

**SURVEYS FOR THE BLUE-GREY TAILDROPPER AND OTHER
GASTROPODS AT RISK WITH FOCUS ON
CAPITAL REGIONAL DISTRICT PARKS, FALL 2010**

Prepared for
**Habitat Acquisition Trust
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Cover photograph: Blue-grey Tailedropper (*Prophyaon coeruleum*), Vancouver Island (photo by K. Ovaska, November 2008).

EXECUTIVE SUMMARY

The Blue-grey Taildropper (*Prophysaon coeruleum*) is a native forest-dwelling slug, listed as endangered in Canada due to its small distribution and threats to its habitats from urbanization and other human activities. Its entire Canadian distribution is restricted to southern Vancouver Island, where before this study it was known from only seven sites. Here we report on surveys carried out in the fall of 2010 within the Capital Regional District (CRD), with focus on properties within the CRD Regional Parks and Trails system and building on previous studies on terrestrial gastropods (slugs and land snails) at risk within CRD parks. The overall objective was to clarify the distribution and habitats of the Blue-grey Taildropper by surveying both new sites with potentially suitable habitat and selected known sites to guide stewardship and habitat management.

To survey for gastropods, we set up 100 m-long transects with cardboard cover-objects in five CRD Parks properties: Bear Hill (2 transects), Mt. Work (4 transects), Mt. Wells (2 transects), and Thetis Lake (8 transects) Regional Parks, and Sooke Hills Wilderness Regional Park Reserve (2 transects). In addition, we set up one 50 m-long transect on a 10-acre residential property with potentially suitable habitat. In total, there were 19 transects with 370 cover-objects, which were checked four times (in CRD Parks) or twice (on residential property, with landowners) from 18 October – 11 December 2010 for a total of 1460 cover-object flips. The timing of the surveys was set to late fall, when the Blue-grey Taildropper is most readily detected.

During surveys of the cover-objects, we found 29 species of terrestrial gastropods, consisting of five native and six introduced species of slugs and 18 species of native snails. The Blue-grey Taildropper was found at two sites in Thetis Lake Regional Park (two slugs found on 13 November) and at one site in Mt. Work Regional Park near Durrance Lake (one slug found on 8 December). One of the sites in Thetis Lake Regional Park, located near Prior Lake, represents a new occurrence record and extends the known distribution of the species in the park by 1.7 km to the northwest. The other two sites are in the immediate vicinity of previous observations of the species. Habitats at the three sites consist of relatively open-canopy Douglas-fir dominated forest. The new site is in an old Douglas-fir stand, fringing a rocky knoll; the sites with previous records are in Douglas-fir/arbutus woodland with Garry oak present at the Thetis Lake site.

In addition to above observations, we opportunistically encountered two Blue-grey Taildroppers crossing a trail in a Saanich municipal park within an older Douglas-fir-dominated stand with dense shrub understorey. The observation took place on 6 December during a cool (air temperature = 2°C) morning, following below-freezing conditions and snow cover in late November. This occurrence record, located about 3.5 km from nearest site (near Prior Lake), extends the known distribution of the species eastwards on the Saanich Peninsula.

Other listed species of gastropods at risk found during the surveys were the Threaded Vertigo, *Nearctula* species (Special Concern in Canada; red-listed in B.C.), which was found at Bear Hill and Mt. Wells Regional Parks; Pacific Sideband, *Monadenia fidelis* (blue-listed in B.C.), which was found at Sooke Hills Wilderness Reserve and Thetis Lake Regional Park; and Scarletback Tailedropper, *Prophysaon vanatta* (blue-listed in B.C.), which was found at Mt. Work and Thetis Lake Regional Parks. The records for the Threaded Vertigo are of particular interest and represent new occurrence records for this small, largely arboreal snail. Few gastropods and no listed species were found on the residential property.

CRD Parks has an excellent opportunity to manage and protect the Blue-grey Tailedropper within a significant proportion of its Canadian range. Recommended management measures in CRD and municipal parks include deactivation and reclaiming of excess and unauthorized trails; preventing unauthorized ATV/vehicle use in problem areas; controlling invasive plants, such as laurel-leaved Daphne that is prevalent and spreading at one of the Blue-grey Tailedropper sites at Thetis Lake; ensuring that people undertaking fuel reduction to decrease potential for wildfires, habitat restoration, maintenance, or other activities are aware of the locations of this and other gastropod species at risk, so that habitat disturbance can be minimized.

Within the CRD Parks and Trails system, recommendations for 2011 include continued surveys of new areas for the Blue-grey Tailedropper in late fall and monitoring of selected known sites from spring to fall to increase knowledge of the species' life history and habitat use. Expanding survey effort to municipal parks is recommended. Potential habitat for the Blue-grey Tailedropper and other gastropods at risk also exists on private residential lands, especially in areas with large, wooded lots. Expansion of landowner involvement in surveys and stewardship is desirable in these areas.

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Plate 6. Blue-grey Taildropper habitat at the above site in a Douglas-fir stand with salal, Oregon grape, and sword fern in the understory.

1.0 INTRODUCTION

The Blue-grey Taildropper (*Prophysaon coeruleum*) is a small forest slug native to western North America. It is one of four species of taildroppers that occur in British Columbia; the others are Scarletback Taildropper (*P. vanatta*), Yellow-bordered Taildropper (*P. foliolatum*), and Reticulate Taildropper (*P. andersonii*). The common name of the group refers to the slugs' ability to detach the tail if seized by a predator; the tail will then regenerate.

The Blue-grey Taildropper is the rarest of the taildropper slugs in the province. It is listed as endangered in Canada (COSEWIC 2006) and is on the provincial Red List of species at risk. Its entire Canadian distribution is confined to southern Vancouver Island, where it is known from only a few sites. Federal lands and regional parks provide relatively large areas of forest habitat amidst residential areas, and up to this study contained all known occurrences of the species. However, populations and habitats in these areas are not necessarily safe, unless the needs of the species are taken into account in managing human activities. Potentially suitable habitat for the species is also present in municipal parks and on private residential lands, which are unsurveyed for this species. Distribution and habitat information is essential for stewardship and appropriate management of sites with species at risk.

