

# Recovery Strategy for the Blue-grey Taildropper (*Prophysaon coeruleum*) in Canada

## Blue-grey Taildropper



2018



Government  
of Canada

Gouvernement  
du Canada

Canada

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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)<sup>1</sup>.

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<sup>1</sup> <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

# RECOVERY STRATEGY FOR THE BLUE-GREY TAILDROPPER (*Prophysaon coeruleum*) IN CANADA

2018

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of British Columbia has given permission to the Government of Canada to adopt the *Recovery Plan for Blue-grey Taildropper (Prophysaon coeruleum) in British Columbia* (Part 2) under Section 44 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Blue-grey Taildropper Slug in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Plan for Blue-grey Taildropper (Prophysaon coeruleum) in British Columbia* prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Plan for Blue-grey Taildropper (Prophysaon coeruleum) in British Columbia*, prepared by the Blue-grey Taildropper Recovery Team for the British Columbia Ministry of Environment.

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Part 2 – *Recovery Plan for Blue-grey Tailedropper* (*Prophysaon coeruleum*) in *British Columbia*, prepared by the Blue-grey Tailedropper Recovery Team for the British Columbia Ministry of Environment.

**Part 1 – Federal Addition to the *Recovery Plan for Blue-grey Tailedropper* (*Prophyaon coeruleum*) in *British Columbia*, prepared by Environment and Climate Change Canada**

## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)<sup>2</sup> agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of Environment and Climate Change is the competent minister under SARA for the Blue-grey Tailedropper and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of British Columbia as per section 39(1) of SARA. SARA section 44 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Province of British Columbia provided the attached recovery plan for the Blue-grey Tailedropper (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment and Climate Change Canada.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Blue-grey Tailedropper and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment and Climate Change Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

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<sup>2</sup> <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area<sup>3</sup> be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

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<sup>3</sup> These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

## Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the *Recovery Plan for Blue-grey Tailedropper* (*Prophyaon coeruleum*) in *British Columbia* (Part 2 of this document, referred to henceforth as “the provincial recovery plan”) and to provide updated or additional information. In some cases, these sections may also include updated information or modifications to the provincial recovery plan for adoption by Environment and Climate Change Canada.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery plan referring to protection of survival/recovery habitat may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however, whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

## Acknowledgements

Kristiina Ovaska, Lennart Sopuck, and Christian Engelstoft of Biolinx Environmental Research Inc. drafted and/or contributed data/expertise to a preliminary version of this document.

### 1. Population and Distribution

This section replaces the information summary for known records of the Blue-grey Tailedropper in British Columbia (Table 1 in the provincial recovery plan).

The updated information summary below (Table 1) describes the distribution and abundance of recorded populations<sup>4</sup> in Canada. Since publication of the provincial recovery plan, two new populations have been identified. In West Saanich one individual was observed in 2014 (Ovaska and Sopuck 2014b) west of population #10 (Observatory Hill) and at Mt. Tzouhalem (Chase Woods), two individuals were observed in 2014 (Ovaska and Sopuck 2014a). The Chase Woods location, which is at the base of Mt. Tzouhalem near Duncan, is 25 km north of the nearest previously known population. The Prior Lake population (#12) was included in the Thetis Lake occurrence (#9) in the provincial recovery plan but is separated by >1 km and is thus treated as a separate population. All population numbers in this section align with those provided in Table 1 of the provincial recovery plan, aside from the additional populations described.

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<sup>4</sup> “Populations” are characterized as being separated by >1 km (Cordeiro 2004 in NatureServe 2013).



**Table 1.** Summary of Blue-grey Tailedropper populations in Canada. Location and last observation are shown for each population as appropriate. Population numbers align with those in Table 1 of the provincial recovery plan.

Population	Population Name	Last Observation
1	Devonian	2012
2	Durrance Lake (Mount Work/Cole Hill)	2014
3	Galloping Goose (Sooke River)	2004
4	Logan	2010
5	Matheson Lake	2014
6	Mill Hill - Colwood	2009
7	Rocky Point	2014
8	Sooke Hills	2009
9	Thetis Lake	2010
10	Observatory Hill	2015
11	Trevlac Pond	2011
12 *	Prior Lake	2011
13 **	Mt. Tzouhalem (Chase Woods)	2014
14 **	West Saanich	2014

\* Prior Lake was included in the Thetis Lake occurrence (#9) in the provincial recovery plan but is separated by >1 km and is thus treated as a separate population

\*\* New occurrence since provincial recovery plan

## 2. Critical Habitat

### 2.1 Identification of the Species' Critical Habitat

This section replaces section 7.1 "Description of Survival/Recovery Habitat" in the provincial recovery plan.

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. More precise boundaries may be mapped, and additional critical habitat may be added in the future if additional information supports the inclusion of areas beyond those currently identified. A primary consideration in the identification of critical habitat is the amount, quality, and locations of habitat needed to achieve the population and distribution objectives.

It is recognized that the critical habitat identified below is insufficient to achieve the population and distribution objectives for the Blue-grey Tailedropper. All known (and newly recorded) populations, and the habitat that supports them, are deemed necessary for the survival of the species. Detailed location information for some known populations is not available to Environment and Climate Change Canada (Population # 11 & 14).

Environment and Climate Change Canada will work with the applicable organizations and/or parties to complete the identification of critical habitat on those lands. The schedule of studies (Section 3.2) outlines the activities required to identify additional critical habitat necessary to support these objectives.

### **Geospatial location of areas containing critical habitat**

Critical habitat for the Blue-grey Tailedropper is identified at 12 locations in British Columbia, Canada:

- Population 1. Devonian (Figure 1)
- Population 2. Durrance Lake (Mount Work/Cole Hill) (Figure 6)
- Population 3. Galloping Goose (Sooke River) (Figure 2)
- Population 4. Logan (Figure 4)
- Population 5. Matheson Lake (Figure 1)
- Population 6. Mill Hill – Colwood (Figure 4)
- Population 7. Rocky Point (Figure 1)
- Population 8. Sooke Hills (Figure 3)
- Population 9. Thetis Lake (Figure 4)
- Population 10. Observatory Hill (Figure 5)
- Population 12. Prior Lake (Figure 4)
- Population 13. Mt. Tzouhalem (Chase Woods) (Figure 7)

Critical habitat for Blue-grey Tailedropper in Canada is identified within two zones:

1. Occupied zone:
  - occurrences for which detailed location information is available to Environment and Climate Change Canada, surrounded by an area with a 25 m radial distance to account for limited seasonal movement and error associated with GPS mapping.
2. Zone of influence:
  - an additional area with a 240 m radial distance delineated around the occupied zone to maintain a moist 'interior forest' microclimate (i.e., cooler temperatures and higher moisture levels) where the slugs occur. The 240 m radial area was selected based on edge effects studies from coastal forests (Voller 1998 and Chen et al. 1995). Voller (1998) found that the microclimatic influence of the forest edge (i.e., lower humidity) penetrates 200 m or more into mature coastal forests, meaning that a forested buffer of >200 m must be present in order to maintain unmodified 'interior' conditions within the centre of a patch. Chen et al. (1995) showed a similar pattern: that humidity is affected up to 240 m from the forest edge. The slightly larger 240-m distance was selected as a precautionary measure.

## Biophysical attributes of critical habitat

The Blue-grey Tailedropper requires habitats with features that provide/maintain moist conditions and provide cover, food (fungi and understory plants), and egg-laying/rearing substrate (Blue-grey Tailedropper Recovery Team 2012; Ovaska and Sopuck 2010, 2012, and 2014b). Specific biophysical attributes are summarized as follows.

Within the occupied zones (Figures 1-7), critical habitat is identified wherever any of these biophysical attributes occur:

- Mature (>50-year-old) mixed-wood overstory with semi-open canopy (20-70% closure; Ovaska and Sopuck 2010) that may contain Douglas-fir (*Pseudotsuga menziesii*), Grand Fir (*Abies grandis*), and/or Western Redcedar (*Thuja plicata*) along with a deciduous component of Arbutus (*Arbutus menziesii*), Garry Oak (*Quercus garryana*), Bigleaf Maple (*Acer macrophyllum*) and/or Trembling Aspen (*Populus tremuloides*), to maintain moisture, provide mycorrhizal fungi (for food), and contribute coarse woody debris and litter for localized moisture, cover, and egg-laying/rearing substrate;
- understory of shrubs (especially Oceanspray [*Holodiscus discolor*], Salal [*Gaultheria shallon*], Dull Oregon Grape [*Mahonia nervosa*], rose [*Rosa* spp.], and Trailing Blackberry [*Rubus ursinus*]), and grasses/herbs (often including Sword Ferns [*Polystichum munitum*]), to provide cover and maintain moisture;
- depressions, swales, seepage areas, or ephemeral wet areas, to provide moisture;
- well-developed litter/duff layer and/or coarse woody debris (at any stage of decay), to provide localized moisture, cover, and substrate for egg-laying/rearing and fungi growth (for food).

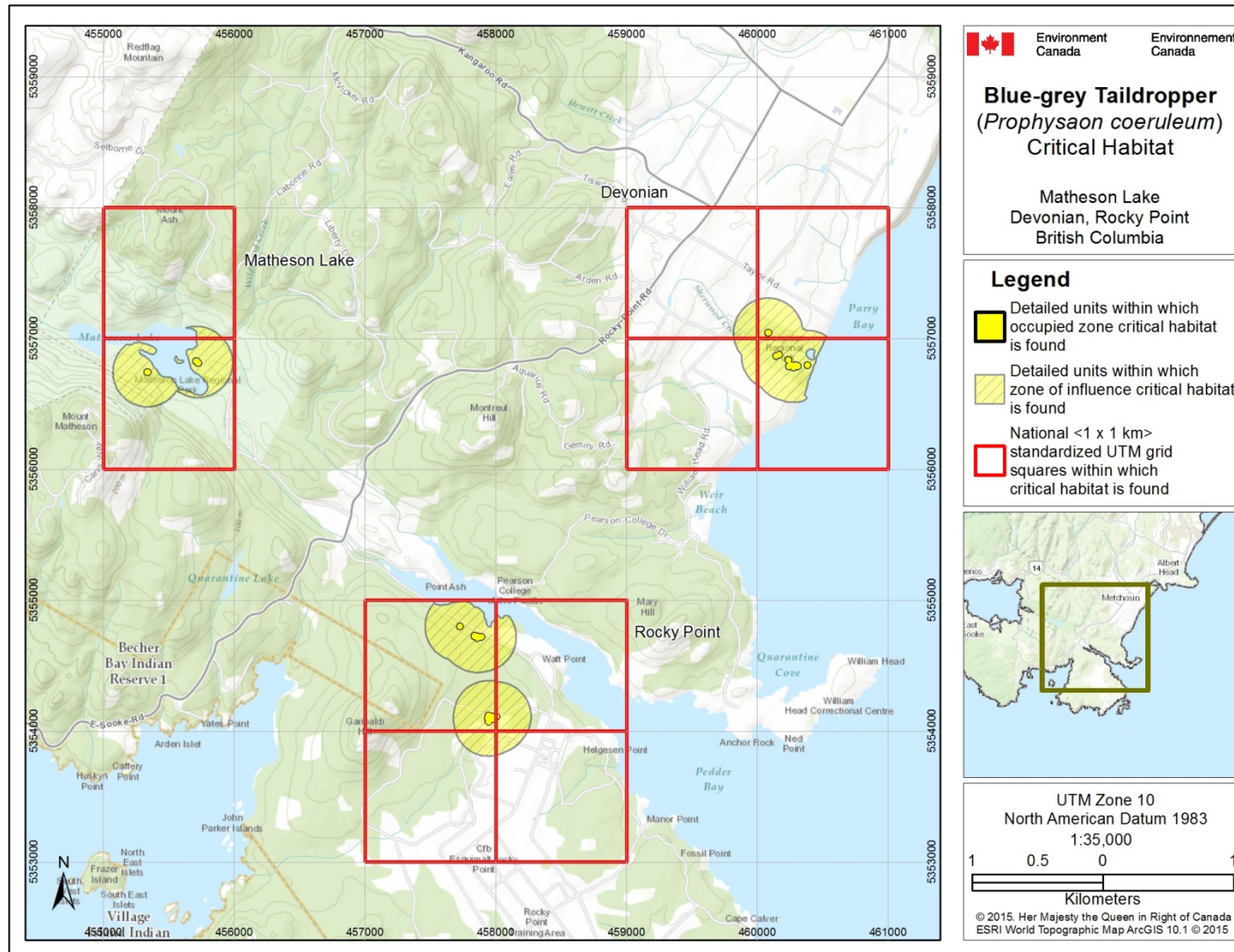
Within the zone of influence areas (Figures 1-7), critical habitat is identified wherever the following biophysical attribute occurs:

- Mature (>50-year-old) mixed-wood overstory with >20% canopy closure that may contain Douglas-fir (*Pseudotsuga menziesii*), Grand Fir (*Abies grandis*), and/or Western Redcedar (*Thuja plicata*) along with a deciduous component of Arbutus (*Arbutus menziesii*), Garry Oak (*Quercus garryana*), Bigleaf Maple (*Acer macrophyllum*) and/or Trembling Aspen (*Populus tremuloides*), to maintain moisture.

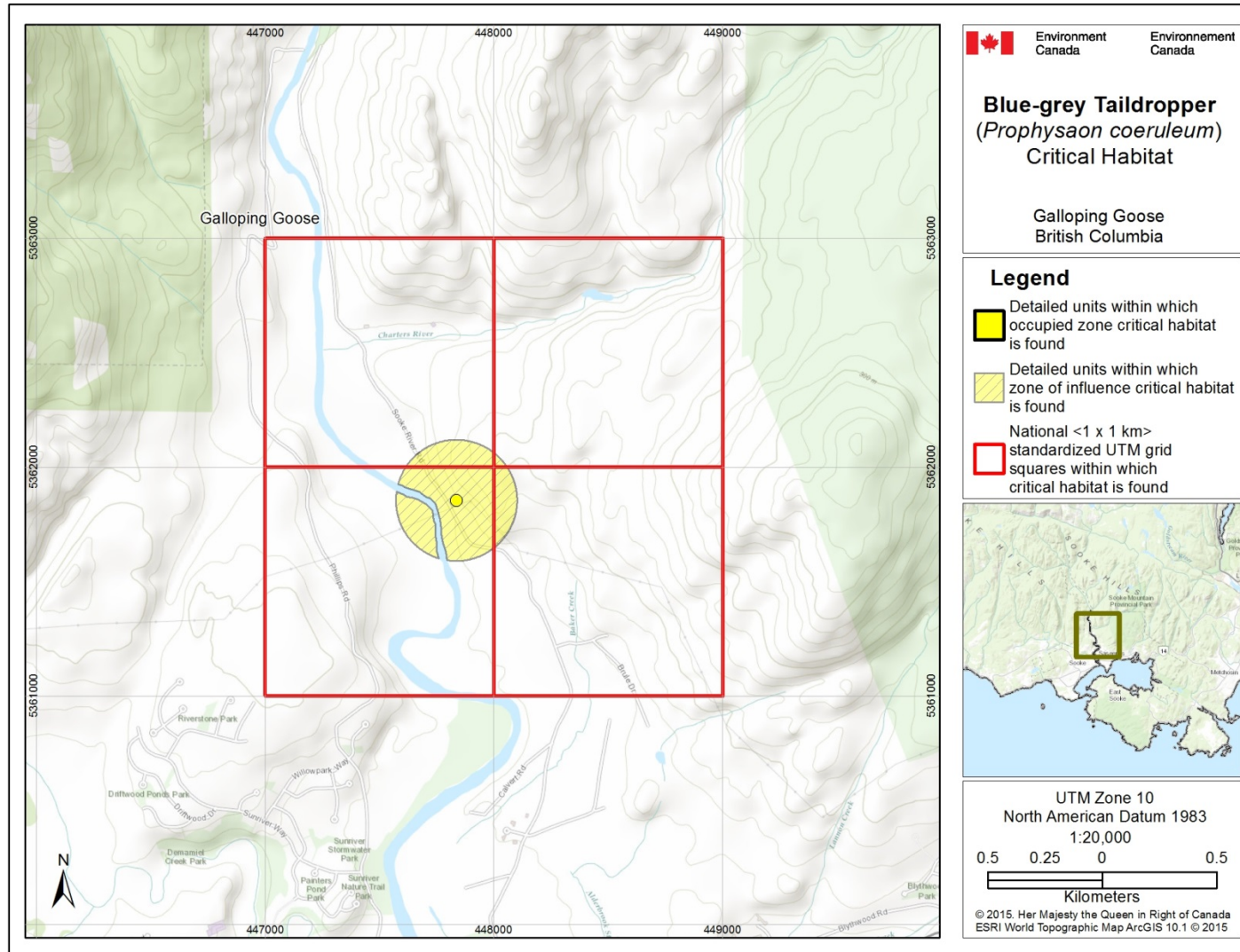
## Spatial Information on critical habitat

The areas containing critical habitat for Blue-grey Tailedropper are presented in Figures 1-7. Critical habitat for Blue-grey Tailedropper in Canada occurs within the shaded yellow polygons shown on each map, wherever the biophysical attributes described in this section occur. Unsuitable habitats such as dry meadows, open water

and anthropogenic features (e.g., buildings and roads) do not possess the attributes required by the Blue-grey Tailedropper and therefore are not identified as critical habitat. The 1 km x 1 km UTM grid overlay shown on these figures is a standardized national grid system that highlights the general geographic area containing critical habitat, for land use planning and/or environmental assessment purposes.

