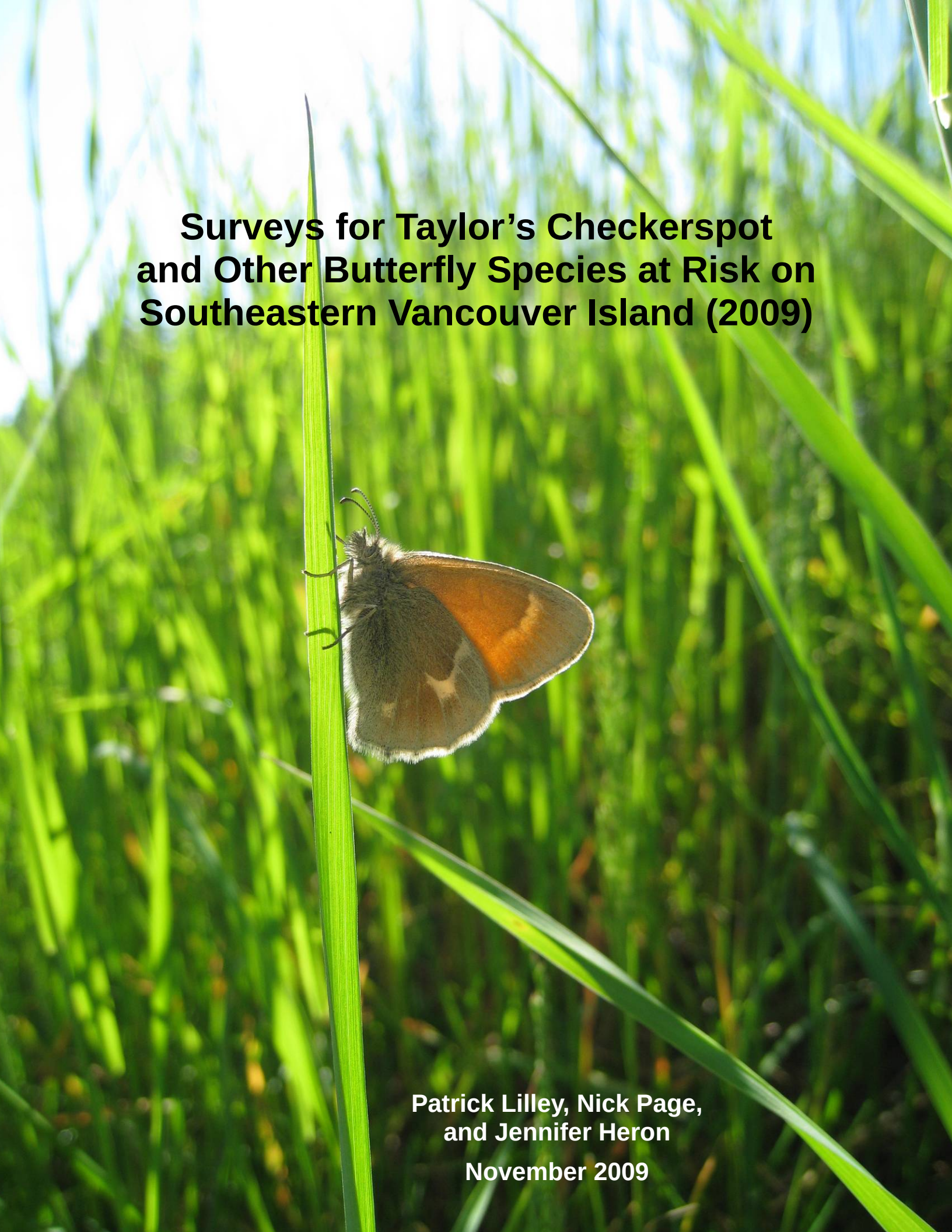
Surveys for Taylor's Checkerspot and Other Butterfly Species at Risk on Southeastern Vancouver Island (2009)



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The City of Victoria Parks Department (Michelle Gorman) provided additional data that was included as part of this report.

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Cover photo of Vancouver Island Ringlet (*Coenonympha tullia insulana*) by Patrick Lilley.

1. SUMMARY

Surveys were undertaken in 2009 to search for the endangered Taylor's Checkerspot (*Euphydryas editha taylori*) and other butterfly species at risk on southeastern Vancouver Island. In addition to Taylor's Checkerspot, four other species were targeted as part of the surveys: Island Marble (*Euchloe ausonides insulanus*), Vancouver Island Ringlet (*Coenonympha tullia insulana*), Island Blue (*Plebejus saepiolus insulanus*), and Bremner's Fritilllary (*Speyeria zerene bremnerii*). All butterfly observations were mapped and recorded.