Here we report on surveys conducted in five CRD Parks properties in fall 2010. Surveys for the Blue-grey Taildropper and other terrestrial gastropods (slugs and land snails) at risk have been conducted in CRD Regional Parks and Trails System annually from 2006 – 2009 (Ovaska and Sopuck 2006, 2007, 2008, 2009). However, many areas with suitable habitat remain unsurveyed or survey effort needs to be expanded to detect this elusive species. In addition, we initiated surveys for the species on private residential lands that contain suitable habitat and report on an opportunistic observation of the Blue-grey Taildropper from a municipal park.

2.0 OBJECTIVES

The study objectives were to:

- Survey suitable habitats for the Blue-grey Taildropper within the CRD Regional Parks and Trails System in an effort to better delineate its distribution.
- Describe habitats and threats at sites where the Blue-grey Taildropper is found, and provide management recommendations.
- Initiate surveys on private residential properties with potentially suitable habitat.
- Record all gastropods found during the surveys, with emphasis on species at risk that might occur at the study sites.

3.0 STUDY SITES

The study sites were located within five CRD Parks properties: Bear Hill (49 ha), Mt. Work (575 ha), Mt. Wells (123 ha), and Thetis Lake (831 ha) Regional Parks, and

Sooke Hills Wilderness Regional Park Reserve (4090 ha) (Figure 1; see confidential Appendices 1 and 4 for exact locations of transects). Previous records for the Blue-grey Taildropper existed from Mount Work (Durrance Lake portion), Sooke Hills Wilderness, and Thetis Lake Regional Parks. However, these parks are large, and many areas have not been surveyed for gastropods. The other sites contain potentially suitable habitat for the species but have no previous records.

We used orthophotos from CRD Natural Areas Atlas (2010), coupled with an inspection of habitats on the ground, to select survey sites. In the parks with previous records of the Blue-grey Taildropper, we surveyed sites at or near where the species was known to occur and new areas with potentially suitable habitat in other parts of the parks. In all new areas, we selected sites with habitat features deemed important for the slugs, including moist areas in forest gaps or woodlands within or near Garry oak/arbutus ecosystems. A landowner with a 10 acre property with Garry oak/arbutus woodland recruited as habitat steward with HATs “Good Neighbours” Program allowed us to place gastropod cover-objects on the property.

4.0 METHODS

4.1 Survey methods and effort

To survey for gastropods, we used artificial cover-objects (ACOs) constructed of corrugated cardboard (Hawkins et al. 1998, Ovaska and Sopuck 2001, 2008). The ACOs used for this project consisted of small (30 cm x 30 cm), layered pieces of cardboard. Our past experience shows that these ACOs are effective in detecting the Blue-grey Taildropper and many other gastropods. ACOs allow repeated surveys of the same sites with minimal disturbance to the habitat without harming gastropods or other animals, which can move freely in and out of the cover-objects.

We placed ACOs along 100 m-long transects at sampling stations that were 10 m apart. Each sampling station had two ACOs, about 1 m apart, to increase the coverage of available microhabitats. There were 18 transects within CRD Parks properties, each with 10 sampling stations; one transect was set up on a residential property and had 5 sampling stations. In total, there were 370 ACOs along 19 transects (Table 1).

The cover-objects were placed on the forest floor from 26 – 28 September in CRD parks and on 5 October on the residential property. They were allowed to weather for at least two weeks before the first survey. Each transect within CRD Parks properties was surveyed four times from 18 October to 11 November; the transect on the residential

Figure 1. Overview of survey site locations in 2010 (indicated by red stars).



property was surveyed twice with the landowners (Table 2). The surveys were timed to correspond with mild and moist conditions suitable for gastropod activity.

Late fall was emphasized because previous surveys suggest that the Blue-grey Taildropper is detected most often at this time (Ovaska and Sopuck 2008, 2009). During the last two weeks of November, southern Vancouver Island experienced a spell of cold weather with temperature down to -10°C and snow cover. An opportunistic observation of the Blue-grey Taildropper by one of us on 6 December, after the return of milder conditions, prompted us to conduct a fourth survey of all cover-objects.

Table 1. Summary of search effort using artificial cover-objects (ACO) to survey terrestrial gastropods in 2010.

Site Name	# transects	# stations	# ACOs	# surveys	# of ACO flips
Bear Hill Regional Park	2	20	40	4	160
Mt Wells Regional Park	2	20	40	4	160
Mt Work Regional Park (Durrance Lake & Killarney Lake)	4	40	80	4	320
Sooke Hills Wilderness Reserve	2	20	40	4	160
Thetis Lake Regional Park	8	80	160	4	640
Prospect Lake (residential)	1	5	10	2	20
Total	19	185	370	22	1460

Table 2. Survey dates of artificial cover-object transects in 2010.

Site name	Trans. ID	Check 1	Check 2	Check 3	Check 4
Bear Hill Regional Park	1, 2	18-Oct	29-Oct	14-Nov	10-Dec
Mt Wells Regional Park	1, 2	18-Oct	31-Oct	13-Nov	9-Dec
Mt Work Regional Park (Killarney Lake)	1, 2	19-Oct	29-Oct	11-Nov	10-Dec
Mt Work Regional Park (Durrance Lake)	3, 4	19-Oct	30-Oct	12-Nov	8-Dec
Sooke Hills Wilderness Reserve	1, 2	18-Oct	31-Oct	13-Nov	9-Dec
Thetis Lake Regional Park	1	18-Oct	04-Nov	14-Nov	8-Dec
Thetis Lake Regional Park	2, 3	20-Oct	04-Nov	15-Nov	9-Dec
Thetis Lake Regional Park	4, 5	18-Oct	03-Nov	13-Nov	10-Dec
Thetis Lake Regional Park	6, 7	18-Oct	31-Oct	13-Nov	11-Dec
Thetis Lake Regional Park	8	18-Oct	04-Nov	14-Nov	8-Dec
Propect Lake (residential)	1	19-Oct	11-Nov	NA	NA

4.2 Identification and data recording

We identified all gastropods found on the cover-objects based on descriptions in Forsyth (2004). Identification was done in the field using external characteristics, and the animals were released after examination. We took photographs of the Blue-grey Taildroppers found as vouchers. We described the habitat at the center of each transect and at the site of each Blue-grey Taildropper observation by visually estimating canopy closure and percentage coverage by shrubs, ferns, herbaceous plants, and coarse woody debris. We also recorded the dominant overstory and understory plants (see Appendix 2 for habitat descriptions for each transect).

The data were entered into Microsoft Excel 2007 spreadsheets. Raw data are submitted together with this report as an Excel file.

