Common Plantain**



**Figure 15. Reproductive habitat, with yellow ribbons hung above three larval sites**  
(Polygon 16, more northern cluster of sites). American brooklime used as foodplant.





**Figure 16. Reproductive habitat, with yellow ribbons hung above larval sites  
(most of Polygon 14 is visible)**

Yellow lines are above two nearly hidden ribbons. American brooklime used as foodplant.



**Figure 17. Reproductive habitat, with yellow ribbons hung above larval site  
Private land. Thyme-leaved speedwell used as foodplant (below yellow ribbon).**





Figure 18. Distribution of Taylor's Checkerspots on the Settlement Lands

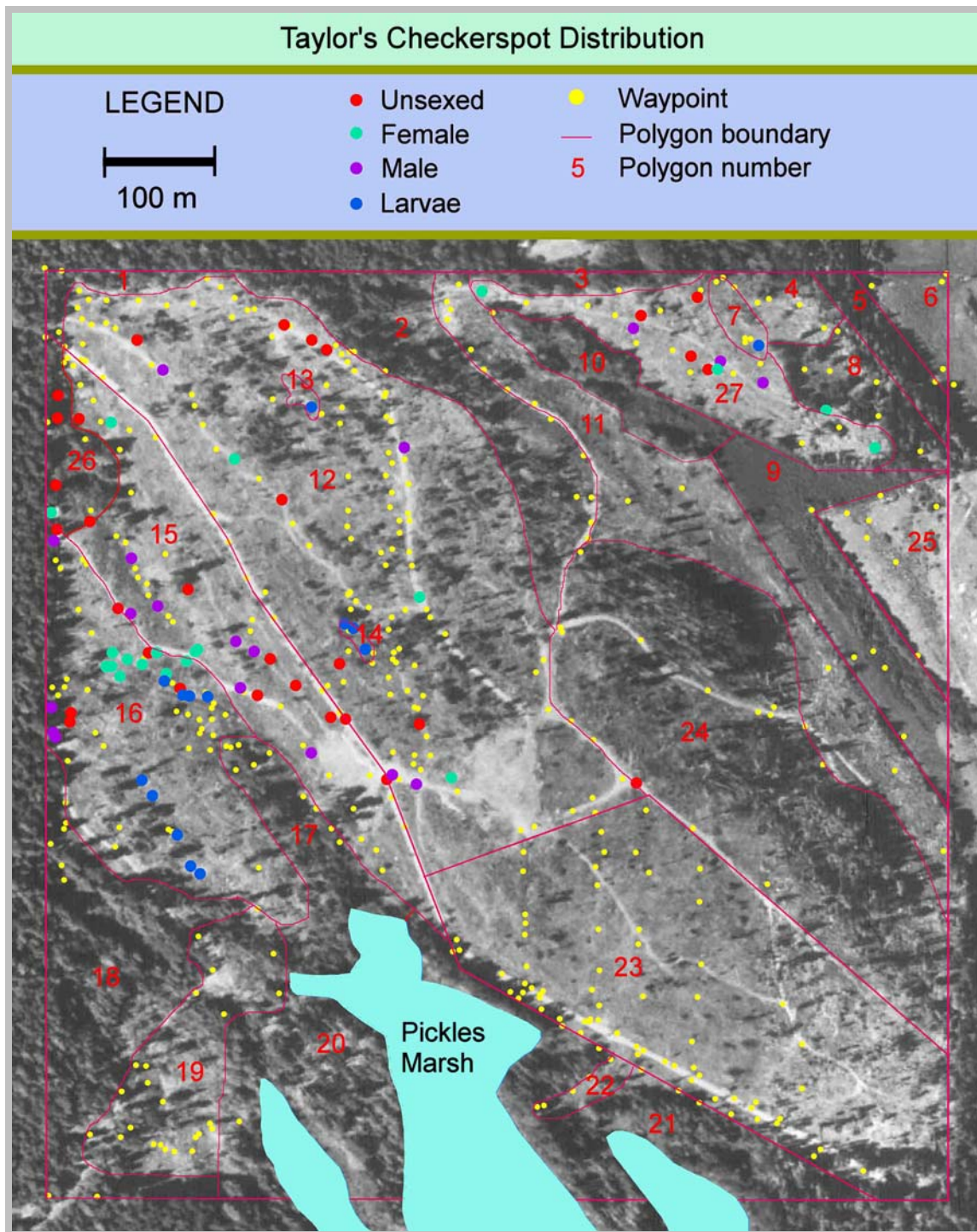


Figure 19. Distribution of Nectar Sources for Taylor's Checkerspots

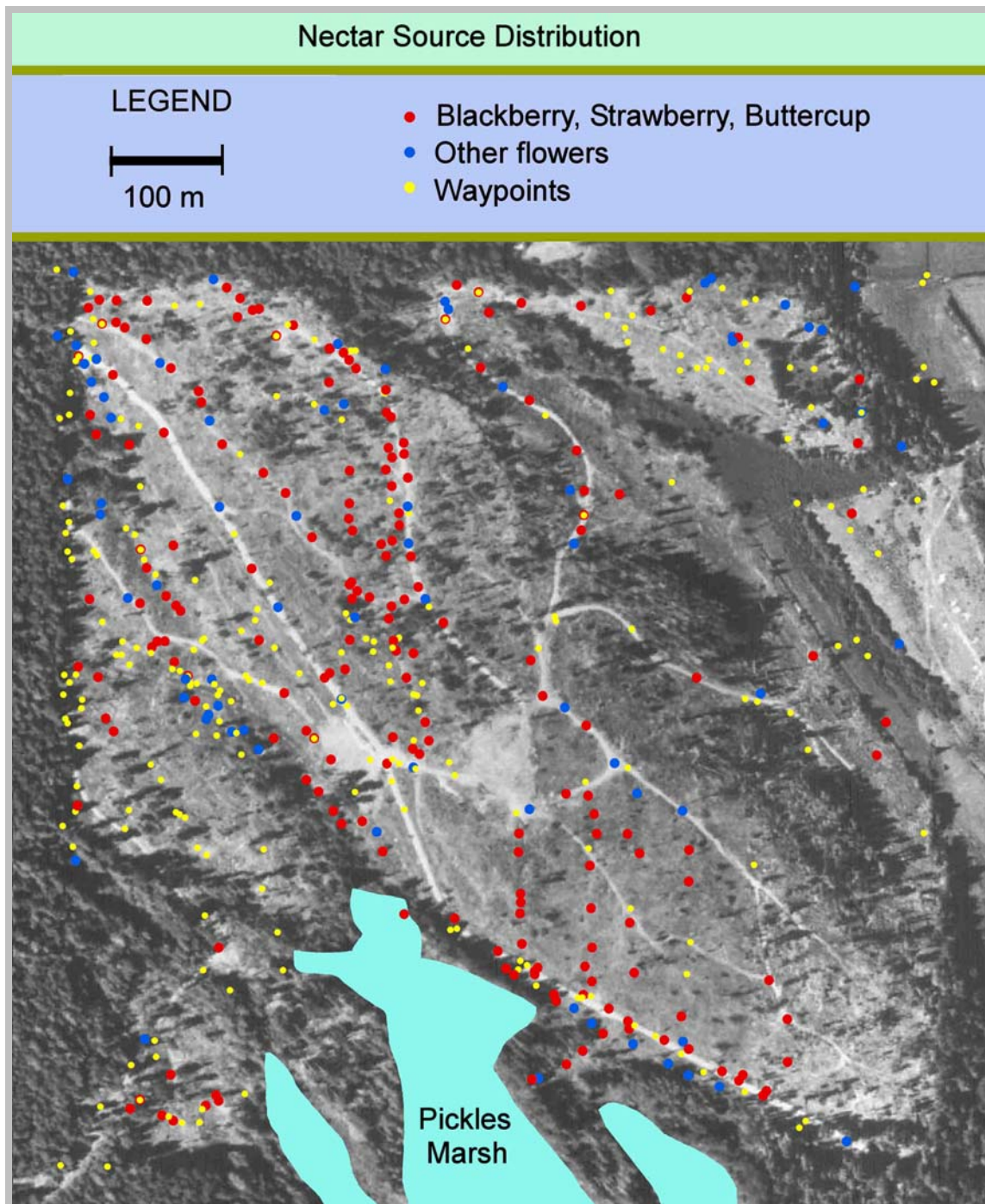
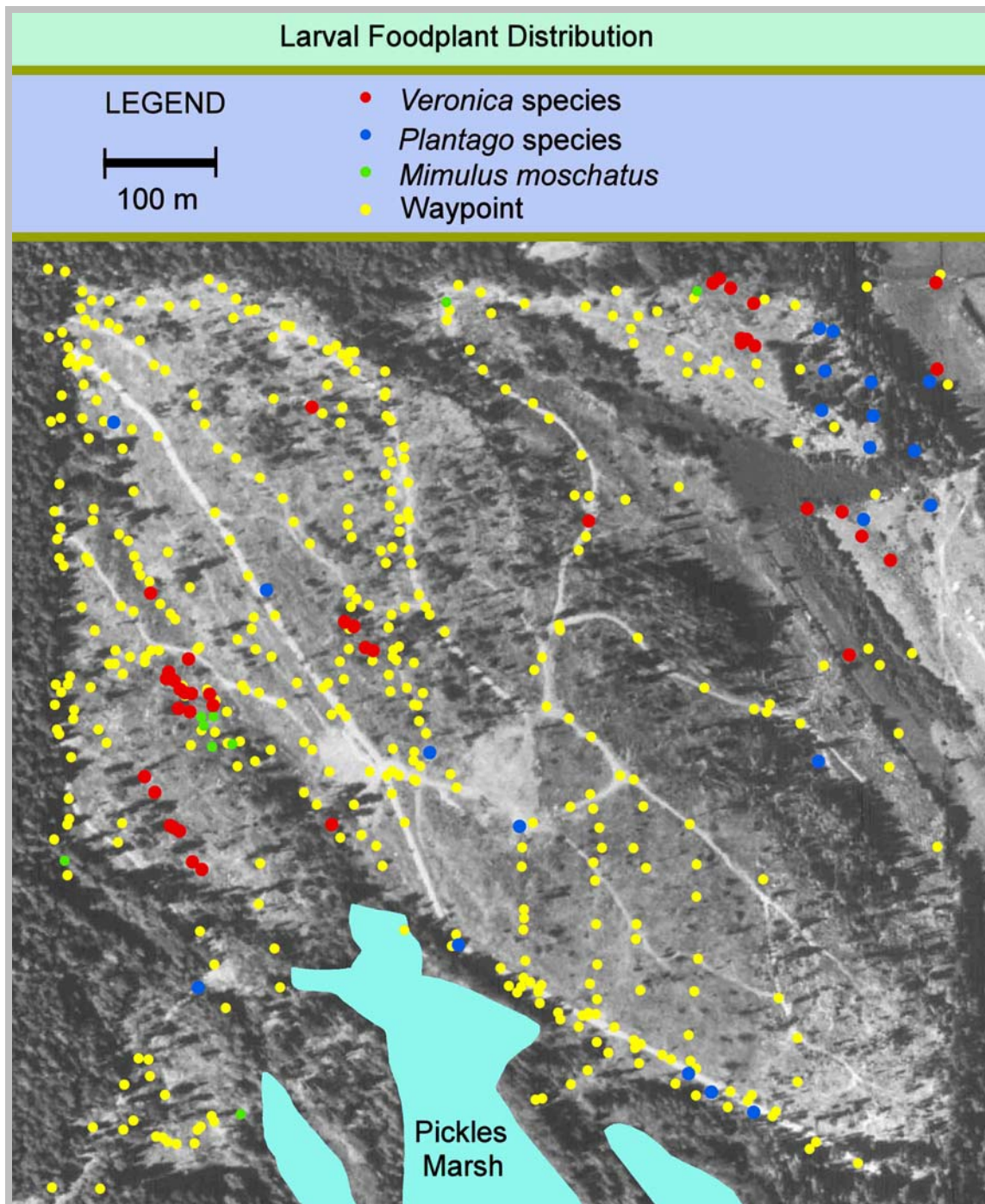




Figure 20. Distribution of Larval Foodplants for Taylor's Checkerspots



### 3.5. Taylor's Checkerspot Pre-Diapause Larvae

The larval Taylor's Checkerspots spanned Instars I to III (Instars 1 to 3, as Roman numerals), with about equal numbers of webs being associated with each of the three instars (Figures 21 to 31). No egg masses were found. Relatively few Instar III larvae were found, apparently because they dispersed widely and many may have entered hibernation under debris.