Wandering transects through open habitats were the primary method for identifying the presence and distribution of butterflies. A total of 374.2 km of wandering transects was undertaken between May 21 and August 26, 2009 encompassing 101.5 hrs of field time.

A total of 1,933 butterfly observations were mapped during the survey encompassing 27 unique taxa. Taylor's Checkerspot was not encountered during the survey. Vancouver Island Ringlet was recorded at six sites, including three new sites in the Cowichan Valley. The most abundant five butterflies were Western Spring Azure (*Celastrina echo*) (551; 28.5% of observations), Mylitta Crescent (*Phyciodes mylitta*) (303; 15.7%), Hydaspe Fritillary (*Speyeria hydaspe*) (133; 6.9%), Vancouver Island Ringlet (*Coenonympha tullia insulana*) (123; 6.4%), and Cabbage White (*Pieris rapae*) (121; 6.3%). Two other butterfly species of conservation concern were observed. Fifty-one observations of Propertius Duskywing (*Erynnis propertius*) and 19 observations of Common Wood-nymph (*Cercyonis pegala incana*), both provincially blue-listed species, were made at eight and four sites, respectively.

2. INTRODUCTION

Project Purpose

The purpose of the surveys was to search for undocumented populations of Taylor's Checkerspot (*Euphydryas editha taylori*) and four other butterfly species at risk known historically from southeastern Vancouver Island: Large Marble, *insulanus* subspecies (*Euchloe ausonides insulanus*; also known as Island Marble), Common Ringlet, *insulana* subspecies (*Coenonympha tullia insulana*; also known as Vancouver Island Ringlet), Greenish Blue, *insulanus* subspecies (*Plebejus saepiolus insulanus*; also known as Island Blue), and Zerene Fritillary, *bremnerii* subspecies (*Speyeria zerene bremnerii*; also known as Bremner's Fritilllary). Secondarily, the surveys aimed to identify and map the distribution of all butterflies encountered, including eight other rare species known from the area (see Table 1). Of the five main target species, Taylor's Checkerspot had the highest priority and a greater amount of time was devoted to searches within the flight season and potentially suitable habitat for this species.

Background

Taylor's Checkerspot is a charismatic orange, black, and white checkered butterfly historically known from open habitats of southeastern Vancouver Island, British Columbia. Elsewhere in the species' global range, it occurs in Puget Sound and the Willamette Valley. Adults typically fly from mid-April to late May. Historic adult occurrence records exist from maritime meadows of Garry oak ecosystems, semi-maintained agricultural fields, disturbed clearings, and utility rights-of-way. In Canada, it is currently known from a single population on Denman Island which occupies moist clearcuts and other adjacent clearings and flies from mid-May to mid-June (Page et al. 2007, Page et al. 2008). Twenty-two other Canadian populations are thought to be extirpated. The two most recently occupied sites were a powerline right-of-way 3 km southwest of Mill Bay (last observation in 1989) and maritime meadows in Helliwell Provincial Park on Hornby Island (last observation in 1995).

In 2008, a single Taylor's Checkerspot butterfly was observed on a utility right-of-way east of Highway 19 and north of Buckley Bay (Page et al. 2008). It is not known whether this sighting represents a previously-unknown population or whether the individual had dispersed from the Denman Island population. As Taylor's Checkerspot is red-listed in BC and listed as Endangered in Canada (COSEWIC 2000), surveys for new undocumented populations throughout the species' range are part of recovery efforts for this species (Parks Canada 2006).

In addition to Taylor's Checkerspot, twelve other butterfly species of conservation concern are known from southeastern Vancouver Island and the adjacent Gulf Islands (Appendix 1). Surveys within unchecked habitat are identified as priority actions in the respective recovery strategies for Taylor's Checkerspot, Island Marble (Parks Canada 2006), and Island Blue (Garry Oak Invertebrates Recovery Implementation Group 2008). Some species, such as Propertius Duskywing and Moss' Elfin, are still common locally but have a limited geographic range. Others, such as Island Marble, are likely extirpated from Canada.

Table 1. Conservation rankings and listing status of thirteen butterfly species of conservation concern known from Southeastern Vancouver Island and the Gulf Islands.