5.0 RESULTS

5.1 Overview of gastropods found

In total, we found 29 species of terrestrial gastropods. The species found within CRD Parks properties included five native and six introduced species of slugs, and 18 species of snails, all native (Table 3). The Pacific Banana Slug, Chocolate Arion (introduced), Reticulate Taildropper, Robust Lancetooth, Northwest Hesperian, Tightcoil snails, and Conical Spot were widespread and found at 50% or more of the transects. In terms of relative abundance, the Northwest Hesperian, Tightcoil snails, and introduced Hedgehog Slug dominated the samples, each with over 15% of all gastropod observations (Table 4).

Only one species, the Western Glass-snail, was found on the cover-objects on the residential property near Prospect Lake. Opportunistic searches of natural cover on the property revealed the presence of the Reticulate Taildropper and the introduced Grey Fieldslug.

5.2 Blue-grey Taildropper

The Blue-grey Taildropper was found at four sites: two sites in Thetis Lake Regional Park (on Transects 4 and 7), one site in Mt. Work Regional Park (Transect 4), and opportunistically in a Saanich municipal park. One of the sites in Thetis Lake Regional Park, near Prior Lake, represents a new occurrence record for the species and is located 1.7 km northwest from the nearest previous observation. The observation from Saanich municipal park also represents a new occurrence record and is located 3.5 km northeast of the nearest previous observation. The other two sites are in the immediate vicinity of previous observations (Ovaska and Sopuck 2008, 2009): In Thetis Lake Regional Park, the species has been previously found within 80 m of the 2010 observation on Transect 7, along the adjoining Transect 6; in Mt. Work Regional Park, the species has been previously found near Durrance Lake, within 30 m of the 2010 observation.

Table 3. Terrestrial gastropod species and transects where found within CRD Regional Parks in 2010. Numbers in cells denote transect identification numbers.

n = total # of transects per site; * = introduced species

SPECIES	Bear Hill (n=2)	Mt Wells (n=2)	Mt Work (n=4)	Sooke Hills (n=2)	Thetis Lake (n=8)	# of transects (n=18)	% of transects where present
Slugs:							
Pacific Banana-slug, <i>Ariolimax columbianus</i>	2	1, 2	1, 2, 3, 4	1, 2	1, 2, 3, 4, 6	14	77.8
Brown-banded Arion, <i>Arion circumscriptus</i> *	nil	nil	nil	nil	1	1	5.6
Hedgehog Arion, <i>Arion intermedius</i> *	nil	nil	nil	nil	3, 6, 7	3	16.7
Chocolate Arion, <i>Arion rufus</i> *	1	1, 2	1, 2	1, 2	1, 3, 5, 7, 8	12	66.7
<i>Arion</i> species (unidentified juveniles)	nil	1	2	nil	3, 4, 5	5	27.8
Meadow Slug, <i>Deroceras laeve</i>	nil	nil	nil	nil	6	1	5.6
Longneck Fieldslug, <i>Deroceras panormitanum</i> *	nil	nil	nil	nil	6	1	5.6
Grey Fieldslug, <i>Deroceras reticulatum</i> *	nil	nil	nil	nil	6, 7	2	11.1
Giant Gardenslug, <i>Limax maximus</i> *	2	nil	1, 2	2	4, 7	6	33.3
Reticulate Taildropper, <i>Prophysaon andersonii</i>	2	1	1, 2	1	1, 6, 7, 8	0	50.0
Blue-grey Taildropper, <i>Prophysaon coeruleum</i>	nil	nil	4	nil	4, 7	3	16.7
Scarletbacked Taildropper, <i>Prophysaon vanatta</i>	nil	nil	1	nil	6	2	11.1
Snails (large; adult shell width \geq 8 mm):							
Pygmy Oregonian, <i>Cryptomastix germana</i>	2	nil	nil	nil	7	2	11.1
Robust Lancetooth, <i>Haplotrema vancouverense</i>	1, 2	1	1, 3, 4	1	1, 3, 6, 7, 8	12	66.7
Pacific Sideband, <i>Monadenia fidelis</i>	nil	nil	nil	2	6	2	11.1
Northwest Hesperian, <i>Vespericola columbianus</i>	1, 2	1, 2	1, 2, 3, 4	1, 2	1, 2, 3, 4, 5, 7, 8	17	94.4

SPECIES	Bear Hill (n=2)	Mt Wells (n=2)	Mt Work (n=4)	Sooke Hills (n=2)	Thetis Lake (n=8)	# of transects (n=18)	% of transects where present
Snails (small with adult shell width < 8 mm):							
Toothless Column, <i>Columella edentula</i>	nil	nil	nil	nil	3, 5	2	11.1
Glossy Pillar, <i>Cochlicopa lubrica</i>	nil	nil	3	nil	3, 8	3	16.7
Brown Hive, <i>Euconulus fulvus</i>	nil	nil	1, 2	nil	1, 2, 3, 4, 5	7	38.9
Vancouver Snail, <i>Microphysula cookei</i>	nil	2	nil	nil	3	2	11.1
Threaded Vertigo, <i>Nearctula</i> species 1	2	2	nil	nil	nil	2	11.1
Blue Glass, <i>Nesovitrea binneyana</i>	nil	1, 2	1	2	3, 4, 5, 7	8	44.4
Pinhead Spot, <i>Paralaeoma servilis</i>	nil	nil	nil	nil	7	1	5.6
Western Flat-whorl, <i>Planigyra clappi</i>	2	nil	nil	nil	8	2	11.1
Tightcoil species, <i>Pristiloma</i> sp. (<i>P. stearnsii</i> and/or <i>P. lansingii</i>)	1	1, 2	1, 2, 3, 4	1, 2	1, 2, 3, 4, 5, 6, 7, 8	17	94.4
Conical Spot, <i>Punctum randolphii</i>	1, 2	1, 2	1, 2, 3, 4	1, 2	1, 7	12	66.7
Northwest Striate, <i>Striatura pugetensis</i>	nil	nil	1	nil	4, 5, 6, 8	5	27.8
<i>Vertigo</i> species	nil	2	nil	1, 2	2	4	22.2
Western Glass-snail, <i>Vitrina pellucida</i>	nil	nil	nil	nil	7	1	5.6
Quick Gloss, <i>Zonitoides arboreus</i>	nil	2	1	nil	3, 8	4	22.2

Table 4. Terrestrial gastropod species and numbers found within CRD Regional Parks in 2010. Numbers in cells denote total number of individuals found.