The Instar III larvae will hibernate through until next March, at which time they will become active again, feed and develop through Instars IV and V, pupate, and produce the next generation of adults in May.

**Figure 21. Web of Instar I on thyme-leaved speedwell**



**Figure 22. Web of Instar II on American brooklime**



**Figure 23. Instar I larvae on thyme-leaved speedwell**



**Figure 24. Instar I group molting to Instar II on American brooklime**

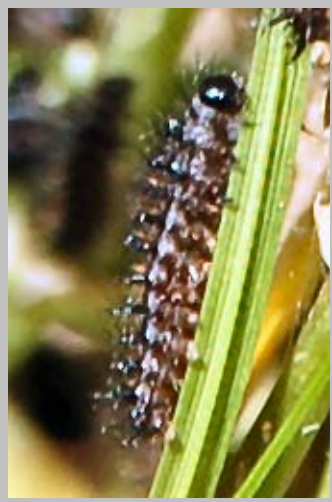




**Figure 25. Instar II dorso-lateral view**



**Figure 26. Instar II lateral view**



**Figure 27. Instar II lateral view**



**Figure 28. Instar II on woody debris**



**Figure 29. Instar II (above) and Instar III (below)**



**Figure 30. Instar III on American brooklime**



**Figure 31. Instar III on woody debris**



### 3.6. Other Butterfly Species

A total of 17 species of butterflies were observed on the Settlement Lands, including Taylor's Checkerspot (Table 5; data in the Excel spreadsheet). One other butterfly, the Purplish Copper (*Lycaena helloides*), was seen elsewhere on private land (data in the Excel spreadsheet). Only Taylor's Checkerspot and the Dun Skipper (*Euphyes vestris*) are of conservation concern.

The Dun Skipper (*Euphyes vestris*) occurred at two sites on the Settlement Lands. It is provincially red-listed and the 'Western Population' is nationally *Threatened* under the *Species at Risk Act* (SARA). I was not successful in photographing the Dun Skipper at either of the Settlement Lands sites, but had clear views of both specimens and am confident I correctly identified them. I photographed another Dun Skipper on private property elsewhere on Denman Island (Figure32, data in the Excel Spreadsheet).

The Dun Skipper on the Settlement Lands and the private land site may be using the same or similar habitat for breeding as Taylor's Checkerspot – moist, open sedge/rush vernal pools/wetlands. This needs to be confirmed through a focussed habitat and ecology study, similar to that in this report for Taylor's Checkerspot. It must be noted however that field studies of the Dun Skipper will be comparatively difficult because of their apparent low population density, inconspicuous appearance and small size, and fast flight. If the two species are using the same habitats on Denman Island, then a co-management plan focussed on management of vernal pools and wetlands may be appropriate for the two species.

**Figure 32. Dun Skipper**



**Table 5. Butterfly Species Observed on the Settlement Lands**

Common Name	Latin Name	Comments
Anise Swallowtail	<i>Papilio zelicaon</i>	Likely breeds in Pickles Marsh
Arctic Skipper	<i>Carterocephalus palaemon</i>	Damp sedge areas
Cedar Hairstreak	<i>Mitoura rosneri</i>	Occurs throughout the area
Dun Skipper	<i>Euphyes vestris</i>	SARA Threatened; red-list
Grey Hairstreak	<i>Strymon melinus</i>	Likely breeds on salal flowers
Hydaspe Fritillary	<i>Speyeria hydaspe</i>	Occurs throughout the area
Lorquin's Admiral	<i>Limenitis lorquini</i>	Shrubby areas
Margined White	<i>Pieris marginalis</i>	Likely breeds along Pickles Marsh.
Mylitta Crescent	<i>Phyciodes mylitta</i>	Common and widespread
Silvery Blue	<i>Glaucopsyche lygdamus</i>	Only one seen
Pale Swallowtail	<i>Papilio eurymedon</i>	Shrubby areas
Roadside Skipper	<i>Amblyscirtes vialis</i>	Most northern record on the coast
Spring Azure	<i>Celastrina echo</i>	Larvae likely feed on ocean spray & hardhack
Two-banded Checkered Skipper	<i>Pyrgus ruralis</i>	Larvae likely feed on strawberry
Taylor's Checkerspot	<i>Euphydryas editha taylori</i>	Larvae feed on Veronica species
Western Elfin	<i>Incisalia iroides</i>	Larvae likely feed on salal flowers
Western Tiger Swallowtail	<i>Papilio rutulus</i>	Shrubby areas