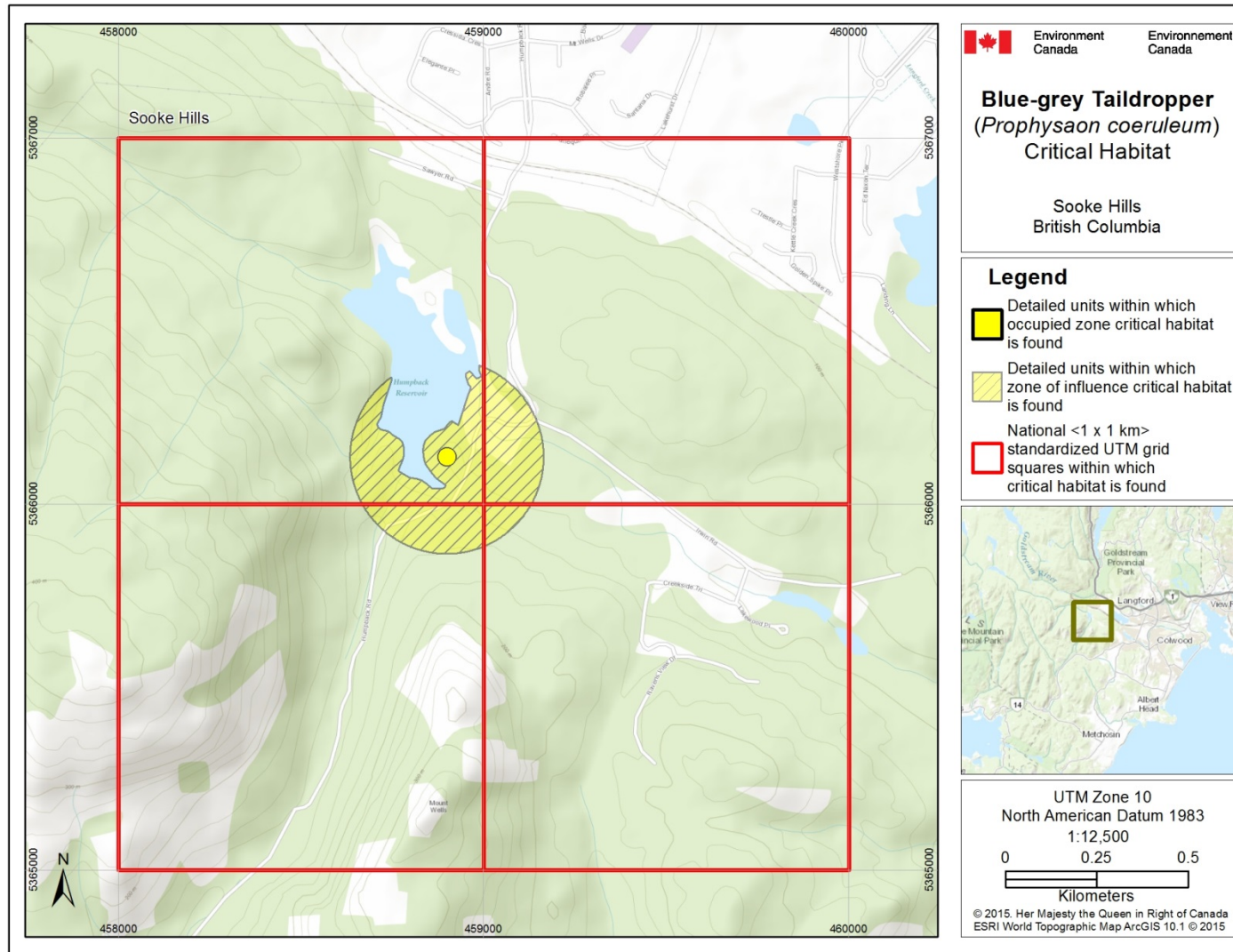


**Figure 1.** Critical habitat for the Blue-grey Tailedropper at Matheson Lake, Devonian, and Rocky Point, B.C. is represented by the yellow shaded polygons (units), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.

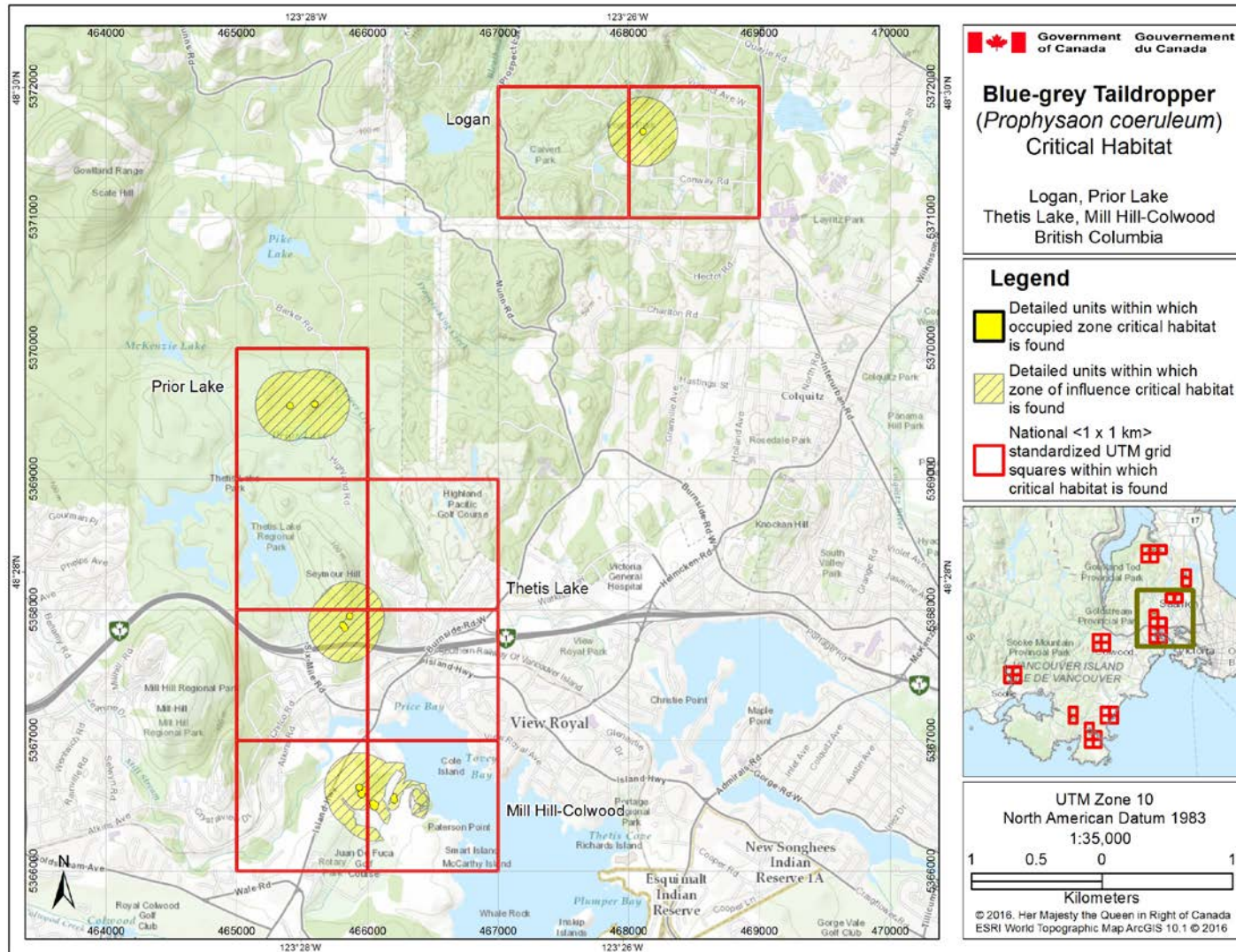


**Figure 2.** Critical habitat for the Blue-grey Tailedropper at Galloping Goose, B.C. is represented by the yellow shaded polygon (unit), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.



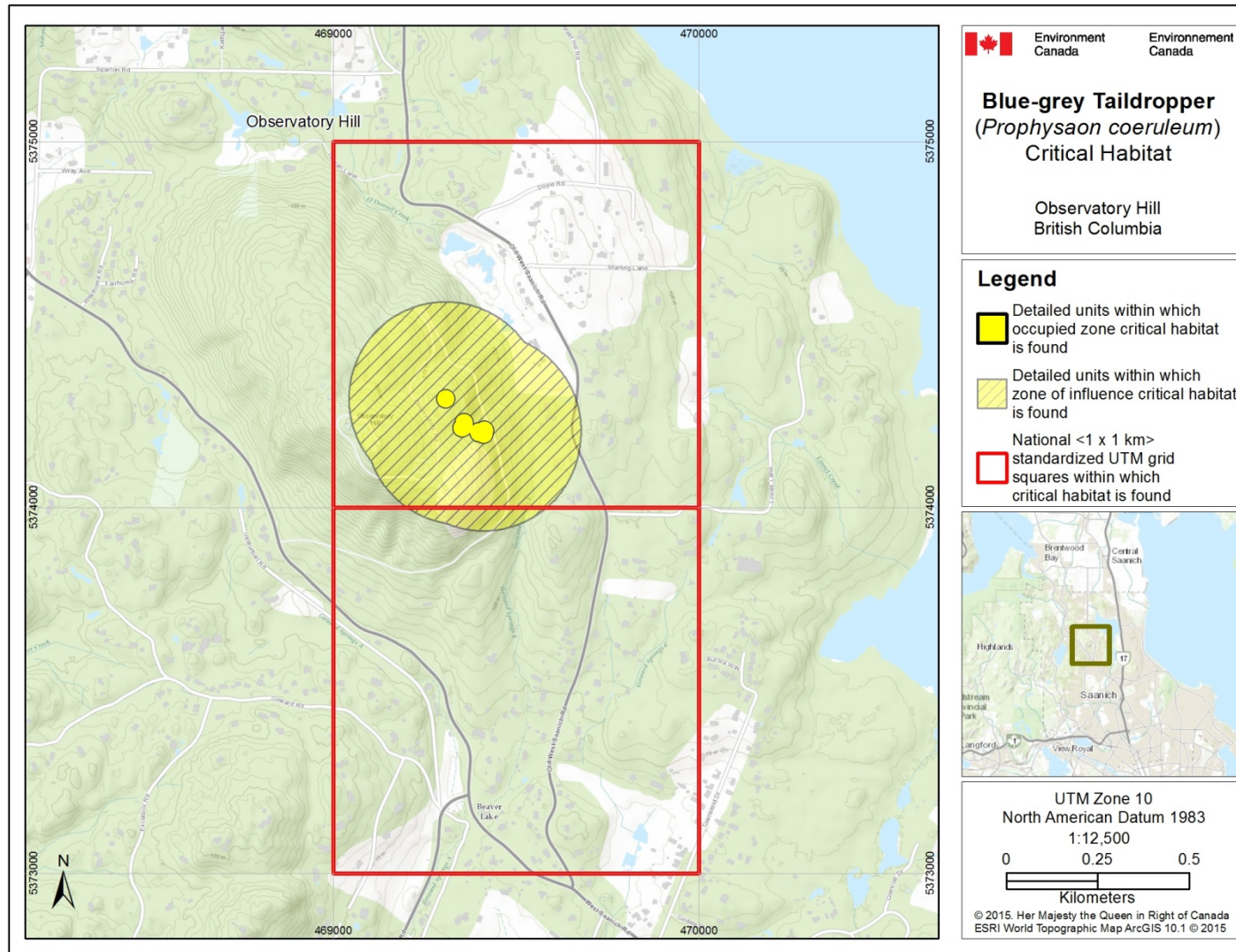


**Figure 3.** Critical habitat for the Blue-grey Tailedropper at Sooke Hills, B.C. is represented by the yellow shaded polygon (unit), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.

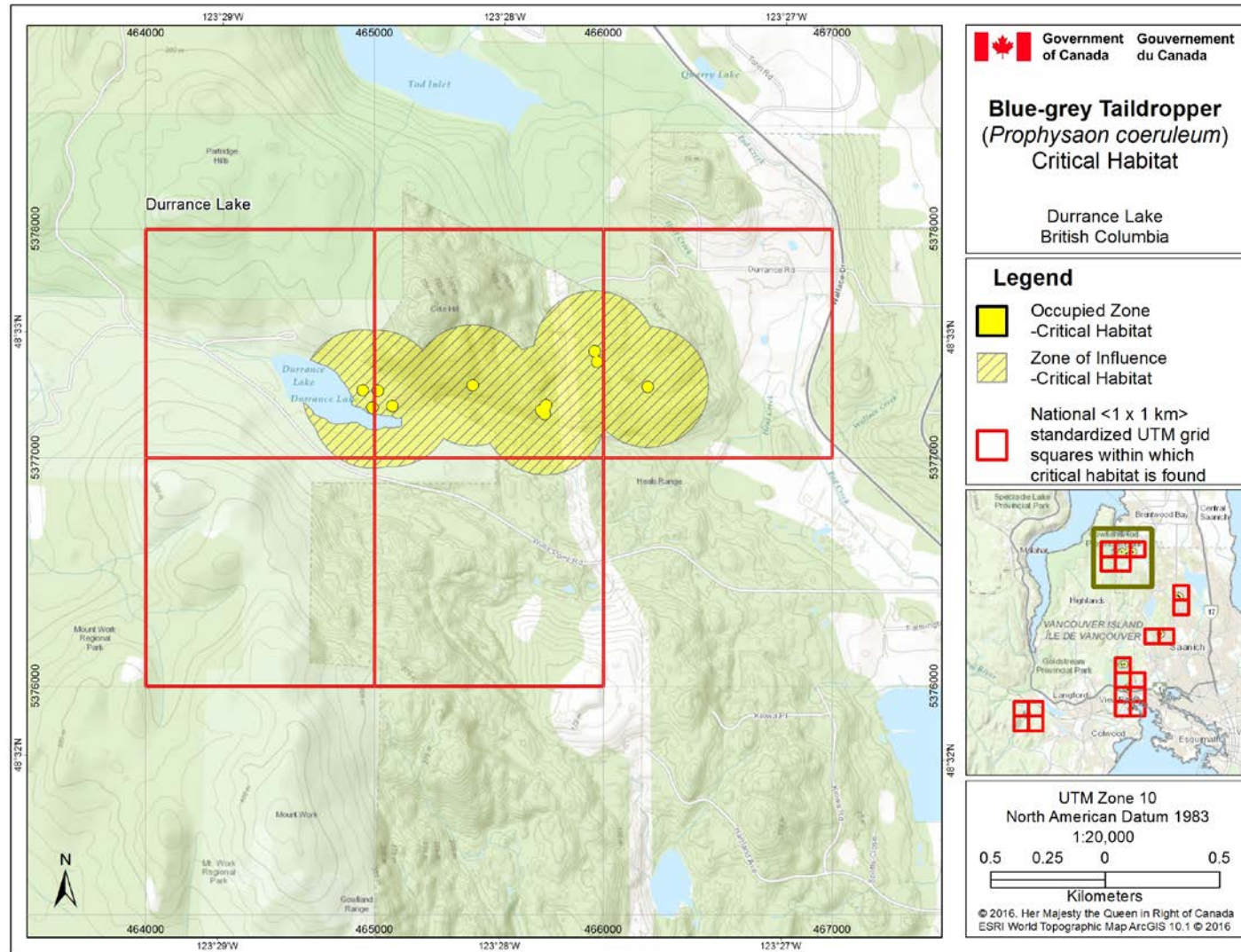


**Figure 4.** Critical habitat for the Blue-grey Tailedropper at Logan, Prior Lake, Thetis Lake, and Mill Hill-Colwood, B.C. is represented by the yellow shaded polygons (units), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.



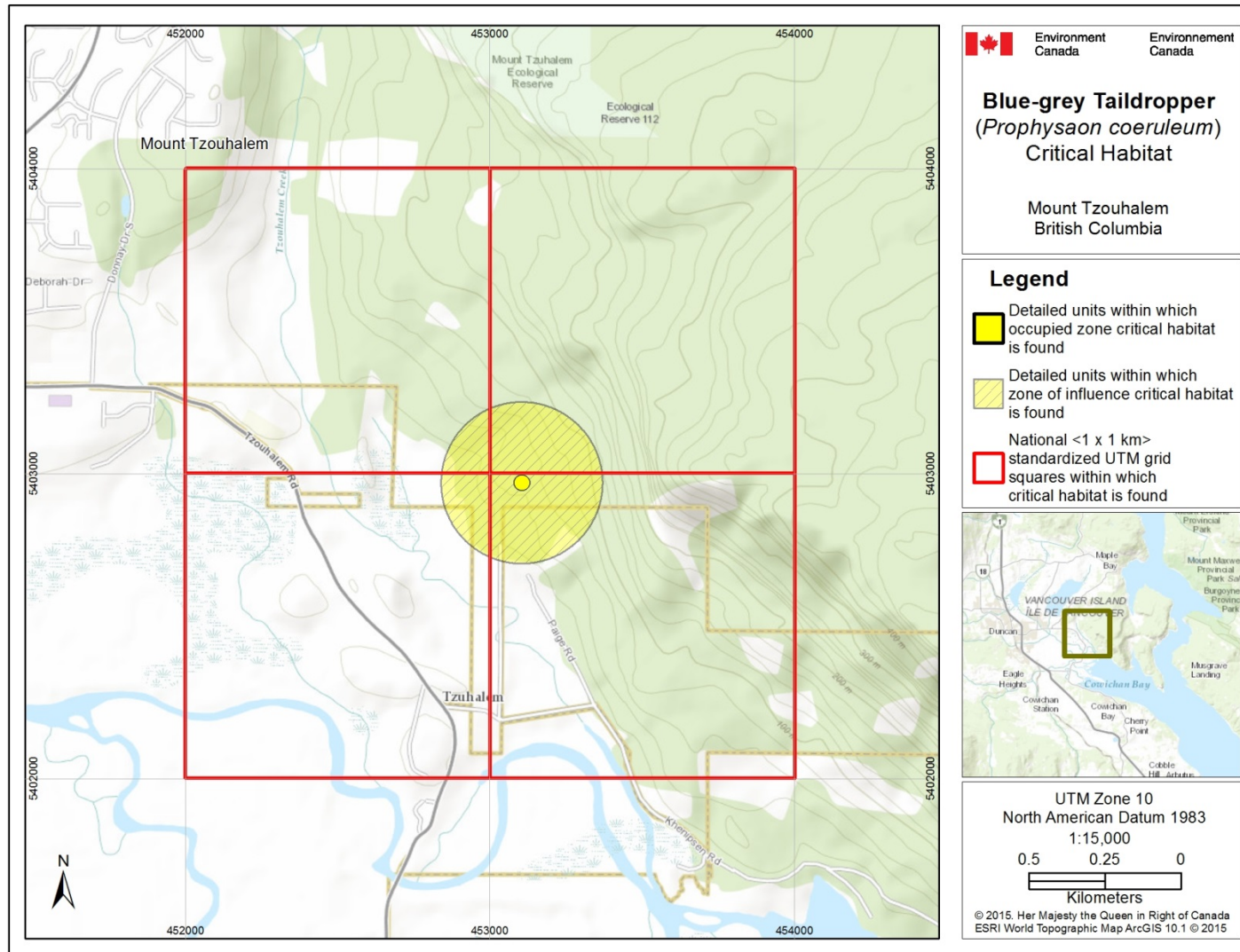


**Figure 5.** Critical habitat for the Blue-grey Tailedropper at Observatory Hill, B.C. is represented by the yellow shaded polygons (unit), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.