n = total # of transects per site; * = introduced species

SPECIES	Bear Hill (n=2)	Mt Wells (n=2)	Mt Work (n=4)	Sooke Hills (n=2)	Thetis Lake (n=8)	# of animals	% of animals
Slugs:							
Pacific Banana-slug, <i>Ariolimax columbianus</i>	2	4	13	5	9	33	4.7
Brown-banded Arion, <i>Arion circumscriptus</i> *	0	0	0	0	1	1	0.1
Hedgehog Arion, <i>Arion intermedius</i> *	0	0	0	0	124	124	17.5
Chocolate Arion, <i>Arion rufus</i> *	2	4	5	3	14	28	4.0
<i>Arion</i> species (unidentified juveniles)	0	1	1	0	4	6	0.8
Meadow Slug, <i>Deroceras laeve</i>	0	0	0	0	1	1	0.1
Longneck Fieldslug, <i>Deroceras panormitanum</i> *	0	0	0	0	2	2	0.3
Grey Fieldslug, <i>Deroceras reticulatum</i> *	0	0	0	0	41	41	5.8
Giant Gardenslug, <i>Limax maximus</i> *	4	0	3	1	4	12	1.7
Reticulate Taildropper, <i>Prophysaon andersonii</i>	3	1	3	1	19	27	3.8
Blue-grey Taildropper, <i>Prophysaon coeruleum</i>	0	0	1	0	2	3	0.4
Scarletbacked Taildropper, <i>Prophysaon vanatta</i>	0	0	1	0	2	3	0.4
Snails (large; adult shell width \geq 8 mm):							
Pygmy Oregonian, <i>Cryptomastix germana</i>	1	0	0	0	5	6	0.8
Robust Lancetooth, <i>Haplotrema vancouverense</i>	5	1	11	2	12	31	4.4
Pacific Sideband, <i>Monadenia fidelis</i>	0	0	0	1	1	2	0.3
Northwest Hesperian, <i>Vespericola columbianus</i>	13	7	43	10	66	139	19.6

SPECIES	Bear Hill (n=2)	Mt Wells (n=2)	Mt Work (n=4)	Sooke Hills (n=2)	Thetis Lake (n=8)	# of animals	% of animals
Snails (small with adult shell width < 8 mm):							
Toothless Column, <i>Columella edentula</i>	0	0	0	0	2	2	0.3
Glossy Pillar, <i>Cochlicopa lubrica</i>	0	0	3	0	12	15	2.1
Brown Hive, <i>Euconulus fulvus</i>	0	0	9	0	21	30	4.2
Vancouver Snail, <i>Microphysula cookei</i>	0	2	0	0	5	7	1.0
Threaded Vertigo, <i>Nearctula</i> species 1	1	2	0	0	0	3	0.4
Blue Glass, <i>Nesovitrea binneyana</i>	0	2	1	1	6	10	1.4
Pinhead Spot, <i>Paralaeoma servilis</i>	0	0	0	0	1	1	0.1
Western Flat-whorl, <i>Planigyra clappi</i>	1	0	0	0	11	12	1.7
Tightcoil species, <i>Pristiloma</i> sp. (<i>P. stearnsii</i> and/or <i>P. lansingii</i>)	2	13	12	10	80	117	16.5
Conical Spot, <i>Punctum randolphii</i>	4	7	10	6	4	31	4.4
Northwest Striate, <i>Striatura pugetensis</i>	0	0	1	0	4	5	0.7
<i>Vertigo</i> species	0	3	0	3	1	7	1.0
Western Glass-snail, <i>Vitrina pellucida</i>	0	0	0	0	6	6	0.8
Quick Gloss, <i>Zonitoides arboreus</i>	0	1	1	0	3	5	0.7

In Thetis Lake Regional Park, two slugs were found, one per site, on 13 November. Habitats consisted of relatively open-canopy forest with dense understorey of either shrubs (Transect 4) or of shrubs and grass (Transect 7) (Table 5). Transect 7 was in open woodland with Douglas-fir, Garry oak, and arbutus, and Transect 4 was in an old Douglas-fir stand at the edge of a rocky knoll with ocean spray patches and deep moss. Habitat at Transect 4 appeared to be in a relatively natural condition, heavy salal cover discouraging visitor access to the upper slope forest and the adjacent rocky knoll. However, the habitat to the south and closer to the lake shore showed damage from visitor use. Habitat at the other Blue-grey Taildropper site (Transects 6 – 7) was more disturbed. Invasive plants, particularly laurel-leaved Daphne, were prevalent and appeared to be spreading. Recent collection of woody debris had taken place at the site, as evidenced by several brush piles near 2008 and 2009 slug locations, possibly from fuel-reduction efforts to reduce risk of wildfires.

In Mt. Work Regional Park, one slug was found on 8 December. The habitat consisted of relatively open woodland with Douglas-fir and arbutus. The understorey was sparse, but a moss layer carpeted the ground.

On 6 December 2010, one of us (KO) opportunistically encountered two Blue-grey Taildroppers in a Saanich municipal park. The slugs were crossing a trail within a few meters from each other, moving uphill. The air temperature at ground level was only 2°C. Subsequent examination of the entire trail looping through the park revealed no further slugs of this or other species. The slugs were found on a wooded slope with bigleaf maple and Douglas-fir, including some very large trees, and a dense shrub understorey of mainly salal (Table 5). A moist riparian area with alder was at the bottom of the slope, about 30 m away.

Table 5. Habitat at locations of Blue-grey Taildropper records in 2010.