### 3.7. Other Butterfly Nectar Sources

Ten of the 17 species of butterflies observed on the Settlement Lands were recorded nectaring at least once (Table 6; Fig. 5 – 10; 33 – 40).

**Table 6. Butterfly Nectaring Records**

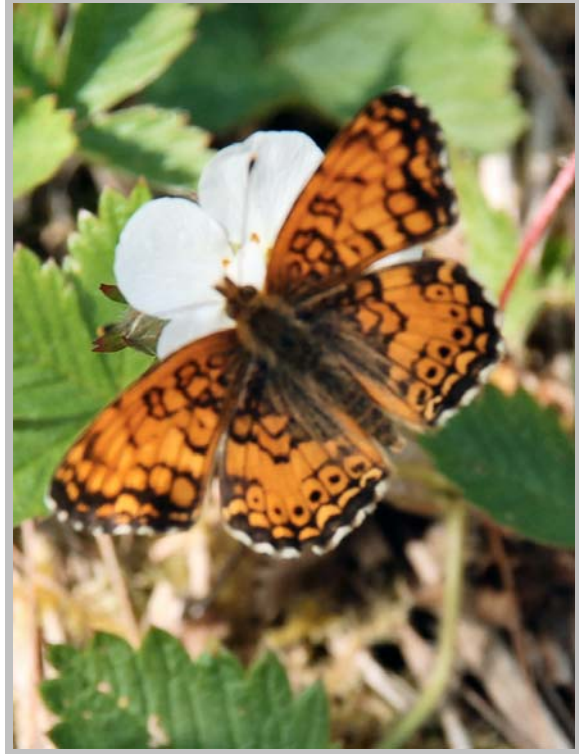
Butterfly Species	Nectar Source	Record#
Anise Swallowtail	trailing blackberry	121
Cedar Hairstreak	trailing blackberry	123
	woodland strawberry	196, 209, 212, 216, 219
Dun Skipper	oxeye daisy	422
	trailing blackberry	464
Grey Hairstreak	small-flowered nemophila	167
	broad-leaved starflower	112
	woodland strawberry	209
Hydaspe Fritillary	buttercup	514
	oxeye daisy	476
Mylitta Crescent	trailing blackberry	28, 270
	woodland strawberry	185, 187, 191, 196, 220, 316
Pale Swallowtail	Canada thistle	469
Taylor's Checkerspot	trailing blackberry	123, 330, 356, 414
	woodland strawberry	120, 178, 183, 193, 196, 228
	Scotch broom (failed)	110
	popcorn flower	420
	creeping buttercup	419
	mud	416
Western Elfin	trailing blackberry	28, 123, 274
	woodland strawberry	212, 216, 217, 221, 249,
Western Tiger Swallowtail	Himalayan blackberry	468