Common Name	Scientific Name	Global Rank	Provincial Rank	BC List	COSEWIC Status
Taylor's Checkerspot	*Euphydryas editha taylori*	G5T1 (2006)	S1 (2008)	Red	Endangered (2000)
Large Marble, *insulanus* subspecies (Island Marble)	*Euchloe ausonides insulanus*	G5T1 (2004)	SX (2006)	Red	Extirpated (2000)
Common Ringlet, *insulana* subspecies (Vancouver Island Ringlet)	*Coenonympha tullia insulana*	G5T3T4 (1998)	S1 (2006)	Red	
Greenish Blue, *insulanus* subspecies (Island Blue)	*Plebejus saepiolus insulanus*	G5TH (2003)	SH (2006)	Red	Endangered (2000)
Zerene Fritillary, *bremnerii* subspecies (Bremner's Fritillary)	*Speyeria zerene bremnerii*	G5T3T4 (1998)	S2 (2006)	Red	Currently under assessment
Johnson's Hairstreak	*Callophrys johnsoni*	G3G4 (2004)	S1S2 (2006)	Red	
Boisduval's Blue, *blackmorei* subspecies (Blackmore's Blue)	*Plebejus icarioides blackmorei*	G5T3 (2006)	S3 (2006)	Blue	
Propertius Duskywing	*Erynnis propertius*	G5 (1998)	S2S3 (2006)	Blue	
Moss' Elfin, *mossii* subspecies	*Callophrys mossii mossii*	G4T4 (2001)	S2S3 (2006)	Blue	
Dun Skipper	*Euphyes vestris*	G5 (2006)	S3 (2006)	Blue	Threatened (2000)
Common Wood-nymph, *incana* subspecies	*Cercyonis pegala incana*	G5T4T5 (2003)	S2 (2006)	Blue	
Western Pine Elfin, *sheltonensis* subspecies	*Callophrys eryphon sheltonensis*	G5TNR	S3 (2006)	Blue	
Chalcedon Checkerspot, *perdiccas* subspecies	*Euphydryas chalcedona perdiccas*	-	-	(subspecies not listed)	

Of the thirteen rare butterfly species known from Southeastern Vancouver Island and the Gulf Islands, four species, Island Marble, Vancouver Island Ringlet, Island Blue, and Bremner's Fritillary, also occupy open habitats and share a similar historic range with Taylor's Checkerspot (Table 2). This overlap means that surveys for Taylor's Checkerspot can also jointly target these species. While flight periods are not overlapping in some cases (see Table 2 for flight season details), information and landowner permission gathered during early-season surveys for Taylor's Checkerspot are valuable for later-season surveys for these species.

Table 2. Flight periods and potential suitable habitats for five butterfly species at risk targeted during 2009 surveys.

Species	Flight Period	Potential Suitable Habitats	Source(s)
Taylor's Checkerspot *Euphydryas editha taylori*	Mid-April to mid-May Mid-May to mid-June (Denman & Hornby Islands)	Maritime meadows, disturbed clearings and fields, subhygric to hygric clearcuts and utility rights-of-way	Page et al. 2008
Island Marble *Euchloe ausonides insulanus*	May and June Mid-April to late June (San Juan Islands)	Garry oak ecosystems, open shoreline, sand dunes, grassland, and agricultural and disturbed land	Guppy and Shepard 2001 Miskelly and Potter 2009
Vancouver Island Ringlet *Coenonympha tullia insulana*	May to July (first brood) August to October (second brood)	Damp meadows and grasslands	Guppy and Shepard 2001
Island Blue *Plebejus saepiolus insulanus*	Late May to early August	Meadows, forest openings, roadsides, streambanks, subalpine areas	Guppy 2003 Parks Canada 2008
Bremner's Fritillary *Speyeria zerene bremnerii*	Early July to late August	Mesic and xeric meadows with permanent springs	Guppy and Shepard 2001

Most butterflies require the presence of one or more critical host plants for egg laying and larval feeding. Larval host plants are a good indicator of potential habitat and knowledge of larval host plants and their habitats can further help to target surveys. It is also thought that the reduced abundance of host plants is a primary threat to butterfly diversity in the region (Baron and Backhouse 1999). Table 3 lists the documented and possible larval host plants known for each of the five species that were the focus of these surveys.

Table 3. Documented and possible host plants for five butterflies species targeted during 2009 surveys.