**Figure 6.** Critical habitat for the Blue-grey Tailedropper at Durrance Lake, B.C. is represented by the yellow shaded polygon (unit), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.





**Figure 7.** Critical habitat for the Blue-grey Tailedropper at Mt. Tzouhalem, B.C. is represented by the yellow shaded polygon (unit), in accordance with the criteria and methodology set out in section 2.1. The 1 km x 1 km standardized UTM grid overlay shown on this figure is part of a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside the shaded yellow polygons do not contain critical habitat.

## 2.2 Schedule of Studies to Identify Critical Habitat

This section replaces section 7.2, “Studies Needed to Describe Survival/Recovery Habitat”, in the provincial recovery plan. The following schedule of studies will enable the identification of critical habitat for the Blue-grey Tailedropper at additional locations in British Columbia.

**Table 2.** Schedule of studies to identify critical habitat for Blue-grey Tailedropper.

Description of activity	Rationale	Timeline
Obtain data sharing agreements with appropriate individuals permitting access to known, but not yet available, detailed location information (populations #11 & 14).	This will allow for the identification of critical habitat to support all known populations.	2018 - 2022

## 2.3 Activities Likely to Result in Destruction of Critical Habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single or multiple activities at one point in time or from the cumulative effects of one or more activities over time.

Activities described in Table 3 include those likely to cause destruction of critical habitat within the ‘occupied zone’ for the species. Table 4 includes activities likely to cause destruction of critical habitat within the ‘zone of influence’. Destructive activities are not limited to those listed.

**Table 3.** Activities likely to result in destruction of ‘occupied zone’ critical habitat of the Blue-grey Tailedropper.

Description of Activity	Description of effect	Details of effect
Activities involving complete removal/loss of critical habitat (e.g., construction of new or expansion of existing residential/industrial/recreational developments or transportation).	Results in loss of all critical biophysical attributes.	Related IUCN Threat #1.1, 1.2, 1.3, 4.1.
Tree removal activities that result in <20% canopy cover (e.g., logging).	Significant removal of the overstorey can eliminate/alter the moist microclimate and reduce the presence of mycorrhizal fungi (food) and the supply of coarse woody debris and litter (cover and egg-laying/rearing substrate).	Related IUCN Threat #5.3. Limited/small-scale removal of trees (not accompanied by significant disturbance of the understorey/forest floor) can be beneficial for Blue-grey Tailedropper if it results in old-growth-like canopy conditions.
Activities that alter the understory and forest floor substrate (e.g., brush clearing, burning, woody debris removal, addition of bark mulch or other substrate [for trail construction], and herbicide application).	Removal of understorey plants and coarse woody debris or the addition of non-natural substrates can eliminate/alter the moist microclimate and reduce the availability of critical cover, food (plants and fungi), and egg-laying/rearing substrate.	Related IUCN Threat #7.1. Removal of invasive plants is recommended but should be carried out with care to minimize soil disturbance and avoid compaction of the forest floor by trampling. The information available at this time is insufficient to develop a threshold for this activity.
Intensive recreational use (e.g., camping, concentrated hiker traffic, off-road operation of motorized or non-motorized vehicles such as mountain bikes, ATVs and dirtbikes).	Intensive recreational use can lead to soil compaction, which could alter/eliminate moist microfeatures such as seeps and swales and reduce the growth of fungi (food). Recreational vehicles can also introduce invasive plant species by spreading seeds from nearby areas; some invasive plant species can grow into dense monocultures that reduce/alter soil moisture.	Related IUCN Threat #6.1. Recreational trails are present in the vicinity of all Blue-grey Tailedropper populations. The information available at this time is insufficient to develop a threshold for this activity.
Intentional planting or introduction of invasive plants (e.g., dumping of garden waste or other plant materials into natural habitats, hydroseeding with non-native species).	Some invasive plant species (e.g., Scotch Broom [ <i>Cytisus scoparius</i> ] and Spurge-laurel [ <i>Daphne laureola</i> ]) can grow into dense monocultures that reduce/alter soil moisture.	Related IUCN Threat #8.1. Scotch Broom has been recorded at populations #7 & 9. Spurge-laurel has been recorded at population # 9.

**Table 4.** Activities likely to result in destruction of ‘zone of influence’ critical habitat of the Blue-grey Tailedropper.

Description of Activity	Description of effect	Details of effect
Tree removal activities that result in <20% canopy cover (e.g., logging, construction of new or expansion of existing residential/industrial/recreational developments or transportation).	Significant removal of the overstorey within the zone of influence can eliminate/alter the moist microclimate within the occupied zone.	Related IUCN Threat #1.1, 1.2, 1.3, 4.1, and 5.3. Limited/small-scale removal of trees can be beneficial for Blue-grey Tailedropper if it results in old-growth-like canopy conditions.

### 3. Measuring Progress

This section replaces the “Measuring Progress” section in the provincial recovery plan.

The performance indicators presented below provide a way to define and measure progress towards achieving the population and distribution objective set out in the provincial recovery plan.

- Blue-grey Tailedropper populations are stable or increasing in abundance.

In addition to this performance indicator, the performance measures set out in the provincial recovery plan (section 8) will provide pertinent information to assess interim progress towards achieving the ultimate population and distribution goal.

### 4. Statement on Action Plans

This section replaces the “Statement on Action Plans” section in the provincial recovery plan.

One or more action plans for the Blue-grey Tailedropper will be posted on the Species at Risk Public Registry by 2021.

### 5. Effects on the Environment and Other Species

This section replaces the “Effects on Other Species” section in the provincial recovery plan.

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#)<sup>5</sup>. The purpose of a SEA is to

<sup>5</sup> [www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1](http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1)

incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s<sup>6</sup> (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

Negative impacts to other species are not anticipated and are unlikely. Habitat protection and management that promote conservation of the Blue-grey Tailedropper are expected to benefit other organisms occupying similar woodland habitats, as well as endangered Garry Oak ecosystems.

The following species at risk are known to or might co-occur with this species:

Terrestrial gastropods (COSEWIC status):

- Warty Jumping-slug (*Hemphillia glandulosa*) (Special Concern 2003), which is known from similar habitats on southern Vancouver Island and co-occurs with the Blue-grey Tailedropper at least at one location.
- Threaded Vertigo (*Nearctula* sp. 1) (Special Concern 2010), which is known from similar habitats on southern Vancouver Island and co-occurs with the Blue-grey Tailedropper at least at two locations.
- Puget Oregonian Snail (*Cryptomastix devia*) (Extirpated 2002). The two species overlap in their habitat use in the United States (Pilsbry 1940), but no recent Canadian records exist.

Plants (COSEWIC status):

Scouler's Corydalis (*Corydalis scouleri*) (Threatened 2001)  
Phantom Orchid (*Cephalanthera austini*) (Threatened 2000)  
Coastal Wood Fern (*Dryopteris arguta*) (Special Concern 2001)  
Streambank Lupine (*Lupinus rivularis*) (Endangered 2002)

Refer to section 9 (Effects on Other Species) of the provincial recovery plan for a full list of species that may benefit from recovery efforts for the Blue-grey Tailedropper Slug. Recovery planning activities for Blue-grey Tailedropper Slug will be implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to these species or their habitats

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<sup>6</sup> [www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1](http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1)

## 6. References

- Blue-grey Taildropper Recovery Team. 2012. Recovery plan for Blue-grey Taildropper (*Prophysaon coeruleum*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 36 pp.
- Chen, J., J.F. Franklin, and T.A. Spies. 1995. Growing-season Microclimate Gradients from Clearcut Edges into Old-Growth Douglas-Fir Forests. *Ecological Applications* 5:74-86.
- Cordeiro, J. 2004. Population/occurrence delineation – terrestrial snails. Section *in* NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available: <http://www.natureserve.org/explorer> (accessed February 2013).
- COSEWIC 2006. COSEWIC assessment and status report on the Blue-grey Taildropper slug *Prophysaon coeruleum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 27 pp.  
<[www.sararegistry.gc.ca/status/status\\_e.cfm](http://www.sararegistry.gc.ca/status/status_e.cfm)>
- NatureServe. 2015. NatureServe Explorer: an online encyclopedia of life [web application]. Version 7.1. Arlington, V.A. <[www.natureserve.org/explorer](http://www.natureserve.org/explorer)> [Accessed May, 2015].
- Ovaska, K. and L. Sopuck. 2010. Surveys for the Blue-grey Taildropper and other gastropods at risk with focus on Capital Regional District Parks, fall 2010. Report prepared for Habitat Acquisition Trust, Victoria, BC. 30 pp.
- Ovaska, K. and L. Sopuck. 2012. Surveys for the Blue-grey Taildropper and other gastropods at risk with focus on Capital Regional District Parks, fall 2011. Report prepared for Habitat Acquisition Trust, Victoria, BC. 30 pp.
- Ovaska, K. and L. Sopuck. 2014a. Surveys for Blue-grey Taildropper and other gastropods at risk on southern Vancouver Island in 2014. Report prepared for Habitat Acquisition Trust, Victoria, BC. 28pp. + appendices.
- Ovaska, K. and L. Sopuck. 2014b. Surveys and Stewardship for Blue-grey Taildropper on southern Vancouver Island, autumn 2013. Report prepared for Habitat Acquisition Trust, Victoria, BC. 23pp. + appendices.
- Pilsbry, H.A. 1940. Land mollusca of North America (north of Mexico). Academy of Natural Sciences of Philadelphia, Monograph 3, 1(2):575–994, i–ix.
- Sopuck, L. and K. Ovaska. 2012. Surveys for the Blue-grey Taildropper and other gastropods at risk in the Capital Regional District, autumn 2011. Report prepared for Habitat Acquisition Trust, Victoria, BC. 30 pp.
- Voller, J. 1998. Biodiversity and Interior Habitats: The need to minimize edge effects. Part 6 of 7. Extension Note 21. BC Ministry of Forests. 8 pp.



**Part 2 – *Recovery Plan for Blue-grey Tailedropper*  
(*Prophyaon coeruleum*) in *British Columbia*, prepared by  
the Blue-grey Tailedropper Recovery Team for the  
British Columbia Ministry of Environment**

## Recovery Plan for Blue-grey Taildropper (*Prophysaon coeruleum*) in British Columbia



Prepared by Blue-grey Taildropper Recovery Team



Ministry of  
Environment

March 2012

## About the British Columbia Recovery Strategy Series

This series presents the recovery strategies or recovery plans that are prepared as advice to the Province of British Columbia on the general strategic approach required to recover species at risk. Recovery strategies or recovery plans are prepared in accordance with the priorities and management actions assigned under the British Columbia Conservation Framework. The Province prepares recovery strategies to ensure coordinated conservation actions and meet its commitments to recover species at risk under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk*.

### What is recovery?

Species at risk recovery is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

### What is a recovery strategy?

A recovery strategy summarizes the best available science-based knowledge of a species or ecosystem to identify goals, objectives, and strategic approaches that provide a coordinated direction for recovery. These documents outline what is and what is not known about a species or ecosystem, identify threats to the species or ecosystem and explain what should be done to mitigate those threats, as well as provide information on habitat needed for survival and recovery of the species (if available). The Province of British Columbia accepts the information in these documents as advice to inform implementation of recovery measures, including decisions regarding measures to protect habitat for the species. When sufficient information to guide implementation for the species can be included, the document is referred to as a recovery plan, and a separate action plan is not required.

### For more information

To learn more about species at risk recovery in British Columbia, please visit the Ministry of Environment Recovery Planning webpage at:

<<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>

**Recovery Plan for Blue-grey Taidropper  
(*Prophysaon coeruleum*) in British Columbia**

**Prepared by the Blue-grey Taidropper Recovery Team**

**March 2012**

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Kristiina Ovaska, Biolinx Environmental Research Ltd., Sidney, B.C.

## **Additional copies**

Additional copies can be downloaded from the B.C. Ministry of Environment Recovery Planning webpage at:

<<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>

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## Disclaimer

This recovery plan has been prepared by the Blue-grey Tailedropper Recovery Team, as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The British Columbia Ministry of Environment has received this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada – British Columbia Agreement on Species at Risk*.

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover Blue-grey Tailedropper populations in British Columbia. Recovery actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

The responsible jurisdictions and all members of the Blue-grey Tailedropper Recovery Team have had an opportunity to review this document. However, this document does not necessarily represent the official positions of the agencies or the personal views of all individuals on the recovery team.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the recovery of Blue-grey Tailedropper.

## RECOVERY TEAM MEMBERS

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## RESPONSIBLE JURISDICTIONS

The British Columbia Ministry of Environment is responsible for producing a recovery plan for Blue-grey Tailedropper under the *Accord for the Protection of Species at Risk in Canada*. Environment Canada – Canadian Wildlife Service participated in the preparation of this recovery plan.

## ACKNOWLEDGEMENTS

The recovery plan was prepared by Jennifer Heron followed by subsequent review and input from recovery team members. Additional input and review were provided by Marilyn Fuchs (Capital Regional District), Nicole Kroeker (Parks Canada Agency), Bill Woodhouse (BC Parks), Mike Rody (BC Parks), Ross Vennesland (Parks Canada Agency), Arthur Robinson (Canadian Forest Service, Pacific Forestry Centre), and Geoff Scudder (University of British Columbia). Scientific review was completed by Kristiina Ovaska and Lennart Sopuck (Biolinx Environmental Research Ltd, Sidney) with funding from B.C. Ministry of Environment. Thank you to Byron Woods (BC MoE) for maps and GIS support. Additional editorial and technical review was completed by Jeff Brown (BC MoE) and Leah Westereng (BC MoE). This document follows the *B.C. Guide for Recovery Planning for Species and Ecosystems* (Ministry of Environment 2010a).

## EXECUTIVE SUMMARY

Blue-grey Tailedropper (*Prophysaon coeruleum*) is endemic to western North America. Adults are small, slender slugs that grow up to 45 mm in length. The slug's most obvious distinguishing feature is the overall solid and often brilliant-bluish body colouration.

Blue-grey Tailedropper is assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Endangered. The species is listed in Canada on Schedule 1 of the *Species at Risk Act* (SARA) as Endangered due to the species' very small extent of occurrence (~150 km<sup>2</sup>) and area of occupancy (< 5 km<sup>2</sup>), and a continuing decline is projected in quality of habitat. Blue-grey Tailedropper is only known from 11 locations within the Victoria area on southern Vancouver Island. In British Columbia (B.C.), Blue-grey Tailedropper is ranked S1 (critically imperiled) by the Conservation Data Centre and is on the provincial Red list. The B.C. Conservation Framework ranks Blue-grey Tailedropper as a priority 1 under goal 3 (maintain the diversity of native species and ecosystems). Recovery is considered biologically and technically feasible.

The global range of Blue-grey Tailedropper is at the northernmost limit of its range in B.C. and extends south through western Washington State and Oregon into northern California. An isolated, disjunct number of locations are known from northern Idaho. In B.C., Blue-grey Tailedropper comprises less than 3% of the species' global range.

Blue-grey Tailedropper inhabits a wide range of coniferous and mixedwood, multi-age forests, where it is associated with moist plant communities. Important microhabitat features include abundant coarse woody debris or other cover; deep forest litter layer; and shaded, moist forest floor conditions. Optimal sites have minimal introduced plant species and competing introduced gastropods.

Threats to Blue-grey Tailedropper include residential and commercial development (e.g., land conversion to housing and urban areas, commercial and industrial areas, and tourism and recreational areas); transportation and service corridors; logging and wood harvesting within potential habitat; human intrusions and disturbance such as recreational activities within park locations; natural system modifications (e.g., fire suppression); invasive non-native plant species, leading to changes in the habitat and invasive non-native gastropod species; pollution from agricultural effluents; and droughts due to climate change.

The population and distribution goal is to ensure the persistence of all<sup>1</sup> known (and newly recorded) locations of Blue-grey Tailedropper throughout the species' range in B.C.

The recovery objectives are:

1. to secure protection<sup>2</sup> for the known locations (and new locations) and habitats of Blue-grey Tailedropper.

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<sup>1</sup> Nine locations of Blue-grey Tailedropper are known, all within less than 150 km<sup>2</sup> of each other. The population and distribution goal will be amended if the range of the species substantially increases (e.g., a location is found in the Lower Mainland or southern Kootenay regions).



2. to assess and mitigate the extent of the current threats (IUCN-CMP Threat<sup>3</sup> 1, 4, 5, 6, 7, 8, 9) at all locations in B.C.
3. to address knowledge gaps (e.g., habitat requirements, range extent within Vancouver Island, and potential range extent in the Kootenay region) for Blue-grey Tailedropper.

## RECOVERY FEASIBILITY SUMMARY

The recovery of Blue-grey Tailedropper in B.C. is considered technically and biologically feasible based on the criteria outlined by the Government of Canada (2009):

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Yes. There are eleven Blue-grey Tailedropper locations. Although little information exists on populations at each known location, the Blue-grey Tailedropper has been found recently at all of these locations.