ACO refers to identification of artificial cover-object where the slugs were found along the transects. Herbaceous plants could not be assessed due to time of year (November - December)

Habitat feature	Thetis Lake Regional Park: Transect 4 (ACO 3A)	Thetis Lake Regional Park: Transect 7 (ACO 12B)	Mt. Work Regional Park: Transect 4 (ACO 10B)	Saanich municipal park (on trail)
Dominant tree species	Douglas-fir	Garry oak, Douglas-fir, arbutus	Douglas-fir, arbutus, western redcedar	Douglas-fir, bigleaf maple
Dominant shrub species	salal, Oregon grape, ocean spray, rose (90%)	Oregon grape, laurel-leaved Daphne, trailing blackberry, Scotch broom	ocean spray, salal, Oregon grape, honeysuckle	salal, Oregon grape, ocean spray
Fern species	None	None	sword fern	sword fern
% canopy closure	40	20	50	40
Shrubs: % coverage	90	30	10	90

Habitat feature	Thetis Lake Regional Park: Transect 4 (ACO 3A)	Thetis Lake Regional Park: Transect 7 (ACO 12B)	Mt. Work Regional Park: Transect 4 (ACO 10B)	Saanich municipal park (on trail)
Herbs: % coverage	Trace	90(grass)	5	
Ferns: % coverage	0	0	2	20
Coarse Woody Debris: % coverage	5	5		10
Substrate	leaf/needle	leaf/needle/grass	needles/ moss	leaf/needle/moss
Comments	Very large Douglas-fir trees; edge of Garry oak knoll in the forest; dense understorey of mostly salal	Woodland on edge of open outcropping; ground covered with dense grass with shrub patches	South-facing, semi-open second growth forest; sparse understorey with extensive moss cover and cobbly substrate	Southeast wooded slope with moist riparian area at the bottom; some very large Douglas-fir trees

Other native species of gastropods found on the two transects with the Blue-grey Taildropper in Thetis Lake Regional Park included the Pacific Banana Slug, Meadow Slug, Reticulate Taildropper, and Scarletback Taildropper, as well as a number of species of snails (Table 6). Introduced slugs occurred were particularly prevalent on Transects 6 and 7 in Thetis Lake Regional Park (Table 6).

Table 6. Species and numbers of gastropod species found on transects in Thetis Lake Regional Park with records of the Blue-grey Taildropper in 2010.

Numbers in cells denote total number of individuals found.

SPECIES	Thetis Lake: Transect 4	Thetis Lake: Transect 6^	Thetis Lake: Transect 7	Mt Work: Transect 4
Slugs:				
Pacific Banana-slug, <i>Ariolimax columbianus</i>	3	1	0	3
Hedgehog Arion, <i>Arion intermedius</i> *	0	105	17	0
Brown-banded Arion, <i>Arion circumscriptus</i> *	0	1	0	0
Chocolate Arion, <i>Arion rufus</i> *	0	0	3	0
Arion species (unidentified juveniles)	1	0	0	0
Meadow Slug, <i>Deroceras laeve</i>	0	1	0	0
Longneck Fieldslug, <i>Deroceras panormitanum</i> *	0	2	0	0
Grey Fieldslug, <i>Deroceras reticulatum</i> *	0	21	20	0
Giant Gardenslug, <i>Limax maximus</i> *	3	0	1	0
Reticulate Taildropper, <i>Prophysaon andersonii</i>	0	1	5	0
Blue-grey Taildropper, <i>Prophysaon coeruleum</i>	1	0	1	1
Scarletbacked Taildropper, <i>Prophysaon vanatta</i> e	0	2	0	0

SPECIES	Thetis Lake: Transect 4	Thetis Lake: Transect 6 [^]	Thetis Lake: Transect 7	Mt Work: Transect 4
Snails (large; adult shell width \geq 8 mm):				
Pygmy Oregonian, <i>Cryptomastix germana</i>	0	0	5	0
Robust Lancetooth, <i>Haplotrema vancouverense</i>	0	1	1	2
Pacific Sideband, <i>Monadenia fidelis</i>	0	1	0	0
Northwest Hesperian, <i>Vespericola columbianus</i>	20	0	3	14
Snails (small with adult shell width < 8 mm):				
Brown Hive, <i>Euconulus fulvus</i>	4	0	0	0
Blue Glass, <i>Nesovitrea binneyana</i>	1	0	0	0
Pinhead Spot, <i>Paralaeoma servilis</i>	0	0	1	0
Tightcoil species, <i>Pristiloma</i> sp. (<i>P. stearnsii</i> and/or <i>P. lansingii</i>)	6	3	2	3
Conical Spot, <i>Punctum randolphii</i>	0	0	1	7
Northwest Striate, <i>Striatura pugetensis</i>	1	1	0	0
Western Glass-snail, <i>Vitrina pellucida</i>	0	1	5	0

[^]Blue-grey Taildropper found on present Transect 6 in 2008 & 2009 but not in 2010; included here because Transect 6 is in the same habitat as Transect 7, which it joins.