Species	Documented Host Plants	Possible Host Plants	Source(s)
Taylor's Checkerspot *Euphydryas editha taylori*	*Veronica scutellata* *Veronica serpyllifolia* *Veronica beccabunga* *Plantago lanceolata* *Plantago major* (Denman Island) *Plantago lanceolata* *Castelleja hispida* *Collinsia parviflora* *Plectritis congesta* *Triphysaria pusilla* (U.S. populations)	*Plantago maritima* *Castilleja levisecta* Other owl clover sp.	Page et al. 2008 Severns and Warren 2008 Murphy et al. 1983 Parks Canada 2006
Island Marble *Euchloe ausonides insulanus*	*Brassica campestris* *Sisymbrium altissimum* *Lepidium virginicum* (San Juan Islands)	*Arabis* spp., particularly *Arabis hirsuta* (former B.C. populations)	COSEWIC 2000 Miskelly and Potter 2009
Vancouver Island Ringlet *Coenonympha tullia insulana*	Low-growing grasses	*Agrostis* spp., *Poa* spp., *Danthonia californica*, *Festuca rubra*	Guppy and Shepard 2001 J. Miskelly, pers. comm.
Island Blue *Plebejus saepiolus insulanus*	*Trifolium* spp.	*Trifolium wormskioldii Trifolium wildenowii* and other Garry oak ecosystem clovers	Guppy 2003 Parks Canada 2006
Bremner's Fritillary *Speyeria zerene bremnerii*	*Viola* spp. *Viola palustris*	*Viola adunca* *Viola praemorsa*	Guppy and Shepard 2001

This report is intended to provide a concise summary of the methods and results of the survey. Much of the data are provided as appendices including spatial datasets in Arcview GIS or summarized data in spreadsheets.

3. METHODS

The survey for Taylor's Checkerspot and other butterfly species at risk on southeastern Vancouver Island area consisted of four components: (1) prioritization of survey sites; (2) landowner contact to gain permission to conduct surveys; (3) field surveys using wandering transects; and (4) description and preliminary data analysis. Each is described in more detail below.

Field Survey Priorities. Prior to field surveys, potentially suitable habitats for butterflies were identified on southeastern Vancouver Island using recent (2005) orthophotos (provided by B.C. Ministry of Environment), Google Earth imagery, and the authors' local knowledge of the area. Several land managers were also consulted for recommendations of potentially suitable habitat with their jurisdictions. Much of the prioritization was based on habitat maps compiled earlier in the year (see Lilley and Page 2009). In general, potential habitats were defined as grass- or forb-dominated open areas that are not frequently mowed, cultivated, or used for regular livestock grazing. This included natural meadows, rock bluffs, recent clearcuts, unmaintained fields, roadsides, railway corridors, and utility rights-of-way. Based on the known dispersal capabilities of Taylor's Checkerspot (see Ehrlich and Hanski 2004), sites within 5 km of Taylor's Checkerspot or other target species populations were higher

priority than sites farther away. Areas with known populations of larval host plants or habitat characteristics known to be associated with larval host plants were also of higher priority.

Based on a review of historical records, habitat mapping, host plant preferences, and the timing of the 2009 field season, the following high priority areas were identified for surveys:

- Shawnigan-Duncan area (revisit historical site at Shawnigan);
- North Cowichan area (esp. Mount Prevost, Maple Mountain, Mount Sicker);
- Wellington-Nanaimo Lakes-Cassidy area west of Nanaimo;
- Nanoose Bay and areas west;
- Coombs-Errington area north of Nanaimo;
- Buckley Bay area south of Courtenay (esp. the utility right-of-way where a single Taylor's Checkerspot adult was observed in 2008); and
- Black Creek area north of Courtenay.

Landowner Contact. Prior to access to any private lands for butterfly surveys, landowners were contacted in person, by phone, by email, or by mail (see Appendix 1 for example letters) to discuss the purpose of the survey and request permission for access. Information on Taylor's Checkerspot was provided where appropriate (posters or information sheets) but generally landowner contact was verbal and informal. Landowners were specifically told that the data would be provided to the B.C. Conservation Data Centre as part of the project, unless alternate data management requirements were requested or required. Landowner contact information was recorded.

Field Survey Methods. Foot and car based wandering transects were used to survey for Taylor's Checkerspot and other butterfly species in potentially suitable habitats. Wandering transects follow no fixed route and meander through a range of habitats and often follow routes of convenience such as roads or open areas. They are an efficient method for identifying butterfly presence and the spatial distribution of butterfly populations when little information is available, but the data collected cannot be used to statistically infer population sizes or, if used over time, for population monitoring.