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Yes. Blue-grey Tailedropper persists in small habitat patches within each of the eleven known locations on southern Vancouver Island. Additional, undocumented localities are likely to exist. There are also larger patches of suitable, unsurveyed habitat for Blue-grey Tailedropper slug located within southern Vancouver Island, the Lower Mainland, the Kootenays, and areas on the south side of the Fraser River from Langley east to Bridal Veil Falls near Hope.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

Yes. The primary threats to Blue-grey Tailedropper can be addressed at each of the eleven known locations. Lands managers know of Blue-grey Tailedropper occurrences and are working towards integrating recovery actions into land management planning and decisions.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

Yes. Recovery techniques, such developing site-specific management plans, redirecting recreational trails, removing invasive plants that may impact habitat, and establishing cover boards to monitor populations, are examples of techniques that work towards

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<sup>2</sup> Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

<sup>3</sup> See Table 2 for description of threats.

achieving the population and distribution goal. Restoration of habitats that have been modified by urban or agricultural practices may also be possible in some cases.

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## 1 COSEWIC\* SPECIES ASSESSMENT INFORMATION

**Date of Assessment:** April 2006

**Common Name (population):** Blue-grey Tailedropper

**Scientific Name:** *Prophyaon coeruleum* Cockerell, 1890

**COSEWIC Status:** Endangered

**Reason for Designation:** This species has a very small extent of occurrence (~ 150 km<sup>2</sup>) and area of occupancy (< 5 km<sup>2</sup>), and a continuing decline is projected in quality of habitat. It is found in remnant patches of older forest with a deciduous component. It is currently known from only 5 locations on southern Vancouver Island. Threats at these locations include heavy recreational use and the impacts of introduced plants and animals, including introduced invasive slugs and snails.

**Canadian Occurrence:** British Columbia

**COSEWIC Status History:** Designated Endangered in April 2006. Assessment based on a new status report.

\* Committee on the Status of Endangered Wildlife in Canada.

## 2 SPECIES STATUS INFORMATION

Blue-grey Tailedropper Slug <sup>a</sup>	
Legal Designation:	
Identified Wildlife: <sup>b</sup> No	B.C. Wildlife Act: <sup>c</sup> No <a href="#">SARA Schedule</a> : 1 (2007)
Conservation Status <sup>d</sup>	
B.C. List: Red   B.C. Rank: S1 (2008) <a href="#">National Rank</a> : N1 (2006)   Global Rank: G3G4 (2010)	
<a href="#">Subnational Ranks</a> : <sup>e</sup> California (S1S2); Idaho (SNR); Oregon (S3); Washington (S1)	
B.C. Conservation Framework <sup>f</sup>	
Goal 1: Contribute to global efforts for species and ecosystem conservation.	Priority: <sup>g</sup> 2 (2009)
Goal 2: Prevent species and ecosystems from becoming at risk.	Priority: 6 (2009)
Goal 3: Maintain the diversity of native species and ecosystems.	Priority: 1 (2009)
<a href="#">Action Groups</a> :	Compile Status Report; Habitat Protection; List under <i>Wildlife Act</i> ; Send to COSEWIC; Planning Private Land Stewardship; Habitat Restoration; Species and Population Management

<sup>a</sup> Data source: B.C. Conservation Data Centre (2012) unless otherwise noted.

<sup>b</sup> Identified Wildlife under the *Forest and Range Practices Act*, which includes the categories of species at risk, ungulates, and regionally important wildlife (Province of British Columbia 2002).

<sup>c</sup> Listed as Endangered or Threatened under the *Wildlife Act* (Province of British Columbia 1982).

<sup>d</sup> S = Subnational; N = National; G = Global; B = Breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.

<sup>e</sup> Data source: NatureServe (2010).

<sup>f</sup> Data source: Ministry of Environment (2010b).

<sup>g</sup> Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

### 3 SPECIES INFORMATION

#### 3.1 Species Description

Blue-grey Taildropper is a small, slender slug, with adult length up to 45 mm when extended in movement (Forsyth 2004). Distinguishing features include solid and often brilliant-bluish colouration speckled with scattered, lighter flecking; absence of banding; and longitudinal, parallel grooves and ridges on the tail (Figure 1, 2). Individuals vary in tone and brightness of colour. A thin, oblique constriction line is usually visible on the tail where autotomy (self-amputation) occurs when the slug is disturbed. See Forsyth (2004) and the COSEWIC status report (2006) for a detailed morphological description of Blue-grey Taildropper.



**Figure 1.** Adult Blue-grey Taildropper slug (Photo: K. Ovaska).

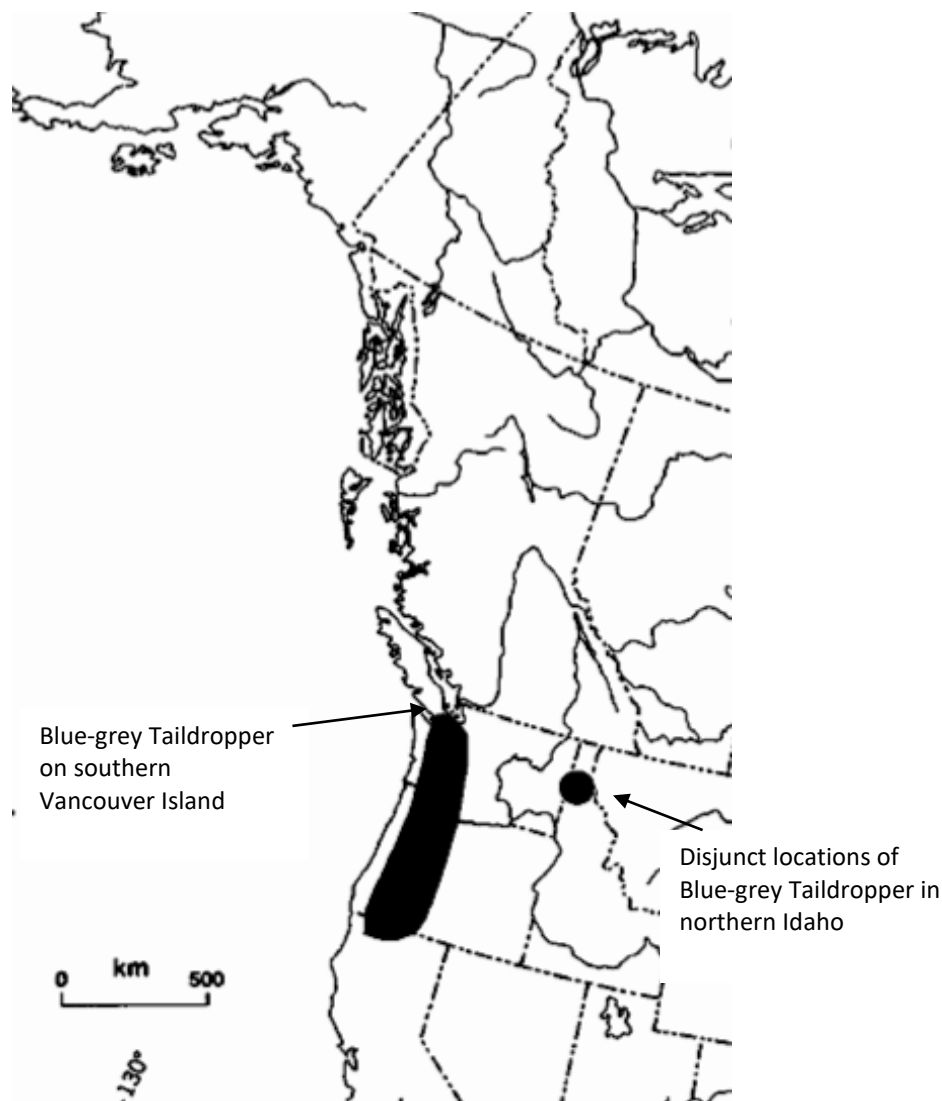


**Figure 2.** Adult Blue-grey Taildropper slug (Photo: K. Ovaska).

#### 3.2 Populations and Distribution

The global range of Blue-grey Taildropper extends south from Vancouver Island, B.C., through western Washington State and Oregon into northern California (Figure 3) (COSEWIC 2006). The distribution of the species throughout the northern portion of its range appears highly fragmented (K. Ovaska pers. comm. 2010). An isolated, disjunct number of locations<sup>4</sup> are known from northern Idaho (Ovaska *et al.* 2004a). Populations in southern Oregon and northern California are genetically distinct from populations elsewhere within the species range (Wilke and Duncan 2004) and may represent a separate species (COSEWIC 2006).

<sup>4</sup> As defined by COSEWIC (2008), "A geographically distinct area where a group of individuals of a wildlife species is (or has been) found. The total population of a wildlife species may comprise a number of locations. Dispersal between locations is impossible or very rare. A single threatening event can rapidly affect all individuals in a location." Note there can be a patchy distribution of Blue-grey Taildropper within a given location, defined on habitat acontinuity (e.g., polygon).

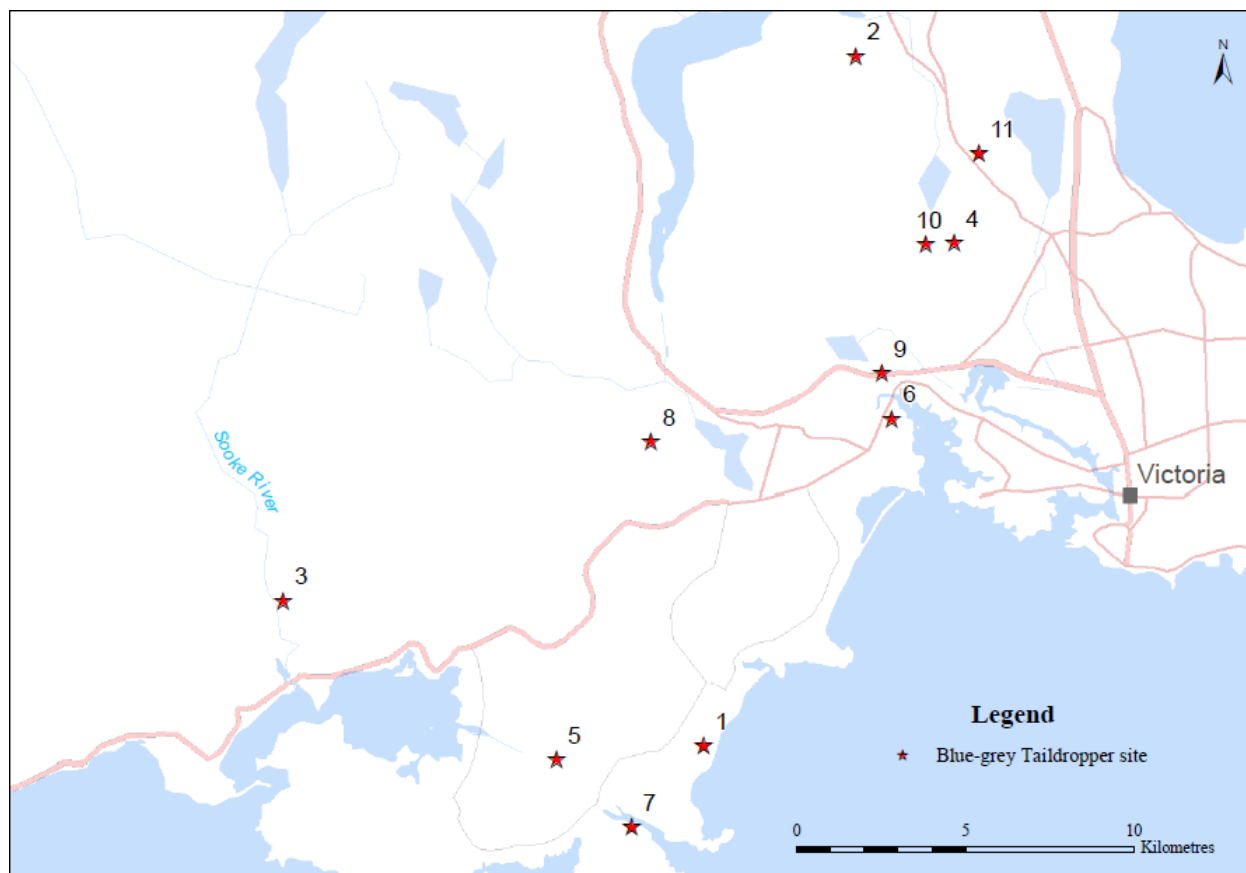


**Figure 3.** Blue-grey Tailedropper slug distribution in Canada/North America (from COSEWIC 2006).

In Canada, Blue-grey Tailedropper is known from southern Vancouver Island, B.C. where it is at the northernmost limit of its global range (Figure 3). The B.C. range extent is less than 150 km<sup>2</sup> and comprises less than 3% of the species' global range (COSEWIC 2006). The COSEWIC status report (2006) states five locations, but since the status report has been prepared an additional six locations have been recorded. As of November 2011 a total of eleven extant and disjunct Blue-grey Tailedropper locations are known in Canada (Figure 4) with the farthest locations less than 25 km apart.

Blue-grey Tailedropper was first confirmed from B.C. in 2002 on southeastern Vancouver Island (Ovaska and Sopuck 2002a, 2002b; COSEWIC 2006). Additional locations may exist within the province as there is suitable habitat in parts of the lower Fraser River valley. However, despite

extensive search effort,<sup>5</sup> the species has not been recorded within this area. There is a small possibility Blue-grey Tailedropper may occur in southeastern B.C. within the Kootenay region. The species was recently recorded from a new location in northern Idaho (Ovaska *et al.* 2004) and, given the proximity to the Canada–U.S. border; it is possible the species' global range may extend into the extreme southern Kootenay region. Surveys within the Kootenay region of southeastern B.C. in 2007 (Ovaska and Sopuck 2007a), 2008 (Ovaska and Sopuck 2008a), 2009 (Ovaska and Sopuck 2009a), and 2010 (Ovaska *et al.* 2010) have not recorded the species.



**Figure 4.** Blue-grey Tailedropper distribution in British Columbia (B.C. Ministry of Environment 2012).

<sup>5</sup> Extensive surveys have been completed within the lower Fraser River valley as part of the preparation of COSEWIC status assessments for other species such as Oregon Forestsnail (*Allogona townsendiana*) (COSEWIC 2002), Puget Oregonian (*Cryptomastix devia*) (COSEWIC 2002), and Threaded Vertigo (*Vertigo rowelli*) (COSEWIC 2010).



**Table 2.** Blue-grey Tailedropper locations<sup>a</sup> in B.C.

<b>Map # (Figure 4)</b>	<b>Location name<sup>b, c</sup></b>	<b>Description of general geographic area of location<sup>d</sup></b>	<b>Land tenure<sup>d</sup></b>	<b>Most recent year observed</b>	<b>Record reference</b>
1	Devonian	Devonian CRD Park, Sherwood Creek, Metchosin	CRD	2009	Ovaska and Sopuck (2009b)
2	Mount Work, Durrance Lake	Mount Work CRD Park  Heal's Rifle Range, Durrance Lake area	CRD  DND	2010	Ovaska and Sopuck (2010)
3	Galloping Goose	Galloping Goose CRD Trail, Sooke River	CRD	2004	Ovaska and Sopuck (2004a)
4	Logan	Logan Park, Saanich	Saanich Municipal Park	2010	Ovaska and Sopuck (2010)
5	Matheson Lake	Matheson Lake CRD Park, Metchosin	CRD	2011	L. Sopuck, pers. comm., 2011
6	Mill Hill - Colwood	Mill Hill CRD Park, Colwood  CFB Colwood Supply/Fuel Oil Depot	CRD  DND	2008  2009	Ovaska and Sopuck (2009b)  DND (2010)
7	Rocky Point	Rocky Point, Metchosin	DND	2009	DND (2010)
8	Sooke Hills	Sooke Hills Wilderness CRD Park Reserve	CRD	2009	Ovaska and Sopuck (2009b)
9	Thetis Lake	Thetis Lake CRD Park	CRD	2010	Ovaska and Sopuck (2010)
10	Observatory Hill	Dominion Astrophysical Laboratory	Federal	2011	B.C. Conservation Data Centre (2012)
11	Trevlac Pond	Calvert Park, Saanich	Saanich Municipal Park	2011	Ovaska and Sopuck (2011)

<sup>a</sup> No information is available for population size or area of occupancy at each location.

<sup>b</sup> There is a possibility Blue-grey Tailedropper occurrences may be in areas surrounding private land around these known locations, although further landowner contact and inventory are needed. These unchecked habitats are not large and would still be considered the same location.

<sup>c</sup> Most surveys for Blue-grey Tailedropper around each defined location have been within the boundaries of the existing park. There is substantial habitat outside of these parks, but due to access limitations these areas have not been surveyed. Locations are named after the general area, and are not meant to only refer to the specific park, as occurrences may be found outside of the park during future surveys.

<sup>d</sup> CFB = Canadian Forces Base; CRD = Capital Regional District; DND = Department of National Defence.

Population sizes and trends of Blue-grey Tailedropper are unknown at each location, and no information is available from which to approximate population densities. No information is

available on the movements and home range of Blue-grey Tailedropper although this species is thought to have limited dispersal capabilities due mainly to its size and occurrence per unit search effort (COSEWIC 2006). Apart from one location where several individuals have been found during searches (Rocky Point; Ovaska and Sopuck 2004b), only 1 or 2 individuals have been found per location in B.C. (Appendix 1), suggesting that populations are small and cryptic. Despite intensive search effort, resurveys in 2006 of two locations where the species was found in 2004 (Mill Hill Regional Park and Galloping Goose Regional Trail) did not record the species (Ovaska and Sopuck 2006). Blue-grey Tailedropper may have always been rare in the landscape, and combined with its cryptic nature and limiting factors (see Section 3.3.3), it is difficult to detect, study, and monitor populations within any one of the eleven extant locations.

### 3.3 Needs of Blue-grey Tailedropper

Blue-grey Tailedropper is hermaphroditic (i.e., possessing both female and male reproductive organs) and likely has an annual life cycle, maturing and reproducing (laying eggs) within one year (Burke *et al.* 2000). The timing of reproduction by Blue-grey Tailedropper is poorly known. On Vancouver Island, adults have been found exclusively in the autumn (COSEWIC 2006), suggesting that oviposition (egg laying) may occur from September through November; the eggs then overwinter and hatch the following spring. Based on the lack of observations of adults in early spring throughout the species' range, few or no individuals probably survive to their second year (COSEWIC 2006).

