

PROPOSED

Species at Risk Act
Management Plan Series
Adopted under Section 69 of SARA

Management Plan for the Northern Rubber Boa (*Charina bottae*) in Canada

Northern Rubber Boa



2016



Government
of Canada

Gouvernement
du Canada

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For copies of the management plan, 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://www.registrelep-sararegistry.gc.ca)¹.

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¹ <http://www.registrelep-sararegistry.gc.ca>

MANAGEMENT PLAN FOR THE NORTHERN RUBBER BOA (*Charina bottae*) IN CANADA

2016

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 *Management Plan for the Northern Rubber Boa (Charina bottae) in British Columbia* (Part 2) under section 69 of the *Species at Risk Act* (SARA). Environment Canada has included a federal addition (Part 1) which completes the SARA requirements for this management plan.

The federal management plan for the Northern Rubber Boa in Canada consists of two parts:

Part 1 – Federal Addition to the *Management Plan for the Northern Rubber Boa (Charina bottae) in British Columbia*, prepared by Environment Canada.

Part 2 – *Management Plan for the Northern Rubber Boa (Charina bottae) in British Columbia*, prepared by British Columbia Ministry of Environment.

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**Part 1 – Federal Addition to the *Management Plan for the Northern Rubber Boa (Charina bottae) in British Columbia*,
prepared by Environment Canada**

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)² 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 management plans for listed species of special concern 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 the Environment and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Northern Rubber Boa and has prepared this management plan (Part 1) as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the British Columbia (B.C.) Ministry of Environment. SARA section 69 allows the Minister to adopt all or part of an existing plan for the species if it meets the requirements under SARA for the content. The B.C. Ministry of Environment led the development of the attached management plan for the Northern Rubber Boa (Part 2) in cooperation with Environment Canada and the Parks Canada Agency.

Success in the conservation 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 management plan and will not be achieved by Environment Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Northern Rubber Boa and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

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

Additions and Modifications to the Adopted Document

The following section has been included to address specific requirements of SARA that are not addressed in the *Management Plan for the Northern Rubber Boa* (*Charina bottae*) in *British Columbia* (Part 2) and/or to provide updated or additional information.

Under SARA, there are specific requirements and processes set out regarding the protection of species and their habitats. Therefore, statements in the provincial management plan referring to protection of species and their habitats may not directly correspond to federal requirements, and are not being adopted by the competent ministers as part of the federal management plan.

1.0 Effects on the Environment and Other Species

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](#)³. The purpose of a SEA is to 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 achievement of any of the [Federal Sustainable Development Strategy](#)'s⁴ (FSDS) goals and targets.

Conservation planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of management plans may 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 management plan itself, but are also summarized below in this statement.

The provincial management plan for Northern Rubber Boa contains a short section describing the effects of management activities on other species (i.e., Section 8). The competent ministers adopt this section of the provincial management plan as the statement on effects of management activities on the environment and other species. The distribution of Northern Rubber Boa overlaps with that of several other federally-listed species at risk. Conservation planning activities for Northern Rubber Boa 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. Some management actions for Northern Rubber Boa (e.g., inventory and monitoring, threat mitigation, habitat conservation, education, and research) may promote the conservation of other species at risk that overlap in distribution and rely on similar habitat attributes.

³ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

⁴ <http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1>

**Part 2 – *Management Plan for the Northern Rubber Boa*
(*Charina bottae*) in *British Columbia*, prepared by
British Columbia Ministry of Environment**

Management Plan for the Northern Rubber Boa (*Charina bottae*) in British Columbia



Prepared by B.C. Ministry of Environment



Ministry of
Environment

March 2015

About the British Columbia Management Plan Series

This series presents the management plans that are prepared as advice to the Province of British Columbia. Management plans are prepared in accordance with the priorities and management actions assigned under the British Columbia Conservation Framework. The Province prepares management plans for species that may be at risk of becoming endangered or threatened due to sensitivity to human activities or natural events.

What is a management plan?

A management plan identifies a set of coordinated conservation activities and land use measures needed to ensure, at a minimum, that the target species does not become threatened or endangered. A management plan summarizes the best available science-based information on biology and threats to inform the development of a management framework. Management plans set goals and objectives, and recommend approaches appropriate for species or ecosystem conservation.