For each wandering transect at each location, the following general information was collected: (1) date and general location; (2) start + end points (GPS points); (3) start + end times; and (5) air temperature and weather (e.g., amount of sun, wind). Transect routes were recording using the tracking function in the handheld GPS (Garmin GPSmap60) and provided an accurate record of the transect route. Most data was collected during warm, dry and sunny or bright overcast weather between 9 am and 5 pm[1].

Where butterflies were observed, the following data were collected: (1) point location using handheld GPS (typically 5–10 m accuracy); (2) butterfly species and number of individuals observed; and (3) general behavior (flying, perched, sunning, nectaring, mating, territorial behavior).

Identification of butterflies was generally undertaken visually without capture or collection. Some species (e.g., anglewings, some skippers, etc.) were often observed in flight and difficult to identify from

[1] We generally followed the guidelines of the UK Butterfly Monitoring Scheme, which recommends that surveys be undertaken during dry conditions where temperatures are 13°C or greater if there is at least 60% sunshine, or more than 17°C if overcast.

a distance. Therefore, not all observations were identified to species. Photographs were taken of representative butterflies to confirm identification. No specimens were collected during the survey.

We focused on surveying a range of potentially suitable habitats, such as recent clearcuts, utility rights-of-way, open meadow habitats, and pastures. Initial surveys attempted to cover a wide array of potential habitats across the region. Both walking and driving transects were used to cover maximum territory. However, suitable habitats were limited, particularly in agricultural areas. Most agricultural fields are grass-dominated ad support too few host or nectar plants to sustain butterflies. Further efforts were exerted relative to the general quality of habitat, based on the presence of appropriate larval host plants and adult nectaring plants, openness, exposure, and disturbance level. The highest quality habitats were generally surveyed multiple times on foot.

Survey periods were timed to coincide with the flight periods of the five target species, with a greater focus on the flight season of Taylor's Checkerspot. Note that not all parts of southeastern Vancouver Island were covered during each survey period. Surveys were focused on the highest priority areas and habitats for the target species during each survey period.

All adult surveys in 2009 were undertaken by Patrick Lilley and Nick Page of Raincoast Applied Ecology.

Additional Data. During 2009, Raincoast Applied Ecology (Nick Page and Patrick Lilley) conducted butterfly surveys in four municipal parks in the City of Victoria (Beacon Hill Park, Moss Ross Park, Summit Park, and Banfield Park) for the City of Victoria. With permission from the City of Victoria Parks Department, data was included in this report as these parks fall within the historic range and/or historic occurrence records for the five target species.

Data Analysis. Analyses characterized the general butterfly community (abundance and distribution of species observed), and mapped the location of transects and butterfly observations. All data will be submitted to the B.C. Conservation Data Centre and the provincial Wildlife Species Inventory. Warehouse.

5. RESULTS AND DISCUSSION

Survey Timing and Intensity. A total of 374.2 km of wandering transects (279.2 km by foot; 95.0 km by car) were covered in 101.5 hrs of field time between May 21 and August 26, 2009. Survey effort was distributed over six general survey periods. The six survey periods and regions covered during each period were as follows:

- Survey Period 1 (May 21–June 1): North and South of Courtenay, Qualicum-Parksville area, Cowichan Valley, Shawnigan-Malahat area, Salt Spring Island, Greater Victoria.
- Survey Period 2 (June 13–16): North and South of Courtenay, Cowichan Valley, Nanaimo-Ladysmith area.
- Survey Period 3 (July 2–3): Greater Victoria.
- Survey Period 4 (July 22–24): Nanaimo-Ladysmith area, Shawnigan-Malahat area.
- Survey Period 5 (July 31–Aug 1): Greater Victoria.
- Survey Period 6 (Aug 26): Cowichan Valley.

Figure 1 shows the relationship between survey periods and the flight seasons of rare butterflies.

Figure 1. Chart showing timing of six general survey periods in relation to flight seasons of rare other butterflies on southeastern Vancouver Island.