The reproductive behavior of Blue-grey Tailedropper is poorly known, and no eggs or nests have been found in B.C. Individual eggs of *Prophysaon* slugs are opaque white and oval in shape, but no specific description of the eggs of the Blue-grey Tailedropper is available. Nests are likely well hidden and encountered only by chance in moist, low-elevation, coniferous or mixedwood forests inhabited by the species (see Section 3.3). In the United States, eggs have been found "in groups of several, to many in cool damp spots such as under logs or pieces of wood on the shaded forest floor" (Burke *et al.* 2000). Blue-grey Tailedropper nests may contain eggs or hatchlings from September to May. It is possible that moist, large downed logs and stumps provide suitable conditions for more than one nest each year and for generations of slugs for decades. Nests can be best recognized if slugs are found in the process of laying eggs or near egg masses.

The behavior of Blue-grey Tailedropper is unstudied. A combination of environmental factors, such as temperature, water availability, and day length, affect the activity patterns of all slugs and their presence within an area. Other slug species exhibit group aggregations, or huddles, aggregating together to prevent water loss (Cook 1981a, 1981b; Prior 1981; Prior *et al.* 1983, as cited in Prior 1985). Huddles create a high humidity microenvironment and reduce dehydration, yet appear to be non-social aggregations (Cook 1981a as cited in Prior 1985). When a slug becomes dehydrated, the animal will also assume a flattened body position over a wet surface, to maximize the surface area of water absorption through the foot (Prior 1985). It is likely Blue-grey Tailedropper exhibits similar huddling and flattening behavior when dehydrated.

The homing behavior of Blue-grey Tailedropper is unstudied. Prior (1985) summarizes homing behavior in some slugs and snails. Slugs have been observed to leave their homesite or shelter

site after dark, forage for several hours, and return before dawn. When slugs exhibit this homing behavior, it ensures the animal returns to suitable shelter, minimizes dehydration, and prevents exposure to drying conditions (Prior 1985). It is likely Blue-grey Tailedropper exhibits similar homing behavior.

### 3.3.1 Habitat and Biological Needs

No information is available on the specific biological needs of Blue-grey Tailedropper within B.C. Occurrences within B.C. are disjunct populations at the northern limits of the species' global range and thus may have slightly different biological needs than elsewhere within the species global range.

In B.C., all Blue-grey Tailedropper records are from below 100 m elevations (COSEWIC 2006; B.C. Conservation Data Centre 2012). In Oregon, records of the species exist from up to 1650 m (Wilke and Duncan 2004).

Blue-grey Tailedropper inhabits a wide range of coniferous and mixed wood forests, where the species is associated with moist plant communities (Kelley *et al.* 1999; Burke *et al.* 2000; COSEWIC 2006; B.C. Conservation Data Centre 2012). In B.C., all records are from mixedwood, second-growth forest (Table 1), often with an understory of sword fern (*Polystichum munitum*). Bigleaf maple (*Acer macrophyllum*) (#1 Devonian, #2 Mount Work Durrance Lake, #7 Rocky Point) or trembling aspen (*Populus tremuloides*) (#7 Rocky Point) are present at some locations. One location (#4 Logan Park) is immediately adjacent to a small wetland (Ovaska and Sopuck 2004a) and one location (#9 Thetis Lake) is immediately adjacent to a Garry oak (*Quercus garryana*) meadow. At known locations in the United States, Blue-grey Tailedropper has been observed in mature and old-growth forests but also occurs in younger stands that contain old-growth attributes (COSEWIC 2006).

Blue-grey Tailedropper is often associated with decaying wood (Ovaska *et al.* 2004a; COSEWIC 2006). Important microhabitat features for Blue-grey Tailedropper include abundant coarse woody debris or other cover; deep forest litter layer; and shaded, moist forest floor conditions (Burke *et al.* 2000; COSEWIC 2006; Ovaska and Sopuck 2004a, 2004b, 2007b, 2007c, 2007d, 2009a, 2009b, 2010).

During mating and oviposition, Blue-grey Tailedropper nests are most likely located within partially rotted logs or stumps, under sloughing-off bark of large logs, or possibly within the leaf litter (K. Ovaska, unpublished data). Such sites provide a moist, stable microenvironment required for egg development. Suitable nest sites are essential for the successful development of Blue-grey Tailedropper eggs and for overwintering survival of local populations. As adults seldom live more than one year (Burke *et al.* 2000; COSEWIC 2006), the nest functions as an overwintering site for eggs, which ensures survival of the population to the following year. Slug eggs have little resistance to water loss and will dry up if not protected within a sheltered, moist site (South 1992). Under the forest canopy, decaying wood or deep leaf litter is likely to buffer eggs of the Blue-grey Tailedropper from changes in temperature and moisture and help maintain a suitable microclimate for their development. If research shows that a particular feature or micro-

site supports one or more nests each year, then this location is important for as long as it provides suitable conditions for nesting.

Blue-grey Taildropper is a fungivore-herbivore. In Oregon where the species' diet has been studied, slugs fed extensively on a variety of fungi, including fungi that form symbiotic, mycorrhizal associations with plant roots (McGraw *et al.* 2002). The species is also known to consume lichens and vascular plants, as well as mushrooms such as *Tubulicrinis sororius* (L. Sopuck, pers. comm., 2011 submitted to B.C. Conservation Data Centre, 2012). In captivity, Blue-grey Taildropper slugs readily feed on fresh plant material (K. Ovaska, pers. comm., 2007).

### 3.3.2 Ecological Role

Blue-grey Taildropper plays an ecological role<sup>6</sup> as a decomposer, soil builder, consumer of live and decaying plant matter; and as prey for various vertebrate and invertebrate predators. Some forest-dwelling gastropods appear to function as dispersal agents for fungal spores, including the fungal spores that form essential mycorrhizal associations with both coniferous and deciduous tree roots. These fungal spores promote healthy tree growth, thus contributing to the overall natural capital of forest ecosystems. Gastropods are also known to aid in the dispersal of plant seeds (Richter 1980; Gervais *et al.* 1998). Slugs are also prey for various predators including birds, amphibians, Carabid beetles, and small mammals. It is unknown if Blue-grey Taildropper has relationships, such as mutualism or parasitism, with other species.

### 3.3.3 Limiting Factors

*Dispersal ability:* The dispersal ability of Blue-grey Taildropper slug is likely poor, and it is unclear how much spatial area (habitat) is required to sustain a population within a location. The heavily fragmented low-elevation coniferous forests of southern Vancouver Island may limit natural dispersal. By their very nature, slugs are sedentary and cryptic animals, and their natural ability to colonize new areas is likely poor.

*Low population density:* Blue-grey Taildropper appears to be primarily nocturnal and secretive, occurs at low densities (as shown by inventory documented in Ovaska and Sopuck 2004a, 2004b, 2007b, 2007c, 2007d, 2009a, 2009b, 2010) and thus presumably low reproductive potential even within optimal habitats.

*Northernmost extent of global range:* In B.C. Blue-grey Taildropper is at the northernmost extent of its global range, which likely increases the species' susceptibility to climatic and stochastic population fluctuations.

*Require high air moisture environments:* Blue-grey Taildropper is an associate of coniferous and mixedwood low-elevation forests, with well-developed and thick understory vegetation that provides the moist microhabitat necessary to maintain high humidity. The slug has a scattered distribution pattern throughout its range, likely due to the isolation of suitable habitat patches and

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<sup>6</sup> E.g., Blue-grey Taildropper contributes to the natural capital, or ecosystem goods and services.

poor dispersal capabilities. At known locations in the United States, Blue-grey Tailedropper has been observed in mature and old-growth forests but also occurs in younger stands that contain old-growth attributes (COSEWIC 2006).

*Susceptible to dehydration:* Slugs are known to initiate “water seeking” responses to dehydration after a short-term reduction in locomotor activity (Prior 1985). The physiology and activity patterns of Blue-grey Tailedropper inherently make them susceptible to continuous water loss through dehydration. All slugs deposit a dilute mucous trail, and experience constant evaporative water loss through the lung surface and integument. Numerous ecological and physiological studies show a relationship between varying body temperature hydration on locomotor activity (Machin 1975; Peake 1978; Burton 1983; Riddle 1983; Martin 1983 as cited in Prior 1985). Within two hours, active slugs can lose 30–40% of their initial body weight and habitat selection by slugs is correlated with water availability (Prior 1985). Although this information pertains to other slug species, it is likely similar for Blue-grey Tailedropper.

## **4 THREATS**

Threats are defined as the proximate (human) activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity and natural processes. Threats can be past (historical), ongoing, and/or likely to occur in the future. Threats do not include intrinsic biological features of the species or population such as inbreeding depression, small population size, and genetic isolation, which are considered limiting factors.

## 4.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre and the B.C. Conservation Framework. For a detailed description of the threat classification system, see the [CMP website](#) (CMP 2010). For information on how the values are assigned, see [Master \*et al.\*](#) (2009) and table footnotes for details. Threats for the Blue-grey Tailedropper were assessed for the entire province (Table 2).

**Table 3.** Threat classification table for Blue-grey Tailedropper

Threat #	Threat	Impact <sup>a</sup>	Scope <sup>b</sup>	Severity <sup>c</sup>	Timing <sup>d</sup>	Locations <sup>e</sup>
1	Residential & commercial development	Medium	Restricted	Extreme	High	
1.1	Housing & urban areas	Low	Small	Extreme	High	<ul style="list-style-type: none"> <li>• Threat to potential unsurveyed habitats and additional potential locations.</li> </ul>
1.2	Commercial & industrial areas	Low	Small	Extreme	High	<ul style="list-style-type: none"> <li>• Threat to potential unsurveyed habitats and additional potential locations.</li> </ul>
1.3	Tourism & recreation areas	Medium-Low	Restricted	Serious-Moderate	High	<ul style="list-style-type: none"> <li>• All 11 known locations.</li> <li>• Threat to potential unsurveyed habitats and additional potential locations.</li> </ul>
4	Transportation & service corridors	Medium	Large - restricted	Moderate	High	
4.1	Roads & railroads	Medium	Large – restricted	Moderate	High	<ul style="list-style-type: none"> <li>• Threat at known locations: 1, 3, 4, 5, 8, and 9.</li> <li>• Threat to potential unsurveyed habitats and additional potential locations.</li> </ul>
5	Biological resource use	Low	Small	Serious-moderate	High	
5.3	Logging & wood harvesting	Low	Small	Serious-Moderate	High	<ul style="list-style-type: none"> <li>• Threat to potential unsurveyed habitats and additional potential locations.</li> </ul>
6	Human intrusions & disturbance	High	Large	Serious	High	
6.1	Recreational activities	High	Large	Serious	High	<ul style="list-style-type: none"> <li>• All 11 known locations.</li> </ul>

7	Natural system modifications	Medium	Restricted	Serious	High	
7.1	Fire & fire suppression	Medium	Restricted	Serious	High	• All 11 known locations.
8	Invasive & other problematic species and genes	High	Large	Serious	High	
8.1	Invasive non-native/alien species	High	Large	Serious	High	• All 11 known locations.
9	Pollution	Unknown	Large	Unknown	High	
9.3	Agricultural & forestry effluents	Unknown	Large	Unknown	High	• All 11 known locations.
10	Geological events	Unknown	Unknown	Unknown	Unknown	
10.2	Earthquakes/tsunamis	Unknown	Unknown	Unknown	Moderate-Low	• All 11 known locations.
11	Climate change & severe weather	Unknown	Pervasive	Unknown	Low	
11.2	Droughts	Unknown	Pervasive	Unknown	Low	• All 11 known locations.

<sup>a</sup> **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each stress is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: very high (75% declines), high (40%), medium (15%), and low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity is unknown).

<sup>b</sup> **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%)

<sup>c</sup> **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species' population (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%).

<sup>d</sup> **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [ $< 10$  years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

<sup>e</sup> **Locations** – See Table 1 for location names.



## 4.2 Description of Threats

The overall province-wide Threat Impact for this species is Very High<sup>7</sup> (Table 2). Major threats include ongoing recreational activities at current locations, leading to degradation of habitat; and increased spread of introduced species. Details are discussed below under the IUCN level 1 headings.

The Canadian range of Blue-grey Tailedropper is 150 km<sup>2</sup> and coincides with the most densely populated and developed part of Vancouver Island. There has been extensive habitat loss from historic activities (e.g., logging, agriculture, urbanization). In particular, low-elevation (< 100 m) habitats within the Coastal Douglas-Fir biogeoclimatic zone have been extensively modified over the past century as a result of urbanization, forestry, and agriculture, and little of the original forest remains (MacKinnon and Eng 1995). Further, approximately 90% of Garry Oak ecosystems have been lost to residential and commercial development (GOERT 2011). Diminishing forest habitats and a scattered distribution pattern suggest that B.C. populations of this species are becoming more fragmented. For example, larger stands of older, second-growth mixedwood forest within the Capital Regional District (greater Victoria area, which is also the range extent of Blue-grey Tailedropper) are often fragmented. While historic impacts are acknowledged here, the threat assessment for Blue-grey Tailedropper is based on current and future threats.

### 4.2.1 High-impact Threats

#### **IUCN-CMP Threat 6. Human intrusions and disturbance (6.1 Recreational activities)**

Recreational activities within forested areas include camping, hiking, foot and bicycle traffic, and the use of all-terrain vehicles (ATVs) and trail bikes, especially off-trail bikes. Such activities can result in degradation of habitat quality through soil compaction and can also cause accidental mortality. Hiking and related activities may also increase the spread of exotic species (see Threat 8.1). Within Logan Park (Location #4), recreational use of trails for horseback riding is also prominent and likely impacts habitat (e.g., trampling of trails/edges and defecation, which increases the spread of fungus, seeds) (A. Pollard pers. comm. 2011).

Recreational activities occur within all Blue-grey Tailedropper locations, including illegal ATV use in remote habitats such as Sooke Hills (Location #8).

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<sup>7</sup> The overall threat impact was calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species where Timing = High. This includes 2 High, 3 Medium, 1 Low, and 3 Unknown (Table 2). The overall threat considers the cumulative impacts of multiple threats.

**IUCN-CMP Threat 8. Invasive and other problematic species and genes (8.1 Invasive non-native/alien species)**

Introduced gastropods, invertebrates, and plant species are present at all eleven Blue-grey Tailedropper locations, although the scope of introduction and suite of species present at each location are not known.

*Invasive gastropods:* Invasive gastropod species may pose a threat to Blue-grey Tailedropper at all eleven locations through competition for food and shelter or through predation (K. Ovaska pers. comm. 2009). Invasive gastropods of European origin are prevalent within urban and agricultural areas on southern Vancouver Island and several species have penetrated forested habitats and can be locally abundant (Forsyth 1999, 2004). These species continue to spread into new areas with inadvertent assistance from humans when nursery plants, garden ornamentals, or other materials with adhering soil are transported or when garden waste is discarded (Forsyth 1999).

Invasive gastropod species that may compete with Blue-grey Tailedropper include Grovesnail (*Cepaea nemoralis*) and several species of slugs, such as Dusky Arion (*Arion subfuscus*), Chocolate Arion (*Arion rufus*), Giant Gardenslug (*Limax maximus*), and Longneck Fieldslug (*Deroceras panormitanum*). Rollo and Wellington (1979) demonstrated intra- and interspecific aggression among slugs and competition for refuges. Three invasive species locally common are particularly aggressive including Giant Gardenslug, Dusky Arion, and Gray Fieldslug (*Deroceras reticulatum*). The invasive, carnivorous Dark-bodied Glass-snail (*Oxychilus draparnaudi*) is locally common in southern Vancouver Island (Victoria area) (Forsyth 1999). Dark-bodied Glass-snail could be a significant predator of its eggs and young (Ovaska, pers. comm., 2003). This species has been identified as a potential threat to native gastropods in other areas where it has been invasive (Frest and Rhodes 1982).

Although most invasive gastropods species are found primarily in areas of high human use and alteration, some have spread into intact coniferous forest habitats and increased their range extent (Ovaska, pers. comm. 2008). Within forests in Washington State, Chocolate Arion is documented from within old-growth forests, and may be displacing native Pacific Bananaslug (*Ariolimax columbianus*) (Burke *et al.* 1999).

Blue-grey Tailedropper is likely vulnerable to predation pressure from native gastropods, which likely increases in human-modified landscapes. Potential native invertebrate predators include the carnivorous Robust Lancetooth snail (*Haplotrema vancouverense*) and ground beetles (e.g., *Scaphinotus angusticollis*) (Ovaska, pers. comm., 2008; Sopuck, pers. comm., 2008). Both species are believed to be gastropod specialists (Thiele 1977) and will follow the slime trails of slugs. Robust Lancetooth has been observed to attack and kill slugs (K. Ovaska and L. Sopuck unpubl. data 2000). These (and other) invertebrate predators are common throughout southern Vancouver Island forests although there is no known obligate association with Blue-grey Tailedropper. Predation by native animals is not considered a threat to the species, although it has been observed and is worth consideration for further research.

*Invasive invertebrate predators:* Concentration of invertebrate predators in small habitat patches where little escape cover is available will potentially increase predation rates on Blue-grey

Tailedropper. Competition and predation as a limiting factor may become more of a threat when combined with competition and predation from introduced species and further development pressures. For example, roads are known to increase the spread of introduced species and predation pressure on gastropods (Trombulak and Frissell 2000). Carabid beetles are known predators of land snails (Digweed 1993) and there are numerous records of introduced Carabids within the range Blue-grey Tailedropper (C. Copley pers. comm. 2011). These introduced species may pose a threat to Blue-grey Tailedropper, although the scope and severity of this threat are unknown.

In 2011, there have been numerous reports of European Fire Ant (*Myrmica rubra*) within greater Victoria. This species is known to occupy longer grassy habitats and displace native invertebrates (Higgins, pers. comm., 2011). This species has not been reported from habitats where Blue-grey Tailedropper is known to occur. However, one of the documented means of spread has been by well-meaning members of the public who have transplanted vegetation within parks, from gardens that contain populations of European Fire Ant (Higgins, pers. comm., 2011).