**Figure 33. Grey Hairstreak nectaring on broad-leaved starflower**



**Figure 34. Mylitta Crescent nectaring on woodland strawberry**



**Figure 35. Grey Hairstreak nectaring on small-flowered nemophila**



**Figure 36. Mylitta Crescent nectaring on trailing blackberry**





**Figure 37. Western Elfin nectaring on trailing blackberry**



**Figure 38 Cedar Hairstreak nectaring on trailing blackberry**



**Figure 38. Arctic Skipper nectaring on woodland strawberry**



**Figure 40. Cedar Hairstream nectaring on woodland strawberry**



#### 4. CONCLUSIONS

1. Taylor's Checkerspot reproduces and lives in two general areas on the Settlement Lands, one adjacent to the old orchard in the northeast corner of the property, and one on both sides of Central Road.
2. Taylor's Checkerspot presently has a small but apparently healthy population on the Settlement Lands.
3. Taylor's Checkerspot will be eliminated from the Settlement Lands through forest regrowth (if left unchecked) in the Central Road area through shading of the vernal pools/wetlands; the orchard population will less certainly (because of the relatively large area of wetland) be eliminated. These impacts are already underway, and the population size will steadily decrease to zero over the next (20?) years.
4. The areas in the northeast corner of the Settlement Land that are present over-grazed by cattle from the neighbouring property may become suitable for Taylor's Checkerspot if cattle are fenced out.
5. Taylor's Checkerspot reproduces in vernal pools and vernal wetlands on the Settlement Lands, with the dominant vegetation being sedges (*Carex* sp.) and rushes (*Juncus effuses*). This is a previously undocumented habitat type for this species.
6. Taylor's Checkerspot uses two *Veronica* species (family Scrophulariaceae), American brooklime (*Veronica beccabunga* var. *americana*) and thyme-leaved speedwell (*Veronica serpyllifolia*), as the only pre-diapause larval foodplant on the Settlement Lands. This is a previously undocumented use of *Veronica* as the primary or sole foodplant by Taylor's Checkerspot.
7. Trailing blackberry, woodland strawberry, and (less so) buttercup species are used as nectar sources by Taylor's Checkerspot, and are widely distributed on the Settlement Lands. Nectar supply is not likely to be a limiting factor.
8. The Dun Skipper (*Euphyes vestris*, Western population), which is SARA-listed as nationally **Threatened**, is present on the Settlement Lands and may be using the same reproductive habitats as Taylor's Checkerspot.

## 5. RECOMMENDATIONS

1. Develop a management plan for Taylor's Checkerspot on the Settlement Lands – the area is large enough for at least two stable population centres, one in the orchard area and one in the Central Road area. Management should be on a “progressive improvement” model, and incorporate monitoring of management impacts. Appendix 1 provides some initial suggestions to consider when developing the management plan, and will undoubtedly need further work.
2. Research – Taylor's Checkerspot diapause larvae: Determine the state of the ribboned larval sites through fall and winter, especially with respect to flooding and the condition of the larval foodplants.
3. Research – Taylor's Checkerspot post-diapause larvae: Determine the state of the ribboned larval sites in the spring, especially with respect to flooding and the condition of the larval foodplants. Document the activities of post-diapause larvae.
4. Research – Taylor's Checkerspot oviposition: Determine the nature of oviposition behaviour, and any apparent characteristics of preferred oviposition micro-sites. This should be possible now that the reproductive areas have been determined.
5. Research – Dun Skipper: Conduct a basic research project, similar to the present project, for the Dun Skipper. Field research should be limited to adults, with the option to rear in captivity one or more larvae should oviposition be observed (larvae are probably too difficult to locate in the field). Adult field time will need to be greater than was needed for Taylor's Checkerspot, because Dun Skippers have low density populations and are difficult to visually locate and follow.
6. Inventory – Dun Skipper: Conduct a basic inventory project on Denman Island focussed on the Dun Skipper. Field time will need to be greater than was needed for Taylor's Checkerspot and needs to be very species-focussed, because Dun Skippers have low density populations and are difficult to visually locate.
7. Inventory – Taylor's Checkerspot and its habitat: Conduct an intensive inventory project on the east coast of central Vancouver Island (Nanaimo to Campbell River) for Taylor's Checkerspot and its habitat. The objective should be to (1) determine if the checkerspot occurs in that area; and (2) identify areas of potentially suitable habitat, as potential introduction sites.

The moderate abundance of Taylor's Checkerspot on the Settlement Lands, and Denman Island in general, is apparently a temporary phenomenon resulting from recent large-scale clearcuts. There is a narrow window of opportunity, over the next 5 years or so, to use that abundance for research, development of management strategies, and for re-locating live larvae and/or adults to establish new populations elsewhere. Once the clearcut populations decline as a result of forest regeneration, such activities will become increasingly difficult and perhaps impossible.