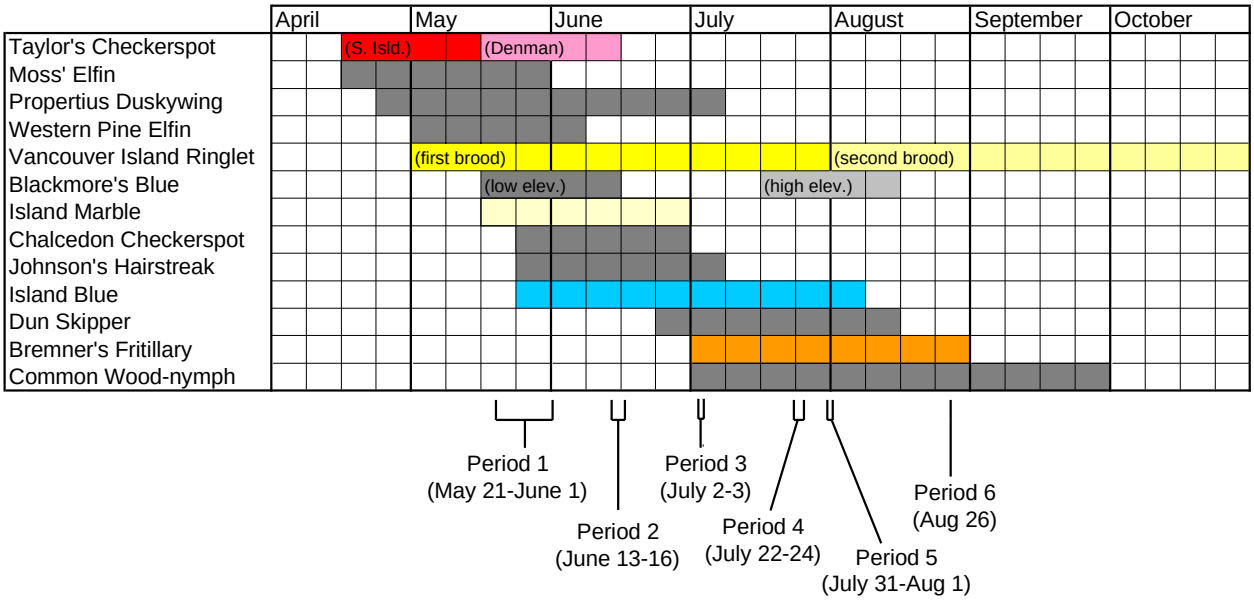

Table 4 summarizes the distribution of survey effort (distance travelled and time spent conducting transects by foot and by car) over the six survey periods. Almost 50% of the effort was expended during the first survey period (May 21–June 1) coinciding with the flight seasons of Taylor's Checkerspot and Vancouver Island Ringlet.

Table 4. Summary of distances covered and time spent surveying by survey period (2009).

		Distance (km)				Time (hours)			
Survey Period		**By foot**	**By car**	**Total**	**% of total**	**By foot**	**By car**	**Total**	**% of total**
1	May 21-June 1	170.1	0.0	170.1	45.5%	48.1	0.0	48.1	47.5%
2	June 13-16	31.1	0.0	31.1	8.3%	14.7	0.0	14.7	14.5%
3	July 2-3	22.1	15.2	37.3	10.0%	10.8	0.7	11.5	11.4%
4	July 22-24	7.5	0.0	7.5	2.0%	2.4	0.0	2.4	2.4%
5	July 31-Aug 1	33.9	49.0	83.0	22.2%	14.0	4.4	18.2	18.0%
6	Aug 26	14.5	30.8	45.3	12.1%	4.3	2.1	6.4	6.3%
Grand Total		**279.2**	**95.0**	**374.2**	**100.0%**	**94.3**	**7.2**	**101.5**	**100.0%**

Appendix 2 provides a summary of transect by date, length of time, and observer. Appendix 3 provides a map showing the location of wandering transects.

Summary of Butterfly Observations. A total of 1,933 butterfly observations were mapped during the survey encompassing 27 unique taxa (see Fig. 2 for examples). No Taylor's Checkerspot were encountered during the surveys. This includes three surveys (May 21, May 24, May 28) of the utility right-of-way site north of Buckley Bay where a single checkerspot was observed in 2008 (Fig. 3b).

Of the four additional rare butterfly species targeted, only Vancouver Island Ringlet was observed (Fig. 2a). Three of the six occupied sites have previous occurrence records with the B.C. Conservation Data Centre: Rithet's Bog (in Saanich), Florence Lake (in Langford), and West of Cobble Hill (along Thain Rd, east of quarry). Three sites, all in the Cowichan Valley, were new occurrences: a utility right-of-way east of Highway 1 at Stratfords Crossing (north of North Cowichan Municipal Hall), a utility right-of-way crossing with Highway 18 three km east of Hillcrest (at Tansor Rd), and a utility right-of-way crossing with Highway 18 two km west of Hillcrest (at Inwood Creek Estates). In total, 123 observations of Vancouver Island Ringlet were recorded across the six sites (Table 5).