*Invasive plant species:* Invasive plant species are known to change the forest floor vegetation and soil structure and may facilitate an increase in light penetrating the understory vegetation to the forest floor if the invasive plant inhibits the growth of the native flora. For example, invasive Himalayan Blackberry (*Rubus discolor*) can potentially overtake the understory of urban deciduous forest patches, prevent the growth of other understory plants growing beneath it, and does not appear to maintain the microhabitat moisture within the understory. Increases in light levels lead to drier microclimate and understory conditions, and desiccation to the forest floor, and increase dehydration stress to gastropods that depend upon high water and humidity levels. Invasive plants, such as Scotch broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), and spurge-laurel (*Daphne laureola*) are likely to invade disturbed areas. English ivy (*Hedera helix*) is known to spread and displace the native vegetation on forest floors. Native gastropods are not known to live within vegetation patches of English Ivy (Burke *et al.* 1999). English Holly (*Ilex aquifolium*) and Himalayan blackberry are also widely spread invasive plants within native ecosystems in southern Vancouver Island, and are known to displace native vegetation.

#### **4.2.2 Medium- and Low-impact Threats**

##### **IUCN-CMP Threat 1. Residential & commercial development (1.1 Housing and urban areas and 1.2 Commercial and industrial areas)**

Within the species' known range there are likely additional locations not yet discovered within similar habitats as the known locations. Much of this habitat is within private land ownership and subject to future development.

##### **IUCN-CMP Threat 1. Residential & commercial development (1.3 Tourism and recreational areas)**

The demand for further tourism and recreational areas within southern Vancouver has increased substantially within the past decade. Natural areas continue to be developed into golf courses,

campgrounds, parks and recreation facilities, and community centres, including those natural areas already within parks and protected areas. Within regional and municipal properties, habitat conservation and recreational development potentially conflict and could impact all eleven known locations.

#### **IUCN-CMP Threat 4. Transportation and service corridors (4.1 Roads and railroads)**

Within the immediate range of Blue-grey Tailedropper on southern Vancouver Island, much of the potential (e.g., unsurveyed habitat) and known (e.g., within parks, protected areas, and federal lands) habitat for Blue-grey Tailedropper is fragmented by extensive roads, service corridors, and other similar transportation corridors. Increased roads, trails, and corridors increase fragmentation of Blue-grey Tailedropper habitat and lead to further habitat modifications through the spread of introduced species and increased frequency of use by humans (IUCN-CMP Threat 8.1). Roadsides act as corridors into natural habitats and are known to facilitate the rapid spread of introduced species (e.g., plant seeds attach to car tires, and become dislodged at new locations) (Trombulak and Frissell 2000). The potential spread of introduced species along roadsides may impact local populations through competition and predation, as well as changes to native vegetation, ultimately leading to changes in microclimate moisture regimes necessary to sustain Blue-grey Tailedropper populations (e.g., limit dehydration) (see Threat 8.1).

#### **IUCN-CMP Threat 5. Biological resource use (5.3 Logging and wood harvesting)**

The B.C. range of Blue-grey Tailedropper has been impacted by extensive historic logging. The forest land base continues to be intensively managed due to the high demand for forest products. Intensive forest management practices, including pre-commercial thinning, pruning, removal of select tree species, fertilization practices, patch-size harvesting, and clearcut harvesting, likely have detrimental effects on populations of Blue-grey Tailedropper.

Pre-commercial thinning and pruning practices reduce the quantity and/or alter the timing of leaf and branch litter that would otherwise fall to the forest floor and provide shelter for Blue-grey Tailedropper. Pruning activities that remove lateral branches reduce the overall forest canopy, which results in lower relative humidity and subsequent desiccation of the forest floor. The active removal of trees and machinery used may compact ground cover, crush individuals of Blue-grey Tailedropper, disturb coarse woody debris and shelter sites, and cause localized impacts within a harvested area.

All Blue-grey Tailedropper B.C. records are within second-growth forest, although survival within a harvested and/or second-growth forest landscape may depend on the availability of old rotten logs within which the species can take cover and lay eggs. Present day intensive forest management practices target the removal of large coarse woody debris during the second rotation of forest harvesting. Thus, such coarse woody debris may be in short supply in intensively managed forests. These logs are likely important for maintaining stable microclimates for developing eggs, and thus suitable microhabitat for Blue-grey Tailedropper.

**IUCN-CMP Threat 7. Natural system modifications (7.1 Fire and fire suppression)**

Human activities such as brush burning and mowing as a form of fire suppression will adversely affect Blue-grey Tailedropper. Burke *et al.* (1999) cited fire as a threat to gastropod populations in Washington State. Coniferous forests on the eastern side of southern Vancouver Island are typically dry and much more susceptible to fire, particularly in July through September. Human activities that increase the threat of fire, including careless attendance to campfires, discarded cigarettes, and improperly wired camping equipment and machinery used within wilderness areas, contribute to the possibility of wildfires.

Brush clearing, piling, and periodic burning of vegetation and woody debris occur on private and public lands throughout the range of Blue-grey Tailedropper. Although burning would only impact small areas of land, there is the possibility of overlap with unknown occurrences of Blue-grey Tailedropper. The smoke generated from periodic brush burning, and the resultant char and burned debris are also detrimental to habitat quality.

Mowing and cutting of vegetation within locations may impact Blue-grey Tailedropper through decreasing available moisture retention within habitats and increasing dehydration stress to individuals. Slug activity patterns predominantly coincide with preventing dehydration (Prior 1985). Slugs seek shelter and microhabitat that retains water, humidity, and cool temperatures. Dehydration is known to decrease locomotor activity (Prior 1985).

The threat of fire and fire suppression activities are present at all eleven Blue-grey Tailedropper locations, although the threat is not widespread across all habitats at any one time. For example, fire suppression activities such as mowing or brush burning may not occur yearly and not within the same habitat each year.

**4.2.3 Impact of Threats Unknown****IUCN-CMP Threat 9. Pollution (9.3 Agricultural and forestry effluents)**

Use of general pesticides, especially those aimed at gastropods, and the use of herbicides to control vegetation are both detrimental to habitat quality. Herbicides are used in some locations to control road and trailside vegetation. Now and in the past, herbicides have been used along hiking trails, throughout recreational picnic areas within parks, and along road and railway corridors. For example, various herbicides have been tested to control two highly invasive plants — Scotch broom (*Cytisus scoparius*) and gorse (*Ulex europaeus*) — along roadsides in the Duncan area on Vancouver Island (Zielke *et al.* 1992). Although herbicides are used less today, it is unclear how extensive this practice was (or is currently) within the potential range of Blue-grey Tailedropper on southern Vancouver Island.

The use of roadsides by gastropods has been documented by Baur and Baur (1990), who concluded the land snail *Arianta arbustorum* prefers moving along road verges and avoids crossing roads, including unpaved roads of only 3m wide (as cited in Trombulak and Frissell 2000). Spraying herbicides to control roadside vegetation likely harms gastropods within these roadside verges, and the cumulative and lasting effects of herbicides within these environments

may lead to long-term declines in gastropod numbers. However, as this has not been substantiated, the severity of this threat is considered unknown.

### **IUCN-CMP Threat 10. Geological events (10.2 Earthquakes/tsunamis)**

The low-elevation areas of greater Victoria are within the tsunami zone; should a natural disaster happen, extensive flooding would occur throughout much of this area and known Blue-grey Tailedropper populations would be wiped out.

### **IUCN-CMP Threat 11. Climate change and severe weather (11.2 Droughts)**

Increased summer droughts may affect occupied habitats and will decrease the available site moisture that allows for suitable microhabitat. These effects become pronounced in habitats that are isolated, marginal, and degraded (COSEWIC 2006).

## **5 RECOVERY GOAL AND OBJECTIVES**

### **5.1 Population and Distribution Goal**

The population and distribution goal is to ensure the persistence of Blue-grey Tailedropper at all<sup>8</sup> known (and newly recorded) locations throughout the species' range in Canada.

### **5.2 Rationale for the Population and Distribution Goal**

This species has a restricted range in Canada and low densities at all known locations, and overall the population and distribution goal aims ensure no populations become extirpated in Canada. The species will likely always be considered "endangered" unless a significant number of new locations are found and the range extent expands substantially. Historical abundance and distribution information for this species show only a few confirmed extant populations and historic museum records. There is no information to indicate that the species was previously more widespread, therefore an objective to actively increase the number of populations, which may allow for downlisting of the species, is not appropriate.

The population and distribution goal for Blue-grey Tailedropper cannot be quantified due to knowledge gaps as population size is unknown at each of the eleven Blue-grey Tailedropper locations. Blue-grey Tailedropper is not commonly found within known locations with most records being one or two individuals per survey per site (see Appendix 1). The difficulty with estimating populations at low densities, coupled with the difficulty of tagging and monitoring small soft-bodied gastropods, makes population estimates labour intensive and logistically difficult. The possibility of causing undue stress to Blue-grey Tailedropper populations and unintended mortality from handling must also be considered. The above population and distribution goal sets a minimum population objective (> 1 slug) for each location. This allows

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<sup>8</sup> Nine locations of Blue-grey Tailedropper are known, and all locations within less than 150 km<sup>2</sup>. The population and distribution goal will be amended if the range of the species substantially increases (e.g., a location is found in the Lower Mainland or southern Kootenay regions).

the survival/recovery habitat to be aimed at identifying and protecting the habitat needed to ensure the location persists.

### 5.3 Recovery Objectives

1. To secure protection<sup>9</sup> for the known locations (and new locations) and habitats of Blue-grey Tailedropper.
2. To assess and mitigate the extent of current threats (IUCN-CMP Threats 1, 4, 5, 6, 7, 8, 9) at all locations in B.C.
3. To address knowledge gaps (e.g., habitat requirements, range extent within Vancouver Island, and potential range extent in the Kootenay region) for Blue-grey Tailedropper.

## 6 APPROACHES TO MEET OBJECTIVES

### 6.1 Actions Already Completed or Underway

Actions listed below have been categorized by the action groups of the B.C. Conservation Framework (Ministry of Environment 2010b). Status of the action group for this species is given in parentheses.

#### **Compile Status Report (complete)**

- COSEWIC report completed (COSEWIC 2006). Update due 2016.

#### **Send to COSEWIC (complete)**

- Blue-grey Tailedropper designated Endangered (COSEWIC 2006). Re-assessment 2016.

#### **Inventory**

- Gastropod surveys in the Kootenay region in 2007, 2008, 2009, 2010 targeting habitat for Blue-grey Tailedropper (Ovaska and Sopuck 2007a, 2008a; Ovaska et al. 2010).<sup>10</sup> No new locations were found.
- Inventory for Blue-grey Tailedropper in the Capital Regional District (CRD) Parks 2006, 2007, 2008, 2009, 2010 (Ovaska and Sopuck 2006, 2007b, 2008b, 2009b, 2010).
  - Inventory for Blue-grey Tailedropper in lands managed by the federal Department of National Defence (DND) in 2006, 2007, and 2008 (Ovaska and Sopuck 2004b, 2007c, 2009c) as well as other federally managed properties including National Research Council (Observatory Hill) and Parks Canada (Fort Rodd Hill) in 2008 (Ovaska and Sopuck 2009b).

#### **Planning (complete)**

- BC Recovery Plan completed (this document, 2012).

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<sup>9</sup> Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

<sup>10</sup> A disjunct population of Blue-grey Tailedropper occurs in northern Idaho, and there is potential a population may occur within the Kootenay region of B.C.



### **Habitat Protection, Habitat Restoration, and Private Land Stewardship (in progress)**

Blue-grey Tailedropper populations and habitat within known locations occur on property that is owned and/or managed by the federal government, District of Saanich, or CRD government. Within these respective organizations, specific land managers are involved in stewardship activities and management actions aimed at protecting both the species' natural habitats, or are aware of the species and its needs.

The regional and municipal parks where Blue-grey Tailedropper is known to occur have management plans that have been prepared by the responsible jurisdictions. Although these management plans are not species specific,<sup>11</sup> they address the protection of natural habitats generally

The DND is engaged in several stewardship activities aimed at managing and protecting species at risk, including Blue-grey Tailedropper. The B.C. government is working towards data sharing agreements between the federal DND and B.C. Conservation Data Centre for occurrence and habitat information for Blue-grey Tailedropper locations on federal property.

The Garry Oak Ecosystems Recovery Team (GOERT) is involved in an outreach and landowner contact program for species at risk, and while Blue-grey Tailedropper is not Garry Oak Ecosystem specific, the team is aware of and includes information about this species in its stewardship activities.

A draft identified wildlife account for Blue-grey Tailedropper slug has been written.

## **6.2 Recovery Planning Table**

**Table 4.** Recovery planning table for Blue-grey Tailedropper

<b>Conservation Framework action group</b>	<b>Actions to meet objectives</b>	<b>Threat<sup>a</sup> or concern addressed</b>	<b>Priority<sup>b</sup></b>
<b>Objective 1. To secure protection<sup>c</sup> for the known locations (and new locations) and habitats of Blue-grey Tailedropper.</b>			
Habitat Protection; Private Land Stewardship	1. Establish protection <sup>c</sup> measures (e.g., Memorandum of Understandings with landowners and lands managers for the eleven locations).	1.3 6.1 7.1 8.1	Essential
	2. Work with municipalities where Blue-grey Tailedropper occurs, to use environmental protection tools as afforded under current legislation (e.g., Development Permit Areas, Riparian Areas Regulation, etc.).	All	Essential
	3. Determine the area of occupancy of known locations and spatially define the habitat polygon where Blue-grey Tailedropper	All	Essential

<sup>11</sup> Most plans do not make specific reference to the occurrence of Blue-grey Tailedropper.

Conservation Framework action group	Actions to meet objectives	Threat <sup>a</sup> or concern addressed	Priority <sup>b</sup>
	populations occur at each location		
	4. Recommend Blue-grey Taildropper to be listed as Identified Wildlife under B.C. <i>Forest and Range Practices Act</i> .	5.3 9.3	Necessary
	5. Develop or refine site-specific management plans that advise land management and operational activities for protected areas, and municipal and federal lands to reduce or remove threats to populations and habitat.	All	Essential
	6. Incorporate Blue-grey Taildropper into existing and new multi-species stewardship programs to protect and manage habitats and ensure recovery actions for one species does not jeopardize recovery of another species (e.g., stewardship programs such as the Garry Oak Ecosystems Recovery Team).	All	Necessary
	7. Work with Garry Oak Ecosystems Recovery Team and South Coast Conservation Program to establish landowner contact program, in the event a new location is found on private lands.	1.1 1.2 1.3	Necessary
	8. Prepare best management practices guidelines, and information for distribution to local governments and other landowners within the species' potential range that may contain undocumented location. Include options for managing habitat for forest-floor invertebrates under different land-use practices.	All	Necessary
	9. Prepare a fact sheet or at-risk brochure on all rare terrestrial gastropods in southwestern B.C., highlighting the ecosystem services they provide.	All	Beneficial
	10. Promote the inclusion of Blue-grey Taildropper in interpretive materials by local government bodies and by provincial and national parks within the species' potential range.	All	Beneficial
	11. Promote the inclusion of Blue-grey Taildropper as a species that is part of workshops on conservation and restoration of remnant forest ecosystems in the range of the species	All	Beneficial

Conservation Framework action group	Actions to meet objectives	Threat <sup>a</sup> or concern addressed	Priority <sup>b</sup>
Objective 2. To assess and mitigate the extent of the current threats (IUCN-CMP Threat 1, 4, 5, 6, 7, 8, 9) at all locations in B.C.			
Habitat Protection; Private Land Stewardship; Habitat Restoration	1. When completing inventory; attempt to list, quantify, and rate threats to habitat through standard protocol thereby assessing reasons slugs may or may not be present within certain habitats.	All	High
	2. Investigate distribution and habitat use patterns of the slugs in relation to those of introduced predators and competitors.	8.1	Essential
	3. Work with land developers to ensure that Blue-grey Tailedropper habitats in urban and rural areas include the needs of the species into land use plans, and habitat is not degraded by developments near occupied habitat.	1.1 1.2 1.3	Essential
	4. In parks and recreational areas, identify site-specific threats related to recreational activities within known occupied habitats to minimize damage to Blue-grey Tailedropper habitat. For example, erosion and destruction of vegetation within occupied habitats during trail construction or during intensive recreational activities such as mountain biking or horse-back riding.	1.3 6.1	Essential
	5. Create best management practises documents that target specific landowners and/or land managers, with information on specific threats and methods for mitigating threats. For example minimizing erosion and destruction of vegetation within occupied habitats during trail construction; fire management, prevention, or suppression activities (e.g., brush burning, mowing); restricting intensive recreational activities (e.g., mountain biking or horse-back riding); as well as providing advice on invasive species removal/management programs (e.g., English Holly, Scotch Broom or other species removal) and herbicide application (e.g., along trails or road systems).	1.3 6.1 7.1 8.1 9.3	High
	6. As part of long-term monitoring program, assess changes in habitat use and distribution due to the effects of climate	11.2	Beneficial

Conservation Framework action group	Actions to meet objectives	Threat <sup>a</sup> or concern addressed	Priority <sup>b</sup>
change (e.g., more frequent drought).			
Objective 3. To address knowledge gaps (e.g., habitat requirements, range extent within Vancouver Island, and potential range extent in the Kootenay region) for Blue-grey Tailedropper.			
	1. Develop monitoring program at known locations and establish cover boards to monitor activity of Blue-grey Tailedropper at known locations. Investigate the vegetative habitat components and organic components (e.g., coarse woody debris) of each location, and determine what habitat attributes are favoured by Blue-grey Tailedropper.	All	Essential
	2. Spatially map all potential Blue-grey Tailedropper habitats within the species range (southern Vancouver Island) and potential range (southern Kootenay and Lower Mainland regions), prioritize sites for inventory, and conduct field inventory in potential habitats.	1.1 1.2 1.3	Necessary

<sup>a</sup> Threat numbers according to the IUCN-CMP classification (see Table 2 for details).

<sup>b</sup> Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial (action is beneficial and could start at any time that was feasible).