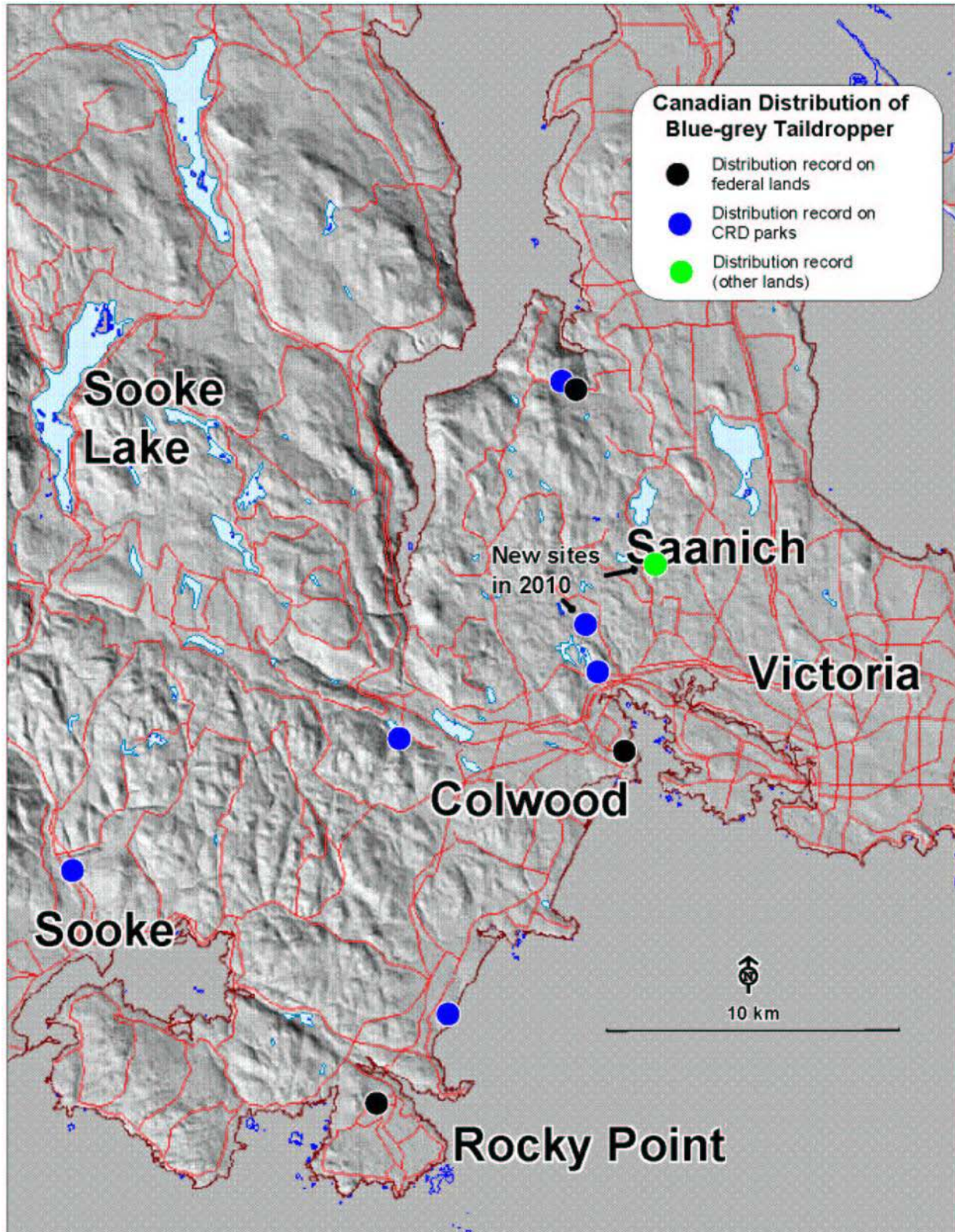
6.0 DISCUSSION

6.1 Blue-grey Taildropper

In 2010, we found the Blue-grey Taildropper at two sites in Thetis Lake Regional Park, one site in Mt. Work Regional Park, and opportunistically in a Saanich municipal park. Two of the sites represent new locations for the species (Figure 2). The observation near Prior Lake in Thetis Lake Regional Park extends the known distribution of the species within the park. There are no other observations of the species from the park or its vicinity. The record from the Saanich park is the easternmost known location, about 3.5 km northeast of the nearest previous observation.

The species has been found in various habitats but seems to prefer relatively open-canopy forests with dense understorey vegetation (COSEWIC 2006, Ovaska and Sopuck 2009). The results of this year's surveys partially support this suggestion, as all observations were in relatively open-canopy Douglas-fir-dominated woodlands. While a dense understorey was present at the Thetis Lake and Saanich municipal park sites, there were few shrubs and herbaceous plants at the Mt. Work site. An extensive moss layer at that site might have provided suitable moist microclimates for the slugs on the forest floor. At some locations, including one of the Thetis Lake sites, the species is associated with Garry oak/arbutus woodlands. Details of the slugs' habitat use remain poorly known and are hindered by small sample sizes of often only one slug per site.

Figure 2. Summary of known occurrences of the Blue-grey Taildropper on Vancouver Island.



Only three Blue-grey Taildroppers were found during the artificial cover-object surveys, one per site. Two slugs were found on 13 November, only a few days before the onset of cold weather with sub-freezing conditions (up to about -10°C). An opportunistic observation of two additional slugs took place on 6 December, prompting an additional survey of all cover-objects after the return of milder conditions. This survey resulted in the finding of one Blue-grey Taildropper on 8 December. During the latter half of November, the area had experienced cold, below-freezing conditions, and the ground had been covered with snow until only shortly before the observations took place. Interestingly, both opportunistically found slugs were actively moving at a temperature only slightly above freezing. Milder conditions persisted until the end of the surveys in mid-December, and low numbers of several species of gastropods were found using the artificial cover-objects.

In previous years, the Blue-grey Taildropper has also been located most readily late in the fall, up to early December (Ovaska and Sopuck 2009). The slugs may be relatively sedentary throughout much of the growing season but move more in late fall, perhaps in search of hibernation or egg-laying sites. The life history and extent of seasonal movements of the slugs remain poorly known.

Information on the occurrence and distribution of this species is essential for appropriate management. CRD Regional Parks provide relatively large areas of natural ecosystems within a populated and largely developed landscape and provide refuges for a range of species at risk, including gastropods. This study contributes to the expanding database on terrestrial gastropods at risk within CRD Parks properties (Appendix 3).

Potential habitat for the Blue-grey Taildropper and other gastropods at risk also exists in other municipal parks and on private residential lands, especially in areas with large, wooded lots. In 2010, landowner contacts were initiated in potentially suitable habitats, and surveys using artificial cover-objects were started on one property. The species was not found, but the landowners will continue monitoring cover-objects. Involving more landowners in the program is planned for next year.

6.2 Other gastropod species at risk

In addition to the Blue-grey Taildropper, three other listed species were found, Threaded Vertigo, Pacific Sideband, and Scarletback Taildropper. The red-listed Threaded Vertigo is a minute snail found on parts of Vancouver Island, southern Gulf Islands, and the Sunshine Coast of the mainland (COSEWIC 2010). It is a mainly arboreal species often found on trunks of Bigleaf Maple trees but occasionally in the leaf litter or understorey vegetation. We found it under cardboard cover-objects at Bear Hill and Mt. Wells Regional Parks (3 snails found). Both sites represent new occurrence records for the species. Previously, the species is known from Devonian Regional Park and from several locations along the Galloping Goose right-of-way in Sooke and Metchosin areas (COSEWIC 2010).

The blue-listed Pacific Sideband is our largest land snail on the west coast. The species is relatively widespread in low-elevation mixed-wood stands forests on Vancouver Island and the mainland coast. In 2010, we found this species in Sooke Hills Wilderness Reserve and in Thetis Lake Regional Park. There are previous records of the species from many locations within the CRD, including regional parks.

The blue-listed Scarletback Taildropper is relatively widespread in mixed-wood and coniferous forests in coastal B.C. but appears to be uncommon in lowland forests within the CRD. In 2010, we found it in Mt. Work and Thetis Lake Regional Parks; three individuals were found, two near one of the Blue-grey Taildropper sites at Thetis Lake.

6.0 SITE-SPECIFIC THREATS AND RECOMMENDED MITIGATION

Populations and habitats of the Blue-grey Taildropper are not necessarily safe in parks and protected areas, unless appropriately managed. One of the Blue-grey Taildropper sites at Thetis Lake Regional Park (Transects 6 – 7) is heavily disturbed by introduced plants and gastropods and is crisscrossed by numerous unofficial paths. The other Blue-grey Taildropper site in this park, near Prior Lake, also contains many unofficial paths, especially near the lakeshore, and shows damage from recreational use. The area is presently closed for habitat restoration, but visitors continue to access the area. The Saanich municipal park where the species was found receives relatively heavy recreational use and is vulnerable to disturbance.