Table 5. Locations and numbers of Vancouver Island Ringlet observations made during the 2009 surveys.

Location	Habitat	No. of observations
Florence Lake, Langford	Wet meadow adjacent to lake	43 (May 30)
Rithet's Bog, Saanich	Wet meadow adjacent to bog	60 (May 31)
West of Cobble Hill (along Thain Rd, east of quarry)	Utility right-of-way	2 (May 27)
Stratsfords Crossing, east of Highway 1 (north of North Cowichan Municipal Hall)	Utility right-of-way	3 (May 29)
Three km east of Hillcrest along Highway 18 (at Tansor Rd)	Utility right-of-way	1 (May 29)
Two km west of Hillcrest along Highway 18 (at Inwood Creek Estates)	Utility right-of-way	11 (May 29) 3 (June 15)
	Total number of observations	**123 (May 27–June 15)**

Appendix 4 lists the species recorded and the number of observations of each species. The most abundant five butterflies, based on total number of visual observations, were Western Spring Azure (*Celastrina echo*) (551; 28.5% of observations), Mylitta Crescent (*Phyciodes mylitta*) (303; 15.7%), Hydaspe Fritillary (*Speyeria hydaspe*) (133; 6.9%), Vancouver Island Ringlet (*Coenonympha tullia insulana*) (123; 6.4%), and Cabbage White (*Pieris rapae*) (121; 6.3%). Appendix 5 provides a summary of butterfly observations by region and Appendix 6 provides a map showing the overall distribution of butterfly observations with selected species highlighted.

Figure 2. Photos of butterflies observed during the 2009 surveys: (a) Vancouver Island Ringlet (*Coenonympha tullia insulana*) west of Hillcrest in the Cowichan Valley; (b) Propertius Duskywing (*Erynnis propertius*) at Mount Maxwell, Salt Spring Island; (c) Cedar Hairstreak (*Mitoura rosneri*) at Burgoyne Bay, Salt Spring Island; (d) Hydaspe Fritillary (*Speyeria hydaspe*) near Blackjack Ridge, west of Nanaimo; (e) Margined White (*Pieris marginalis*) near Paldi in the Cowichan Valley, and (f) Grey Hairstreak (*Strymon melinus atrofasciatus*) at Shawnigan Lake. Photos by Patrick Lilley, May–June 2009.

Suitable Habitat for Taylor's Checkerspot on Southeastern Vancouver Island. Although open habitats are common on southeastern Vancouver Island, suitable habitats with larval host plants for Taylor's Checkerspot were infrequent. The most promising habitats were generally in moist utility rights-of-way and clearcuts, similar to the known population on Denman Island (Fig. 3a) and the powerline site north of Buckley Bay where an adult was observed in 2008 (Fig. 3b). Such wetter sites with disturbance often had *Veronica scutellata* present. *Plantago lanceolata* was frequently encountered along disturbed roadsides. However, in many utility rights-of-way, such as the one southwest of Mill Bay where Taylor's Checkerspot was found historically, dense vegetation with Scotch broom and other shrubs has overtaken herbaceous cover (Fig. 3c) and habitat is generally unsuitable for Taylor's Checkerspot. Clearcuts are often too dry for host plant populations (Fig. 3d). Garry oak meadows/coastal bluffs (Fig. 3e) and weedy fields (Fig. 3f) were also habitat types surveyed. Many recent clearcuts in the Black Creek area north of Courtenay have wetland areas which support *Veronica* species. There are no historic records of Taylor's Checkerspot from this area, but suitable recovery habitat is present.

Additional Butterfly Species of Conservation Concern. Two other species of butterfly tracked by the B.C. Conservation Data Centre were observed during the surveys: Propertius Duskywing (*Erynnis propertius*; Fig. 2b) and Common Wood-nymph, *incana* subspecies (*Cercyonis pegala incana*).

Propertius Duskywing is blue-listed (S2S3) and, on southeastern Vancouver Island, is generally associated with Garry oak stands with an undisturbed understory. The larval food plant in B.C. is Garry oak. Fifty-one observations of Propertius Duskywing were made across eight sites between May 24 and June 1, including Nanoose Hill (north of Nanaimo), Florence Lake (in Langford), Maple Mountain (Cowichan Valley), Mount Tzouhalem (Cowichan Valley), Florence Lake (in Langford), and Mount Tuam, Mount Maxwell, and Burgoyne Bay on Salt Spring Island. All sites have significant stands of Garry oak trees nearby.