## 6. APPENDIX 1. TAYLOR'S CHECKERSPOT MANAGEMENT

The following suggestions could be considered in developing a Taylor's Checkerspot management plan for the Settlement Lands.

### 1. In the orchard area:

- Polygon 7 – manage as vernal pool/wetland reproductive habitat. The shallower water areas around the edges should be enhanced for oviposition and larval use in wet years (I did not consider this during the field work, and hence have no suggestions on how to do the enhancement).
- Polygon 27 – manage primarily as nectar source and general adult living habitat, and secondarily as oviposition habitat. The least expensive long term management may consist of conversion to short shrub/herbaceous meadow, which is mowed “high” every few years. For mowing to be cost effective, the existing stumps should be removed – small depressions can be created at these sites which may function as vernal pool/wetlands (the oviposition habitat component of this polygon). Maintain/enhance plantain as a back-up food supply to the wetland *Veronica*.
- Polygon 9 – manage as nectar source and general adult living habitat. Remove all conifer trees and conifer regeneration; leave deciduous trees. Enhance nectar sources if feasible, and maintain/enhance plantain as a back-up food supply to the wetland *Veronica*.
- Polygon 4 – manage as nectar source and general adult living habitat; some larval habitat may also be possible with relatively intensive management.
- Polygon 5 – leave mostly as is (conifer forest), but clear an open movement corridor (wide enough to be sunny part of the day) to connect Polygon 6 with Polygons 4 and 8.
- Polygons 6 – manage as vernal pool/wetland reproductive habitat. Remove the small trees and shrubs along the west edge to open up the shallower water areas.
- Polygons 25 – manage as vernal pool/wetland reproductive habitat in the wetter areas, and as nectar source and general adult living habitat in the drier areas.
- Polygons 9 and 10 – leave as is (hardhack swamp).

The habitat alteration activities in Polygons 7 and 27 should be done over more than one year, with careful monitoring of the initial impacts before completing the project. Many of the existing scattering of more or less mature trees can be left, for general biodiversity use and to provide shady, moister patches of meadow.

2. In the Central Road area:

- Polygons 13 and 14 – manage as vernal pool/wetland reproductive habitat. The shallower water areas around the edges should be enhanced for oviposition and larval use in wet years (I did not consider this during the field work, and hence have no suggestions on how to do the enhancement).
- Polygons 12 and 15 – manage primarily as nectar source and general adult living habitat, and secondarily as oviposition habitat. The least expensive long term management may consist of conversion to short shrub/herbaceous meadow, which is mowed “high” every few years. For mowing to be cost effective, the existing stumps should be removed – small depressions can be created at these sites which may function as vernal pool/wetlands (the oviposition habitat component of this polygon). Consider seeding in plantain as a back-up food supply to the wetland *Veronica*.
- Polygon 16 – manage primarily as vernal pool/wetland reproductive habitat, and secondarily as nectar source and general adult living habitat. The least expensive long term management may consist of conversion to short shrub/herbaceous meadow around the existing vernal pools/wetlands, which is mowed “high” every few years. For mowing to be cost effective, the existing stumps should be removed – small depressions can be created at these sites which may function as additional vernal pool/wetlands (the oviposition habitat component of this polygon). Consider seeding in plantain as a back-up food supply to the wetland *Veronica*. This polygon will be the most difficult to manage effectively.

The habitat alteration activities in Polygons 12, 15 and 16 should be done over more than one year, with careful monitoring of the initial impacts before completing the project. Many of the existing scattering of more or less mature trees can be left, for general biodiversity use and to provide shady, moister patches of meadow.

The end result of the suggested management will be the creation of two areas of short shrub/herbaceous meadow with patches of vernal pools and vernal wetlands. Presumably meadow and vernal pool/wetland species of conservation concern, in addition to Taylor’s Checkerspot and the Dun Skipper, can be managed for in the same area. The existing forest around Pickles Marsh would be left untouched, with adjacent logged areas left to regenerate (or otherwise managed, depending on the DCA priorities). About 1/3 of the Settlement Lands would be maintained as non-forested, the other 2/3 will be available to regenerate into forest (plus the marsh).