What's next?

Direction set in the management plan provides valuable information on threats and direction on conservation measures that may be used by individuals, communities, land users, conservationists, academics, and governments interested in species and ecosystem conservation.

For more information

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

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

**Management Plan for the Northern Rubber Boa
(*Charina bottae*) in British Columbia**

Prepared by the B.C. Ministry of Environment

March 2015

Recommended citation

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Cover illustration/photograph

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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>>

Disclaimer

The B.C. Ministry of Environment has prepared this management plan as advice to the responsible jurisdictions and organizations that may be involved in managing the species.

This document identifies the management actions that are deemed necessary, based on the best available scientific and traditional information, to prevent Northern Rubber Boa populations in British Columbia from becoming endangered or threatened. Management 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 management approaches may be modified in the future to accommodate new objectives and findings.

The responsible jurisdictions 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.

Success in the conservation 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 management plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the conservation of Northern Rubber Boa.

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EXECUTIVE SUMMARY

The Northern Rubber Boa (*Charina bottae*) is a short and stout snake with a blunt, rounded tail that resembles the head and is used as a distraction during predator evasion. The dorsal surface of adults is uniformly brown, sometimes tinged with grey, yellow, or green and the underbelly is yellow, whereas juveniles are semi-transparent and very pale with no distinct margin between the dorsal and ventral surfaces. The Northern Rubber Boa is crepuscular and nocturnal and spends much of the time under cover and is thus infrequently found except at dens in spring or by actively searching under cover objects in the summer. It occurs across most of southern British Columbia (B.C.) except Vancouver Island and the Gulf Islands, but has most commonly been observed in the Thompson/Okanagan and southern Columbia River basin (west Kootenays) watersheds.

The Northern Rubber Boa was designated as Special Concern in 2003 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is Special Concern in Canada on Schedule 1 of the *Species at Risk Act* (SARA). In B.C., the Northern Rubber Boa is ranked S4 (apparently secure) by the B.C. Conservation Data Centre and is on the provincial Yellow list (secure). The B.C. Conservation Framework ranks the Northern Rubber Boa as a priority 1 under goal 2 (prevent species and ecosystems from becoming at risk). It is protected from capture and killing, under the B.C. *Wildlife Act*.

The Northern Rubber Boa requires specific habitats for thermoregulation and overwintering, although the use of the different habitats in B.C. is not well known.

The overall threat impact is low, with the greatest threats to the species being agriculture (notably vineyards) and roads.

The management goal for the Northern Rubber Boa is to maintain the current area of occupancy and distribution of the Northern Rubber Boa within B.C.

The management objectives are to:

1. protect suitable habitat across the range of the Northern Rubber Boa¹;
2. mitigate threat impacts to local populations where necessary;
3. address current knowledge gaps in the range distribution of the Northern Rubber Boa;
4. assess population size at a variety of locations and habitat across the range to refine the provincial population estimate; and
5. address knowledge gaps in habitat requirements including thermoregulation, refuge, foraging, and overwintering habitats.

¹ Protection can be achieved through various mechanisms including: voluntary stewardship programs, conservation covenants, sale by willing vendors of private lands, land-use designations, and protected areas.

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1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Assessment Summary - May 2003

Common name:** Rubber Boa

Scientific name: *Charina bottae*

Status: Special Concern

Reason for designation: Although this species may be widespread in British Columbia, its status is difficult to determine because the species is cryptic. However, searches indicate that this species is uncommon and patchily distributed. Because the species' abundance is poorly documented, it could qualify as Data Deficient, but the species' life history traits—low reproductive rate, delayed age at maturity, and extended longevity—make it sensitive to human activity. Therefore, this species merits the current status until further investigation shows that it is at higher risk or is secure.

Canadian Occurrence: British Columbia

Status history: Designated Special Concern in May 2003. Assessment based on a new status report.

* Committee on the Status of Endangered Wildlife in Canada.