Common Wood-nymph is also blue-listed (S2) and is associated with open Douglas-fir forest. Larval food plants in B.C. are probably grasses. Nineteen observations of Common Wood-nymph were made at four sites between July 22 and August 26, including Copley Mountain (west of Nanaimo), Blackjack Ridge (west of Nanaimo), Big Sicker Mountain (north of Duncan), and Mount Richards (Cowichan Valley). All sites were open Douglas-fir forest with significant forest openings, either natural and due to logging activity.

a

b

c

d

e

f

Figure 3. Representative photographs of survey sites for Taylor's Checkerspot and other butterfy species at risk: (a) Seasonally wet area in recent clearcut on Denman Island (known habitat for Taylor's Checkerspot); (b) Wet ruts with *Veronica scutellata* in utility right-of-way north of Buckley Bay (single Taylor's Checkerspot observed here in 2008); (c) Utility right-of-way invaded by Scotch broom southwest of Mill Bay where Taylor's Checkerspot was found in 1989; (d) Recent dry clearcut north of Courtenay (e) Garry oak meadow/coastal bluff on Maple Mountain; and (f) Semi-maintained pasture area in Cowichan Valley. Photos a, b, and d by Nick Page, May 2009; photos c, e, and f by Patrick Lilley, May 2009.

Recommendations for Future Surveys. Surveys for Taylor's Checkerspot and other butterfly species at risk in 2009 were widespread and covered a range of potential habitats on southeastern Vancouver Island. The following is recommended for surveys in future years:

1. Surveys of potential Taylor's Checkerspot habitat south of Nanaimo should occur between mid-April and late-May. Based on historical records for Taylor's Checkerspot, the peak of the flight season for south island populations likely occurred in early May. Based on the flight period of the population on Denman Island, the likely flight period for other potential north island populations is from May 15 to June 15. Surveys should be timed to reflect these flight periods.

2. Sites found to have adequate larval host plant and adult nectar plant populations should be revisited in subsequent years. One year of surveys is insufficient to confirm absence of the species; multi-year surveys are important to ensure a population wasn't missed. In addition, other butterfly species at risk could also be recorded from the area. The following sites are considered high priority for additional surveys for Taylor's Checkerspot based on the quality of the habitat present:
    - Clearcuts (south of Highway 19) and the utility right-of-way (north of Highway 19) east of Memorial Ave and south of Qualicum Beach;
    - Sites north of Buckley Bay (east of Highway 19) including the utility right-of-way site where a single Taylor's Checkerspot butterfly was observed in 2008; and
    - Clearcut areas north of Courtenay (Macauley Rd area near Black Creek).

3. Sites identified but either not surveyed or not adequately surveyed for Taylor's Checkerspot due to timing or other factors include:
    - Copley Mountain, east of Nanaimo;
    - Timberwest private forest land holdings east of Nanaimo, including Blackjack Ridge and the Nanaimo River valley;
    - Timberwest private forest land holdings west of Shawnigan Lake;
    - District of North Cowichan forest lands, particularly Mount Prevost, Mount Sicker, Mount Tzouhalem, and Mount Richards;
    - Unsurveyed areas of south Denman Island (to see whether the population on Denman Island has expanded); and
    - Texada Island and Lasqueti Island.

4. Given the limited geographic range and threats to the coastal Douglas-fir biogeoclimatic zone, butterfly surveys are important for guiding conservation efforts for individual species and for the ecosystem as a whole. Because distribution and habitat information is still limited for many of the butterfly species at risk in this ecosystem, surveys should continue to be given high priority in conservation planning and species recovery efforts. Surveys for other butterfly species at risk, such as Vancouver Island Ringlet, Island Marble, Island Blue, and Bremner's Fritillary, should continue to be undertaken in historic and potential habitat during their respective flight periods, with particular focus on areas north of Duncan to Port McNeil. These areas have not been well-surveyed for butterflies.

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7. APPENDICES

Appendix 1 Examples of landowner contact letters
Appendix 2 Transect summary
Appendix 3 Map of 2009 survey transects
Appendix 4 Summary of butterfly species observed by survey period
Appendix 5 Summary of butterfly species observed by region
Appendix 6 Map of 2009 butterfly observations with selected species highlighted
Appendix 7 Survey and butterfly photos (digital files only)
Appendix 8 GIS shapefiles for transects and butterfly observations (digital files only)