The following mitigation measures are recommended for these and other sites occupied by Blue-grey Taildroppers (extracted but slightly modified from a more comprehensive list in Ovaska and Sopuck 2009):

1. Threat: Excessive trail networks causing disturbance to vegetation and compaction of litter/soil layer.

Mitigation measures:

- Avoid creating new trails or widening existing ones in slug habitat.
- Deactivate and reclaim trails that are not required.
- Reclaim trails that are excessively wide or eroded.
- Recondition soil layer and plant native vegetation in areas devoid of vegetation due to trampling and compaction.
- Install barriers, such as large logs or brush piles, on closed trail entrances to discourage unauthorized visitor access

2. Threat: ATV/vehicle use causes disturbance to habitat, destroys trails, and has the potential to result in mortality of slugs and other animals.

Mitigation measure:

- Install boulders or other barriers at trail entrances where unauthorized ATV/vehicle use is a problem.

3. Threat: Introduced plants and animals degrade habitat. Introduced plants such as Laurel-leaved Daphne, English ivy and Scotch broom, create monocultures that reduce complexity of the understory layer and are potentially detrimental to the Blue-grey Taildropper. Introduced gastropods are very abundant at some occupied sites (such as Transects 6 & 7 at Thetis Lake) and may compete with or prey on Blue-grey Taildroppers.

Mitigation measures:

- Remove invasive plants where possible, but do so with care so that native vegetation and the soil/litter layer are minimally disturbed; avoid disturbance to the habitat in the fall when Blue-grey Taildroppers are most active.
- Initiate control measures for invasive laurel-leaved Daphne at one of the Blue-grey Taildropper site by Transects 6 & 7, where this plant appears to be spreading rapidly.

4. Threat: Fire management and vegetation removal may result in loss of valuable coarse woody debris.

Mitigation measures:

- If excessive woody fuel is present on the forest floor, remove only what is absolutely necessary and try to keep larger pieces of coarse woody debris intact.
- Avoid piling of brush right on locations where the species has been found and do not burn these piles.
- Ensure that personnel working on fuel reduction know where Blue-grey Taildroppers are before starting work.

5. Threat: Forest encroachment reducing the size of natural meadows and forest gaps.

Mitigation measures:

- Maintain forest gaps and open nature of Garry oak woodlands; it may be necessary to use tree girdling, selective tree felling, and prescribed burning to maintain the open nature of these habitats over the long term.
- Conduct an analysis of the problem for known Blue-grey Taildropper sites.

6. Threat: Climate change may alter habitats as a result of prolonged or more frequent droughts or other changes to the seasonal patterns of rainfall.

Mitigation measures:

- Maintain large areas of varied and undisturbed woodland habitats and avoid habitat fragmentation to maintain viable populations of the Blue-grey Taildropper over the long term.

8.0 SURVEY RECOMMENDATIONS FOR 2011

- In Thetis Lake Regional Park, continue monitoring cover-objects at existing transects with records of the species from spring through fall to increase knowledge of seasonal habitat use and life history of the Blue-grey Tailedropper.
- Continue surveys of existing transects in Bear Hill, Mt. Wells, Mt. Work, and parts of Thetis Lake Regional Parks and in Sooke Hills Wilderness Reserve, where the species has not yet been located; the species is difficult to detect, and surveys spanning several years are often required. Consider placing additional transects in strategic locations within these and other CRD Regional Parks with potentially suitable habitat.
- Collaborate with Saanich Municipality to initiate surveys in Saanich municipal parks.
- On residential lands in focal areas, encourage landowners to participate in survey and stewardship efforts.

8.0 LITERATURE CITED

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APPENDICES

Appendix 1. Sites surveyed with cardboard cover-objects for terrestrial gastropods in fall of 2010.

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Appendix 2. Habitat characteristics for sites searched for terrestrial gastropods in CRD in 2010.

Assessment conducted 18 - 20 October 2010.

Trees: Dominant species within 20 m radius at center of transect; Understorey vegetation (shrubs, ferns): Dominant species (total percentage of ground coverage by layer) within 10 m radius area at center of transect; note: herbaceous species could not be accurately assessed due to time of year (November). CWD: Coarse woody debris (logs, bark and other wood on the forest floor with diameter of 15 cm or more) within 10 m radius area near centre of transect.

Habitat rating: Assessed for Blue-grey Taildropper based on visual inspection of habitat on the ground: L –low, M-moderate, H–high.

Site name	Trans. ID	Dominant trees	Dominant shrubs	Dominant ferns	Canopy (%)	Shrub (%)	Herbs (%)	Ferns (%)	CWD (%)	Litter type (rel. depth)	Habitat rating	Comments (disturbance, habitat notes)
Bear Hill	1	Garry oak, Douglas-fir, arbutus	ocean spray, Oregon grape, snowberry	licorice fern	20	50	10	20	tr	leaves/ needles/ grass/ moss (moderate)	M	open woodland with dense ocean spray
Bear Hill	2	Garry oak, Douglas-fir, arbutus	ocean spray, Oregon grape, laurel-leaved Daphne, Scotch broom, snowberry, rose	licorice fern, sword fern	30	20	20	20	5	leaves/ needles/ grass/ moss (moderate)	M	semi-open D. fir/arbutus/G. oak forest; moss 50%
Mt Wells	1	Douglas-fir, arbutus, Garry oak	ocean spray, Scotch broom, salal, Oregon grape	sword fern, licorice fern	30	20	20	1	5	needles, moss (thin)	M	Moss-covered (80%), steep slope, fir/arbutus semi-open forest
Mt Wells	2	Douglas-fir, bigleaf maple, western hemlock, western redcedar	ocean spray, salal, Oregon grape, rose, trailing blackberry, red huckleberry	sword fern, licorice fern, bracken	50	50	yr	5	10	leaves / needles/ moss (moderate)	L-M	Closed mixedwood forest, boulders and rocks common, 70% moss
Mt Work	1	Douglas-fir, bigleaf maple, western	ocean spray, salal	sword fern	40	20		tr	10	moss	L-M	Variable shrub cover along transect; some large trees