<sup>c</sup> Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

## 7 INFORMATION ON HABITAT NEEDED TO MEET RECOVERY GOAL

To meet the population and distribution goal for this species, a partial description of the habitat needed for the survival and recovery of Blue-grey Tailedropper has been included to facilitate management and the mitigation of habitat threats.

### 7.1 Description of Survival/Recovery Habitat

Information on habitat requirements for Blue-grey Tailedropper is provided in Section 3.3.1 and summarized here. Additional work needs to be done so that survival/recovery for Blue-grey Tailedropper habitat in B.C. can be spatially described using maps (see Section 7.2). However, at minimum, survival/recovery habitat should include the known area of occupancy and the associated potential location error from geographic positioning system (GPS) units (uncertainty may range up to 25 m distance at a few locations depending on the GPS unit accuracy). An additional minimum 50 meters (i.e., survival/recovery habitat function zone distance<sup>12</sup>) should

<sup>12</sup> Survival/recovery habitat function zone distance has been defined as the threshold habitat fragment size required for maintaining constituent microhabitat properties for a species (e.g., critical light, moisture, humidity levels necessary for survival). Existing research provides a logical basis for suggesting a minimum function zone distance of 50 m or larger as the height of the dominant tree species in the habitat polygon. The tree height provides shade

also be included to encompass immediately adjacent suitable habitat within adjacent areas. If the 50 meter buffer stretches into unsuitable habitat (e.g., parking lot, works yard, or maintenance facility) these areas should be excluded.

Survival/recovery habitat may also include the entire portion of the habitat polygon which are associated with, and are integral to, the production and maintenance of suitable habitat conditions, and which provide ecological context for occupied microhabitats.

Locations of Blue-grey Tailedropper have the following general habitat attributes that provide a partial description of the biophysical attributes of survival/recovery habitat. Note the specific moisture levels, plant information, and/or species composition are unknown and require further study.

- Biogeoclimatic classification: all locations Coastal Douglas-fir moist maritime (CDFmm)
- Elevation < 200 meters (B.C. Conservation Data Centre 2012).
- All records (Table 1) are from mixedwood, second-growth forest. Stand ages 60 – 80 years old (second growth stands).
- Overall habitat description
  - Moist understory plant communities with sustained moisture levels throughout most of the year and shaded, moist forest floor conditions.
  - Deciduous tree species fringe along the periphery of a largely coniferous stand, edges of small wetlands adjacent to an older coniferous stand, edge of coniferous stand at the base of a rocky outcrop with Garry oak (*Quercus garryana*) and arbutus (*Arbutus menziesii*), base of a hill, remnant patch of forest within agricultural area,
  - Ground cover with dense grass mats, dense moss and needles, dense leaf and fine course woody debris and leaf litter.
- Dominant tree species overstory
  - Tree species composition includes Douglas-fir (*Pseudotsuga menziesii*), bigleaf maple (*Acer macrophyllum*), grand fir (*Abies grandis*), western redcedar (*Thuja plicata*), trembling aspen (*Populus tremuloides*), western hemlock (*Tsuga heterophylla*), arbutus
  - one location is immediately adjacent to a Garry oak meadow
- Dominant understory shrubs and ferns
  - Native plant species include salal (*Gaultheria shallon*), red huckleberry (*Vaccinium parvifolium*) and other huckleberry species (*Vaccinium* spp.), ocean spray (*Holodiscus discolor*), Indian plum (*Oemleria cerasiformis*), Oregon grape (*Mahonia aquifolium*), Nootka rose (*Rosa nutkana*).
  - Many sites have a thick and well developed dominant composition of Oregon grape and salal.
  - Fern species include bracken fern (*Pteridium aquilinum*), sword fern (*Polystichum munitum*)

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and enables moisture retention under the canopy that allows for the well-developed plant and herbaceous ground cover.

- Non-native plant species include trailing blackberry (*Rubus ursinus*), Scotch Broom (*Cytisus scoparius*), Holly (*Ilex aquifolium*) and Laurel-leaved Daphne (*Daphne laureola*)
- Dominant herbaceous plants understory
  - Moss and other ground cover that provides shelter and retains moisture.
  - Species composition includes western trumpet honeysuckle (*Lonicera sempervirens*), grass species, fringe cup (*Tellima grandiflora*), sweet Cecily (*Osmorhiza claytonia*), sweet scented bedstraw (*Gallium trifolium*) and pathfinder (*Adenocaulon bicolor*)
- Proximity to wetland areas, which may provide underground water seepages to adjacent habitat allowing the area to remain moist, shaded and with healthy vegetation growth during warmer parts of the year.
- Notable presence of decaying wood at various states of decay classes, including fine (e.g., sticks, twigs, sloughed bark and branches) to coarse larger pieces of debris (e.g., downed trees and stumps).
  - During mating and oviposition, associated within partially rotted logs or stumps, under sloughing-off bark of large logs, or possibly within the leaf litter. Such sites provide a moist, stable microenvironment required for egg development; the nest functions as an overwintering site for eggs.
  - Under the forest canopy, decaying wood, or deep leaf litter are important to the retention of moisture and providing nest and resting sites to slugs.
- Deep forest litter layer likely important for buffering the species (at all life stages) from changes in temperature and moisture and for helping to maintain a suitable microclimate for survival.
- Presence of fungus and other plant matter for consumption
  - variety of fungi, including fungi that form symbiotic, mycorrhizal associations with plant roots
  - lichens and vascular plants, especially fresh moist plant material
  - mushrooms such as *Tubulicrinis sororius*

Further fieldwork is needed to spatially define the habitat polygons for each of the eleven locations. The specific parameters of the habitat polygons may include additional factors to those attributes described above, further research is needed.

## 7.2 Studies Needed to Describe Survival/Recovery Habitat

Studies are needed before survival/recovery habitat can be fully described (Table 4).

**Table 5.** Studies needed to describe survival/recovery habitat to meet the recovery goal for Blue-grey Tailedropper.

Description of research activity	Outcome / Rationale	Start date
1. Conduct habitat assessments at known locations.	<ul style="list-style-type: none"> <li>Enables comparison of locations for habitat values.</li> </ul>	2012
2. Spatially define habitat polygons at each Blue-grey Tailedropper location using established mapping techniques (e.g., terrestrial ecosystem mapping), plant community classification, coarse woody debris classification guidelines, and other existing resources for describing habitat attributes. Ground truth these polygons spatially and adjust mapping accordingly.	<ul style="list-style-type: none"> <li>Enables spatially defined habitat at each location, to direct actions to minimize threats.</li> </ul>	

### 7.3 Specific Human Activities Likely to Damage Survival/Recovery Habitat

Threats (see Table 2) to Blue-grey Tailedropper can remove habitat completely or reduce the function of the habitat and attributes necessary for population viability. The primary threats to Blue-grey Tailedropper habitat include destruction or degradation of habitat due to urban/commercial land development, forestry activities that remove the understory habitat leading to desiccation and/or reduced humidity, recreation or other similar activities that impact the soil and/or degrade habitat, habitat degradation due to the introduction of plants or gastropod species, the application of herbicides or other chemicals that directly lead to gastropod mortality or linger in the environment.

Any activity that changes the microclimate of the nest, disturbs eggs, physically moves or alters the nest, or affects its future occupancy or productivity constitutes damage or destruction to its habitat and thus threatens Blue-grey Tailedropper. Examples of damaging activities include hauling away or removing coarse woody debris; cutting the wood into pieces; removing bark, or otherwise destroying coarse woody debris containing a nest; and excavating, contaminating, or compacting soil around or within a nest site within the forest litter. Removal of forest canopy from the immediate vicinity of the nest will result in drier forest floor conditions, which can be deleterious to the eggs. Any activity that changes the hydrology of the site and increases the potential for either flooding or drying of the nest site is also considered damaging. Restricting Blue-grey Tailedropper locations into smaller habitat patches likely increases their vulnerability to dehydration (e.g., of the forest floor [Prior 1985; Burke *et al.* 1999]), flooding of the forest floor, reduced genetic diversity, and harmful fluctuations in microclimate (Prior 1985).



**Table 6.** Specific human activities likely to damage survival/recovery habitat for Blue-grey Tailedropper

Specific activity	Threat <sup>a</sup>	Locations
Recreational activities such as trail maintenance, new construction of buildings and/or trails, campground expansion or other activities that impact habitats within parks.	4.1 6.1	All
Recreational activities such as mountain biking and all-terrain vehicle use within occupied habitats.	6.1	All
Intentional planting and resultant spread of introduced plants that would impact the microhabitat and understory forest floor structure within locations. This also includes members of the public, or garden organizations, who increase the spread of invasive species by dumping unwanted compost or vegetation into parks, protected areas, or other natural habitats.	8.1	All
Fire suppression activities, including mowing, pruning, and brush burning (at inappropriate times of the year).	7.1	All
Ongoing urban and commercial land development	1.1, 1.2, 1.3	All locations Historic and ongoing threat to potential locations
Herbicide and other chemical applications within recreational areas that contribute pollution to both the habitat, and directly impact Blue-grey Tailedropper individuals (e.g., cause mortality).	9.3	All

<sup>a</sup>Threat numbers according to the IUCN-CMP classification (see Table 2 for details).

## 8 MEASURING PROGRESS

The successful implementation of recovery actions for Blue-grey Tailedropper slug will be indicated through monitoring of populations and habitat trends through time. Blue-grey Tailedropper may have an annual life cycle and therefore population sizes may vary substantially from year to year and overall population (on a scale of decades) may vary within areas of suitable habitat. Population monitoring will allow for an indication of possible extirpation at a given location, changes in area of extent at a given location, and whether the number of extant populations is stable or increasing. The recovery plan will be reviewed in five years to assess progress and to identify additional approaches or changes that may be required to achieve recovery.

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution goal and recovery objectives. Performance measures are listed below for each objective.

**Objective 1:** To secure protection<sup>13</sup> for the known locations (and new locations) and habitats of Blue-grey Tailedropper.

- Recommend Blue-grey Tailedropper be a priority for listing as Identified Wildlife under the provincial *Forest and Range Practices Act*.
- Establish stewardship agreements and/or covenants for known (and any new) Blue-grey Tailedropper locations on regional district and municipal lands by 2016.

<sup>13</sup> Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

**Objective 2:** To assess and mitigate the extent of the current threats (IUCN-CMP Threat 1, 4, 5, 6, 7, 8, 9) at all locations in B.C.

- Specific management practices guidelines for Blue-grey Tailedropper for each landowner or land manager, specific to the threats of the location have been drafted by 2016.

**Objective 3:** To address knowledge gaps (e.g., habitat requirements, range extent within Vancouver Island, and potential range extent in the Kootenay region) for Blue-grey Tailedropper.

- Studies addressing knowledge gaps initiated by 2016.
- Identify and continue to inventory additional potential habitat within the species' range (ongoing).

## 9 EFFECTS ON OTHER SPECIES

Many species at risk occur within the range and habitat of Blue-grey Tailedropper slug. In total, approximately 164 plant species of conservation concern that are either on the provincial Red list or Blue list occur within the species' range. Approximately 24 of these 164 species are forest inhabitants and thus have the potential to overlap with some of the habitat characteristics of Blue-grey Tailedropper slug.

Coordinated, ecosystem-based approaches are needed to ensure Blue-grey Tailedropper recovery activities are compatible with recovery activities for other species and ecosystems including lowland riparian habitats and the Garry oak and associated ecosystems of southern Vancouver Island.

Survey and habitat assessments for Blue-grey Tailedropper may increase knowledge about other gastropods at risk (note COSEWIC status is in brackets):

- Puget Oregonian Snail (*Cryptomastix devia*) (Extirpated 2002). The two species overlap in their habitat use in the United States (Pilsbry 1940).
- Dromedary Jumping-slug (*Hemphillia dromedarius*) (Endangered 2003), which is known from similar habitat types on southern Vancouver Island.
- Warty Jumping-slug (*Hemphillia glandulosa*) (Special Concern 2003), which is known from similar habitat types on southern Vancouver Island.
- Evening Fieldslug (*Deroceras hesperium*) (Data Deficient 2003).
- Threaded Vertigo (*Nearctula* sp. 1) (Special Concern 2010).
- Oregon Forestsnail (*Allogona townsendiana*) (Endangered 2002).

Plant species that may benefit as a result of recovery efforts for Blue-grey Tailedropper (note COSEWIC status is in brackets):

- Scouler's corydalis (*Corydalis scouleri*) (Threatened 2001)
- phantom orchid (*Cephalanthera austini*) (Threatened 2000)
- coastal wood fern (*Dryopteris arguta*) (Special Concern 2001)
- streambank lupine (*Lupinus rivularis*) (Endangered 2002)

## 10 REFERENCES

- Baur, A., and B. Baur. 1990. Are roads barriers to dispersal in the land snail *Arianta arbustorum*? Canadian Journal of Zoology 68: 613 – 617.
- B.C. Conservation Data Centre. 2012. BC Species and Ecosystems Explorer. B.C. Ministry of Environment, Victoria, BC. <<http://a100.gov.bc.ca/pub/eswp/>> [Accessed January 14, 2012]
- Burke, T. J.S. Applegarth and T.R. Weasma 1999. Management recommendations for survey and manage terrestrial mollusks 2.0. Edited by N. Duncan. October 1999. PDF available at [www.or.blm.gov/surveyandmanage/MR/TM4Species/2000-015.1.pdf](http://www.or.blm.gov/surveyandmanage/MR/TM4Species/2000-015.1.pdf)
- Burke, T.E., N. Duncan, and P. Jeske. 2000. Management recommendations for terrestrial mollusk species: *Prophysaon coeruleum*, blue-gray taildropper and *Prophysaon dubium*, papillose taildropper. Version 2.0. U.S. Department of Agriculture Forest Service and U.S. Department of the Interior, Bureau of Land Management. 49 pp.
- Burton, R.F. 1964. Variations in the volume and concentration of the blood of the snail, *Helix pomatia* L., in relation to the water content of the body. Canadian Journal of Zoology 42:1085 – 1097.
- Burton, R.F. 1966. Aspects of ionic regulation in certain terrestrial pulmonata. Comparative Biochemistry and Physiology 17:1007 – 1018.
- Burton, R.F. 1983. Ionic regulation and water balance. In *The Mollusca*, Vol. V (ed. A.S.M. Saleuddin and K.M. Wilbur), Physiology, Part 2 pp. 291 – 352. Academic Press, New York.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2002. COSEWIC status report on Puget Oregonian Snail *Cryptomastix devia*. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2006. COSEWIC status report on the Blue-grey Taildropper slug *Prophysaon coeruleum*. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2010. [www.cosewic.gc.ca](http://www.cosewic.gc.ca) [Accessed May 2008]
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2010. COSEWIC status report on the Threaded Vertigo *Nearctula sp.*. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.
- Conservation Measures Partnership. 2010. Threats taxonomy. <<http://www.conservationmeasures.org/initiatives/threats-actions-taxonomies/threats-taxonomy>> [Accessed June 10, 2011]
- Cook, A. 1981a. Huddling and the control of water loss by the slug, *Limax pseudoflavus* Evans. Animal Behaviour 29:289 – 298.
- Cook, A. 1981b. A comparative study of aggregation in pulmonate slugs (genus *Limax*). Journal of Animal Ecology 50:703 – 713.
- Department of National Defence (DND). 2010. Summary of survey work for Blue-grey Taildropper slug (*Prophysaon coeruleum*) at CRB Esquimalt's Rocky Point and Colwood Properties in 2009. Internal report prepared for DND Formation Environment, Natural Resources Program.
- Digweed, S. 1993. Selection of terrestrial gastropod prey by Cychrine and Pterostichine ground beetles (Coleoptera: Carabida). Canadian Entomologist 125(3):463–472.