Site name	Trans. ID	Dominant trees	Dominant shrubs	Dominant ferns	Canopy (%)	Shrub (%)	Herbs (%)	Ferns (%)	CWD (%)	Litter type (rel. depth)	Habitat rating	Comments (disturbance, habitat notes)
		redcedar										
Mt Work	2	Douglas-fir, arbutus, western redcedar	salal, Oregon grape, rose	sword fern	60	30		tr	5	moss	L-M	Transect fringes rocky knoll on latter part
Mt Work	3	Douglas-fir, arbutus	ocean spray, willow, salal, Oregon grape, rose, snowberry, trailing blackberry	nil	40	20	10	nil	5	needles, moss (thin)	M-H	semi-open D. fir/arbutus forest with o. spray, 95% moss covered
Mt Work	4	Douglas-fir, arbutus	ocean spray, salal, Oregon grape, rose, snowberry, trailing blackberry, honeysuckle	sword fern	50	40	20	1	5	needles/ leaves (moderate)	M-H	Semi-open Douglas-fir/arbutus forest with ocean spray and salal; 40% moss
Prospect Lake (residential)	1	arbutus, Douglas-fir, Garry oak	ocean spray, salal, Oregon grape	sword fern, lady fern	40	10		tr	5	moss	M	Depression/shallow gully between rocky knolls
Sooke Wilderness	1	Douglas-fir	ocean spray, salal, Oregon grape, rose, willow, snowberry, trailing blackberry	bracken, sword fern, licorice fern	30	30	10	tr	10	needles/ moss (thin)	M	moss-covered, fairly dry site mainly on outcrop, open D.fir dominated forest
Sooke Wilderness	2	Douglas-fir, Garry oak, arbutus, shore pine	ocean spray, salal, Oregon grape, rose, trailing blackberry	sword fern, licorice fern	20	20	tr	tr	5	needles/ moss (thin)	M	open D.fir/arbutus forest , n. half on outcrop, 90% moss covered,

Site name	Trans. ID	Dominant trees	Dominant shrubs	Dominant ferns	Canopy (%)	Shrub (%)	Herbs (%)	Ferns (%)	CWD (%)	Litter type (rel. depth)	Habitat rating	Comments (disturbance, habitat notes)
Thetis Lake	1	Douglas-fir, arbutus, Garry oak	Oregon grape, ocean spray, trailing blackberry	sword fern	30	10		5	tr	moss	M	Extends from Garry oak knoll into open forest
Thetis Lake	2	Douglas-fir, Garry oak	ocean spray, salal, rose, Oregon grape	sword fern	40	10		tr	tr	moss	M	Rocky knoll; deep moss layer
Thetis Lake	3	bigleaf maple, Douglas-fir, western redcedar	red huckleberry, ocean spray, salal	sword fern	50	10		20	5	leaf (deep)	L-M	Rocky slope with maple leaves
Thetis Lake	4	Douglas-fir	salal, Oregon grape, ocean spray, rose	nil	40	90			15	leaf/ needle (moderate)	M	Old growth patch with some very large trees; edge of Garry oak knoll/opening
Thetis Lake	5	Douglas-fir, bigleaf maple, yew	salal, Oregon grape, ocean spray	nil	40	80			10	moss	L-M	Old growth; by rocky knoll
Thetis Lake	6	Garry oak, Douglas-fir	laurel-leaved Daphne, Oregon grape, snowberry, Scotch broom, honeysuckle	sword fern	30	90	tr	tr	2	leaves/ needles/ grass (moderate)	M-H	Semi-open G. oak/D.fir forest with grass dominating understorey; piles of woody debris on plot
Thetis Lake	7	Garry oak, Douglas-fir, bigleaf maple	Scotch broom, laurel-leaved Daphne, Oregon grape, snowberry	nil	10	10	90	nil	tr	leaves/ needles/ grass (moderate)	M-H	open-very open G. oak/D.fir forest with grass dominating understorey; large outcrop on N half of plot
Thetis Lake	8	Garry oak, arbutus, Douglas-fir	snowberry, Oregon grape	licorice fern	10	30		tr	tr	leaf/ moss/ grass	M-H	Garry oak knoll; transect ends under big maple

Appendix 3. History of terrestrial gastropod surveys in CRD Regional Parks and Trails System, 2003 – 2010.

Park or Trail	2003	2004	2006	2007	2008	2009	2010	Source
Bear Hill					Oct-Nov		Oct-Dec	Ovaska & Sopuck 2008, 2010 (this report)
Devonian		Sep-Nov	Oct-Nov	Nov	Apr-June; Oct-Nov	Oct-Dec		Ovaska & Sopuck 2004, 2006, 2007, 2008, 2009
East Sooke	Oct	Sep-Nov				Oct-Nov		Ovaska & Sopuck 2004, 2009
Francis/King		Sep-Nov				Oct-Nov		Ovaska & Sopuck 2004, 2009
Galloping Goose Trail at Sooke		Nov	Oct-Nov	Nov	May-Jun; Oct-Nov			Ovaska & Sopuck 2004, 2006, 2007; 2008
Lone Tree Hill		Sep-Nov						Ovaska & Sopuck 2004
Mattheson Lake		Sep-Nov						Ovaska & Sopuck 2004
Mill Hill			Nov					Ovaska and Sopuck 2006
Mount Wells					Oct-Nov	Oct-Nov	Oct-Dec	Ovaska & Sopuck 2008, 2009, 2010 (this report)
Mount Work		Sep-Nov	Oct-Nov	Nov-Dec	Apr-Jun; Oct-Nov	Oct-Nov	Oct-Dec	Ovaska & Sopuck 2004, 2006, 2007, 2008, 2009, 2010 (this report)
Sooke Hills Wilderness			Oct-Nov			Oct-Nov	Oct-Dec	Ovaska & Sopuck 2006, 2010 (this report)
Thetis Lake					Oct-Nov	Oct-Nov	Oct-Dec	Ovaska & Sopuck 2008, 2009, 2010 (this report)
Witty's Lagoon		Sep-Nov						Ovaska & Sopuck 2004
Survey effort (search of forest floor; person-minutes)	160	54*		160				
Survey effort (# ACO flips)		660	1390	260	2360	1620	1460	Ovaska & Sopuck 2009, 2010 (this report)

* At Galloping Goose Trail, where there were no artificial cover-objects (ACOs)

Appendix 4. Detailed locations of transects surveyed in 2010, including Blue-grey Tailedropper sites.

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