- Forsyth, R.G. 1999. Distribution of nine new or little-known exotic land snails in British Columbia. *Canadian Field-Naturalist* 113:559–568.
- Forsyth, R.G. 2004. Land snails of British Columbia. Royal BC Museum, Victoria, BC. Royal British Columbia Museum Handbook.
- Frest, T.J., and R.S. Rhodes II. 1982. *Oxychilus draparnaudi* in Iowa. *The Nautilus* 6:36–39.
- Gervais et al. 1998.
- GOERT. 2011. Garry Oak Ecosystems Recovery Team website <[www.goert.ca](http://www.goert.ca)> [Accessed October 31, 2011]
- Government of Canada. 2009. *Species at Risk Act* policies, overarching policy framework – draft. Environment Canada, Ottawa, ON. 38 pp. <[http://dsp-psd.pwgsc.gc.ca/collection\\_2009/ec/En4-113-2009-eng.pdf](http://dsp-psd.pwgsc.gc.ca/collection_2009/ec/En4-113-2009-eng.pdf)> [Accessed May 3, 2010]
- Kelley, R., S. Dowlan, N. Duncan, and T. Burke. 1999. Field Guide to Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan. USDI Bureau of Land Management, Oregon. 114 pp.
- Machin, J. 1964a. The evaporation of water from *Helix aspersa*. I. Nature of the evaporating surface. *Journal of Experimental Biology* 41: 783 – 792.
- Machin, J. 1964b. The evaporation of water from *Helix aspersa*. II. Measurement of air flow and diffusion of water vapour. *Journal of Experimental Biology* 41: 771 – 781.
- Machin, J. 1964c. The evaporation of water from *Helix aspersa*. III. The application of evaporative formulae. *Journal of Experimental Biology* 41: 783 - 792.
- Machin, J. 1975. Water relationships in Pulmonates, Vol I (ed. V. Fretter and J. Peake), pp. 105 – 163. Academic Press, New York.
- MacKinnon, A. and M. Eng. 1995. Old Forests: Inventory for Coastal British Columbia. *Cordillera: A Journal of British Columbia Natural History* 1995 (Summer):20–33.
- Martin, A.W. 1983. Excretion. In *The Mollusca* (ed. A.S.M. Saleuddin and K.M. Wilbur), Physiology, Part 2 pp. 353 – 405. Academic Press, New York.
- Master, L., D. Faber-Langendoen, R. Bittman, G.A. Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino. 2009. NatureServe conservation status assessments: factors for assessing extinction risk. NatureServe, Arlington, VA. <[http://www.natureserve.org/publications/ConsStatusAssess\\_StatusFactors.pdf](http://www.natureserve.org/publications/ConsStatusAssess_StatusFactors.pdf)> [Accessed June 10, 2011]
- McGraw, R., N. Duncan, and E. Cazares. 2002. Fungi and other items consumed by the Blue-Gray Taildropper slug (*Prophysaon coeruleum*) and the Papillose Taildropper slug (*Prophysaon dubium*). *The Veliger* 45:261–264.
- Meidinger, D., and J. Pojar. 1991. Ecosystems of British Columbia. BC Ministry of Forests, Victoria, BC. 330 pp.
- Ministry of Environment. 2010a. British Columbia guide to recovery planning for species and ecosystems. Victoria, BC. 32 pp. <<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>> [Accessed June 10, 2011]
- Ministry of Environment. 2010b. Conservation framework. Victoria, BC. <<http://www.env.gov.bc.ca/conservationframework/index.html>> [Accessed June 10, 2011]
- NatureServe. 2010. NatureServe explorer: an online encyclopedia of life [web application]. Version 7.1. Arlington, VA. <<http://www.natureserve.org/explorer>> [Accessed June 10, 2011]

- Ovaska, K. and L. Sopuck. 2002a. Surveys for terrestrial and freshwater molluscs on DND lands near Victoria, Vancouver Island, British Columbia. Unpublished report prepared by Biolinx Environmental Research Ltd. for DND/CFS Natural Resources Management Program, CFB Esquimalt, Victoria, BC.
- Ovaska, K. and L. Sopuck. 2002b. Terrestrial gastropods and salamanders as indicators for monitoring ecological effects of variable-retention logging practices. A pilot study, May–October 2001. Unpublished report prepared by Biolinx Environmental Research Ltd. for Weyerhaeuser Company Ltd., Nanaimo, BC.
- Ovaska, K. and L. Sopuck. 2003a. Surveys for terrestrial gastropod species at risk in Pacific Rim National Park Reserve. Unpublished report prepared by Biolinx Environmental Research Ltd. for Parks Canada, Coastal British Columbia Field Unit, Victoria, BC.
- Ovaska, K. and L. Sopuck. 2003b. Distribution and status of rare forest slugs in western Canada. Unpublished report prepared by Biolinx Environmental Research Ltd. for the Endangered Species Recovery Fund, Hull, PQ.
- Ovaska, K. and L. Sopuck. 2003c. Terrestrial gastropods as indicators for monitoring ecological effects of variable-retention logging practices. Pre-disturbance surveys at experimental sites May–November 2003. Unpublished report prepared by Biolinx Environmental Research Ltd. for Weyerhaeuser Canada, Nanaimo Office, Nanaimo, BC.
- Ovaska, K. and L. Sopuck. 2003d. Inventory of rare gastropods in southwestern British Columbia. Prepared for B.C. Ministry of Water, Land and Air Protection, Victoria, BC. Unpublished report.
- Ovaska, K. and L. Sopuck. 2004a. Distribution and status of rare forest slugs in western Canada: results of 2003 and 2004 field seasons. Report prepared by Biolinx Environmental Research Ltd. for Endangered Species Recovery Fund (World Wildlife Fund and Environment Canada).
- Ovaska, K. and L. Sopuck. 2004b. Surveys for terrestrial gastropods at NRS Aldergrove and Matsqui TX and Colwood supply/fuel oil depot. Prepared by Biolinx Environmental Research Ltd. for DND/CFS Natural Resources Management Program, CFB Esquimalt, Victoria, BC.
- Ovaska, K. and L. Sopuck. 2006. Surveys for the Blue-grey Tailedropper and other gastropods at risk within CRD parks and trails system in 2006. Report prepared by Biolinx Environmental Research Ltd. for Capital Regional District Parks, Victoria, BC. 45 p.
- Ovaska, K. and L. Sopuck. 2007a. Surveys for gastropod species at risk in the Kootenay region of B.C. Prepared for B.C. Ministry of Environment, Vancouver, B.C.
- Ovaska, K. and L. Sopuck. 2007b. Surveys for the Blue-grey Tailedropper within CRD parks and trails system in 2007. Progress report prepared by Biolinx Environmental Research Ltd. for Capital Regional District Parks, Victoria, BC. 14 p.
- Ovaska, K. and L. Sopuck. 2007c. Surveys for the Blue-grey Tailedropper slug (*Prophysaon coeruleum*) on federal lands on southern Vancouver Island, BC, fall 2007. Report prepared by Biolinx Environmental Research Ltd. for CFS/CFB Natural Resources Management Program, CFB Esquimalt, Victoria, BC.
- Ovaska, K. and L. Sopuck. 2007d. Surveys for gastropod species at risk in southern Vancouver Island on provincial Crown land. B.C. Ministry of Environment, Vancouver, B.C. Unpublished report.
- Ovaska, K. and L. Sopuck. 2008a. Surveys for gastropod species at risk in the Kootenay Region, B.C. Prepared for B.C. Ministry of Environment, Victoria, B.C.

- Ovaska, K. and L. Sopuck. 2008b. Surveys for the Blue-grey Tailedropper and other gastropods at risk within the CRD parks and trails system in 2008. Report prepared by Biolinx Environmental Research Ltd. for Capital Regional District Parks, Victoria, BC. 61 p.
- Ovaska, K. and L. Sopuck. 2009a. Surveys for the Blue-grey Tailedropper and other gastropods at risk within the CRD parks and trails system in 2009. Report prepared by Biolinx Environmental Research Ltd. for Capital Regional District Parks, Victoria, BC. 36 p.
- Ovaska, K. and L. Sopuck. 2009b. Surveys for the Blue-grey Tailedropper slug (*Prophysaon coeruleum*) on federal lands on southern Vancouver Island in 2008. Report prepared by Biolinx Environmental Research Ltd. for CFS/CFB Natural Resources Management Program, CFB Esquimalt, Victoria, BC.
- Ovaska, K. and L. Sopuck. 2010. Surveys for the Blue-grey Tailedropper and other gastropods at risk with focus on Capital Regional District Parks, Fall 2010. Report prepared by Biolinx Environmental Research Ltd. for Habitat Acquisition Trust and Capital Regional District Parks, Victoria, BC. 30 pp.
- Ovaska, K., L. Sopuck and J. Heron. 2010. Surveys for gastropod species at risk in the Kootenay region, B.C. Ministry of Environment, Vancouver, B.C.
- Ovaska, K. and Sopuck, L. 2011 (in prep). Surveys for the Blue-grey Tailedropper and other gastropods at risk with focus on Capital Regional District Parks, fall 2011. Report prepared by Biolinx Environmental Research Ltd. for Habitat Acquisition Trust, Victoria, BC.
- Parks Canada. 2002. <[http://parkscanada.pch.gc.ca/pn-np/bc/pacificrim/index\\_E.asp](http://parkscanada.pch.gc.ca/pn-np/bc/pacificrim/index_E.asp)> [Accessed January 2007]
- Peake, J. 1978. Distribution and ecology of the Stylommatophora. Pages 429–526 in Pulmonates, Vol. 2A. V. Fretter and J. Peake, eds. Academic Press, New York, NY.
- Phifer, C.B. and D.J. Prior. 1982. Dehydration-induced modification of feeding and its neural correlate in the slug *Limax maximus*. Neuroscience Abstracts 8(2): 901.
- Pilsbry, H.A. 1940. Land mollusca of North America (north of Mexico). Academy of Natural Sciences of Philadelphia, Monograph 3, 1(2):575–994, i–ix.
- Prior, D.J. 1981. Hydration-related behaviour and the effects of osmotic stress of motor function in the slugs. *Limax maximus* and *Limax pseudoflavus*. In Advances in Physiological Sciences Vol. 23, Neurobiology of Invertebrates (ed. J. Salanki), pp. 131 – 145. Pergamon Press, Oxford.
- Prior, D.J. 1983. Hydration-induced modulation of feeding responsiveness in terrestrial slugs. Journal of Experimental Zoology 227: 15 – 22.
- Prior, D.J. 1985. Water-regulatory behaviour in terrestrial gastropods. Biological Reviews 60 (3), 403–424
- Prior, D.J., M. Hume, D. Varga and S.D. Hess. 1983. Physiological and behavioural aspects of water balance and respiratory function in the terrestrial slug, *Limax Maximus*. Journal of Experimental Biology 104: 111 – 127.
- Prior, D.J. and S.K. Pierce. 1981. Adaptation and tolerance of invertebrate nervous systems to osmotic stress. Journal of Experimental Zoology 255: 237 – 245.
- Province of British Columbia. 1982. Wildlife Act [RSBC 1996] c. 488. Queen's Printer, Victoria, BC.
- <[http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/00\\_96488\\_01](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96488_01)> [Accessed June 10, 2011]

- Province of British Columbia. 2002. Forest and Range Practices Act [RSBC 2002] c. 69. Queen's Printer, Victoria, BC.  
<[http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/00\\_02069\\_01](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_02069_01)>  
[Accessed June 10, 2011]
- Richter, K.O. 1980. Evolutionary aspects of mycophagy in *Ariolimax columbianus* and other slugs. Pages 616–636 in D.L. Dindal, ed. Soil biology as related to land use practices. Proceedings of the VII International Colloquium of Soil Biology, USEPA Office of Pesticide and Toxic Substances, Washington, DC. EPA-560/13-80-038.
- Riddle, W.A. 1983. Physiological ecology of land snails and slugs. In *The Mollusca*, vol. 6 (ed. W.D. Russell-Hunter), Ecology, pp. 431 – 461.
- Rollo, C.D. and W.G. Wellington. 1979. Intra- and inter-specific agonistic behavior among terrestrial slugs (Pulmonata: Stylommatophora). *Canadian Journal of Zoology* 57:846–855.
- South, A. 1992. Terrestrial slugs: Biology, ecology, and control. Chapman and Hall, New York, NY.
- Thiele, H.-U. 1977. Carabid Beetles in Their Environment. *Zoophysiology and Ecology* 10, Springer, Berlin, pp. 369.
- Wilke, T. and N. Duncan. 2004. Phylogeographical patterns in the American Pacific Northwest: lessons from the arionid slug *Prophysaon coeruleum*. *Molecular Ecology* 13:2303 – 2315.
- Zielke, K., J. Boateng, N. Caldicott, H. Williams. 1992. Broom and gorse in British Columbia: a forestry perspective problem analysis. British Columbia Ministry of Forests, Victoria, B.C. <http://www.for.gov.bc.ca/hfp/publications/00042/broom-gorse.pdf>

## Personal Communications

- Claudia Copley, Royal B.C. Museum, Victoria, BC. Personal communication to Jennifer Heron.
- Rob Higgins, Thompson Rivers University, Williams Lake, B.C. Personal communication to Jennifer Heron.
- Kristiina Ovaska, Biolinx Environmental Research Ltd., Sidney, BC. Personal communication to Jennifer Heron, 2011.
- Adriane Pollard, District of Saanich, Saanich, BC. Personal communication to Jennifer Heron, 2011.
- Andrea Schiller, Natural Resources Canada, Victoria, BC. Personal communication to Jennifer Heron, 2006 – 2011.
- Lennart Sopuck, Biolinx Environmental Research Ltd., Sidney, BC. Personal communication to Jennifer Heron, 2006 – 2011.



## Appendix 1. Blue-grey tailedropper populations in B.C.

**Table A1.** Status and description of Blue-grey Tailedropper populations in B.C.

Location	Observation date	# slugs observed	Location name	Land ownership <sup>a</sup>	General UTM 10U (Easting)	General UTM 10U (Northing)	Reference for occurrence record
1	2004 Oct. 21	1	Devonian	CRD	460081	5357048	Ovaska and Sopuck (2004a)
1	2007 Nov. 9	1	Devonian	CRD	460274	5356779	Ovaska and Sopuck (2007b)
1	2007 Nov. 9	2	Devonian	CRD	460140	5356870	Ovaska and Sopuck (2007b)
1	2008 June 9	1	Devonian	CRD	46024	5356779	Ovaska and Sopuck (2008b)
1	2008 Nov. 12	1	Devonian	CRD	460263	5356799	Ovaska and Sopuck (2008b)
1	2008 Nov. 12	1	Devonian	CRD	460290	5356798	Ovaska and Sopuck (2008b)
1	2009 Nov. 20	1	Devonian	CRD	460306	5356791	Ovaska and Sopuck (2009a)
1	2009 Nov. 20	1	Devonian	CRD	460234	5356837	Ovaska and Sopuck (2009a)
1	2009 Dec. 1	2	Devonian	CRD	460234	5356837	Ovaska and Sopuck (2009a)
1	2009 Nov. 20	1	Devonian	CRD	460163	5356878	Ovaska and Sopuck (2009a)
1	2009 Dec. 1	2	Devonian	CRD	460163	5356878	Ovaska and Sopuck (2009a)
2	2003 Dec. 9	1	Mount Work, Durrance Lake	DND, Canadian Forces	465429	5377317	Hawkes (2004)

<b>Location</b>	<b>Observation date</b>	<b># slugs observed</b>	<b>Location name</b>	<b>Land ownership<sup>a</sup></b>	<b>General UTM 10U (Easting)</b>	<b>General UTM 10U (Northing)</b>	<b>Reference for occurrence record</b>
2	2007 Oct. 18	1	Mount Work, Durrance Lake	DND, Canadian Forces	465733	5377207	Ovaska and Sopuck (2007c)
2	2008 Nov. 11 (1 slug), Nov. 22 (2 slugs), Nov. 22 (2 slugs)	5	Mount Work, Durrance Lake	DND, Canadian Forces	465728 <sup>b</sup>	5377207 <sup>b</sup>	Ovaska and Sopuck (2009b)
2	2007 Nov. 23	1	Mount Work, Durrance Lake	CRD	464991	5377219	Ovaska and Sopuck (2007b)
2	2008 June 5	1	Mount Work, Durrance Lake	CRD	464949	5377295	Ovaska and Sopuck (2008b)
2	2009 Nov. 26	1	Mount Work, Durrance Lake	CRD	465015	5377293	Ovaska and Sopuck (2009a)
2	2010 Dec. 8	1	Mount Work, Durrance Lake	CRD	465078	5377226	Ovaska and Sopuck (2010)
3	2004 Nov. 22	1	Galloping Goose	CRD	447836	5361855	Ovaska. and Sopuck (2004a)
4	2010 Dec. 6	2	Logan	Saanich Municipal Park	468110	5371657	Ovaska and Sopuck (2010)
5	2011 April 30	2	Matheson Lake	CRD	455721	5356816	L. Sopuck, pers. comm. 2011
5	2011 April 30	1	Matheson Lake	CRD	455721	5356816	L. Sopuck, pers. comm. 2011
6	2003 Nov. 18	2	Mill Hill -Colwood	DND, CFB Colwood	466035	5366514	Ovaska and Sopuck (2004b)
6	2008 Oct. 30 (2 slugs); Nov. 10 (1 slug);	7	Mill Hill -Colwood	DND, CFB Colwood	466055 <sup>b</sup>	5366500 <sup>b</sup>	Ovaska and Sopuck (2009b)

<b>Location</b>	<b>Observation date</b>	<b># slugs observed</b>	<b>Location name</b>	<b>Land ownership<sup>a</sup></b>	<b>General UTM 10U (Easting)</b>	<b>General UTM 10U (Northing)</b>	<b>Reference for occurrence record</b>
	Nov. 18 (4 slugs)						
6	2009 Nov. 9 (1 slug); Nov. 26 (2 slugs); Nov. 26 (1 slug)	4	Mill Hill -Colwood	DND, CFB Colwood	N/A	N/A	DND (2010)
7	2002 Nov. 18	5	Rocky Point	DND	457957	5354106	Ovaska and Sopuck (2002a)
7	2002 Oct. 29	1	Rocky Point	DND, CFB Rocky Point	457858	5354715	Ovaska and Sopuck (2002a)
7	2007 Oct. 22 (1 slug); Nov. 5 (1 slug); Nov. 15 (1 slug)	3	Rocky Point	DND, CFB Rocky Point	457938 <sup>b</sup>	5354102 <sup>b</sup>	Ovaska and Sopuck (2007c)
7	2008 Oct. 14 (1 slug); Oct. 28 (1 slug); Oct. 29 (1 slug); Nov. 10 (1 slug); Nov. 20 (2 slugs); Nov. 21 (4 slugs)	10	Rocky Point	DND, CFB Rocky Point	457853 <sup>b</sup>	5354721 <sup>b</sup>	Ovaska and Sopuck (2009b)
7	2009 Oct. 19 (2 slugs); Nov. 9 (1 slug); Nov. 27 (1 slug)	4	Rocky Point	DND, CFB Rocky Point	N/A	N/A	DND (2010)
8	2009 Nov. 11	1	Sooke Hills	CRD	458899	5366129	Ovaska and Sopuck (2009a)
9	2008 Nov. 15	1	Thetis Lake	CRD	465812	5367884	Ovaska and Sopuck (2008b)
9	2009 Nov. 30	1	Thetis Lake	CRD	465829	5367860	Ovaska and Sopuck (2009a)

<b>Location</b>	<b>Observation date</b>	<b># slugs observed</b>	<b>Location name</b>	<b>Land ownership<sup>a</sup></b>	<b>General UTM 10U (Easting)</b>	<b>General UTM 10U (Northing)</b>	<b>Reference for occurrence record</b>
9	2010 Nov. 13	1	Thetis Lake	CRD	465408	5369560	Ovaska and Sopuck (2010)
9	2010 Nov. 13	1	Thetis Lake	CRD	465864	5367951	Ovaska and Sopuck (2010)
10	2011, Nov. 1	1	Observatory Hill	Federal	468947	5374273	K. Ovaska, pers. comm., 2011; L. Sopuck, pers. comm., 2011
11	2011, Nov. 5	1	Trevlac Pond	Saanich Municipal Park	467268	5371647	Ovaska and Sopuck (2011)

<sup>a</sup> CFB = Canadian Forces Base; CRD = Capital Regional District; DND = Department of National Defence.

<sup>b</sup> This is an approximate UTM.