**Common and scientific names reported in this management plan follow the naming conventions of the British Columbia Conservation Data Centre, which may be different from names reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Northern Rubber Boa ^a	
Legal Designation:	
FRPA : ^b No	B.C. <i>Wildlife Act</i> : ^c Schedule A
OGAA : ^b No	SARA : ^d Schedule 1 –Special Concern
Conservation Status ^e	
B.C. List: Yellow	B.C. Rank: S4 (2012)
National Rank : N4 (2011)	Global Rank: G5 (2006)
Other Subnational Ranks : ^f CA:SNR; ID: (S5); MT:S4; NV: S3S4; OR: S4; UT: S4; WA: S4; WY:S2	
B.C. Conservation Framework (CF) ^g	
Goal 1: Contribute to global efforts for species and ecosystem conservation.	Priority: ^h 5 (2010)
Goal 2: Prevent species and ecosystems from becoming at risk.	Priority: 1 (2010)
Goal 3: Maintain the diversity of native species and ecosystems.	Priority: 3 (2010)
CF Action Groups :	Compile Status Report; Planning; Send to COSEWIC; Habitat Protection; Habitat Restoration; Private Land Stewardship; Species and Population Management

^a Data source: B.C. Conservation Data Centre (2014) unless otherwise noted.

^b No = not listed in one of the categories of wildlife that requires special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the impacts of oil and gas activities on Crown land under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).

^c Schedule A = designated as wildlife under the B.C. *Wildlife Act*, which offers it protection from direct persecution and mortality (Province of British Columbia 1982).

^d Schedule 1 = found on the List of Wildlife Species at Risk under the *Species at Risk Act* (SARA).

^e S = subnational; N = national; G = global; T = refers to the subspecies level; 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.

^f Data source: NatureServe (2014).

^g Data source: B.C. Ministry of Environment (2010).

^h Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

The Northern Rubber Boa is the only member of the family Boidae found in Canada. It is short and stout with a short blunt tail (Matsuda *et al.* 2006), which resembles the head (Nussbaum *et al.* 1983) and is used to distract antagonists (Hoyer and Stewart 2000b) and predators (Greene 1973). The head is rounded, blunt, and not distinguished from the neck (Matsuda *et al.* 2006). The eyes are small with vertical pupils, which are features frequently associated with nocturnal animals. The dorsal surface of adults is uniformly brown, although sometimes tinged with grey, yellow, or green, and the underbelly is yellow (Matsuda *et al.* 2006). In contrast, juveniles are semi-transparent and very pale with no distinct margin between the dorsal and ventral surfaces (Hoyer and Stewart 2000a). The plates on the top of the head are large and irregular and the body scales are small and smooth (Matsuda *et al.* 2006), giving it the appearance of rubber. There is a single anal plate with a spur in a pit on each side (Matsuda *et al.* 2006). The spurs in males are larger than those in females and are used by the males to court females (Hoyer 1974; Hoyer and Storm 1992).

The females can reach sexual maturity in 5 years and the males earlier, in 3–4 years (Hoyer and Storm 1992). Adult females are larger than males, with the largest female 780 mm (Hoyer 1974). The Northern Rubber Boa frequently overwinter in small communal hibernacula (St. Clair 1999; M. Sarell, pers. comm., 2014; L. A. Lowcock, pers. comm., 2014) and mate in the spring after emergence (Hoyer and Storm 1992). These viviparous snakes can give birth to 2–8 young every 2 years, but usually every 3–4 years (Hoyer and Storm 1992). Data from a small number of Northern Rubber Boa in western Oregon (R. Hoyer, unpublished data) suggest that they can live longer than 20 years.

3.2 Populations and Distribution

The Northern Rubber Boa occurs in southern British Columbia (B.C.) through Washington and Oregon and the northern half of California, and west through Idaho, Utah, western Montana, and western Wyoming (Matsuda *et al.* 2006; Figure 1). In B.C., records extend north almost to Williams Lake, west to Nelson Island and Sechelt peninsula on coastal B.C. and east to Radium Hot Springs and Canal Flats (Matsuda *et al.* 2006; Pearson 2010; Figure 2). The Northern Rubber Boa is not found on Vancouver Island, the Gulf Islands, or on Haida Gwaii. The eastern records are less than 50 km from the Alberta border, but there are no records of its occurrence in Alberta (Russell and Bauer 2000).

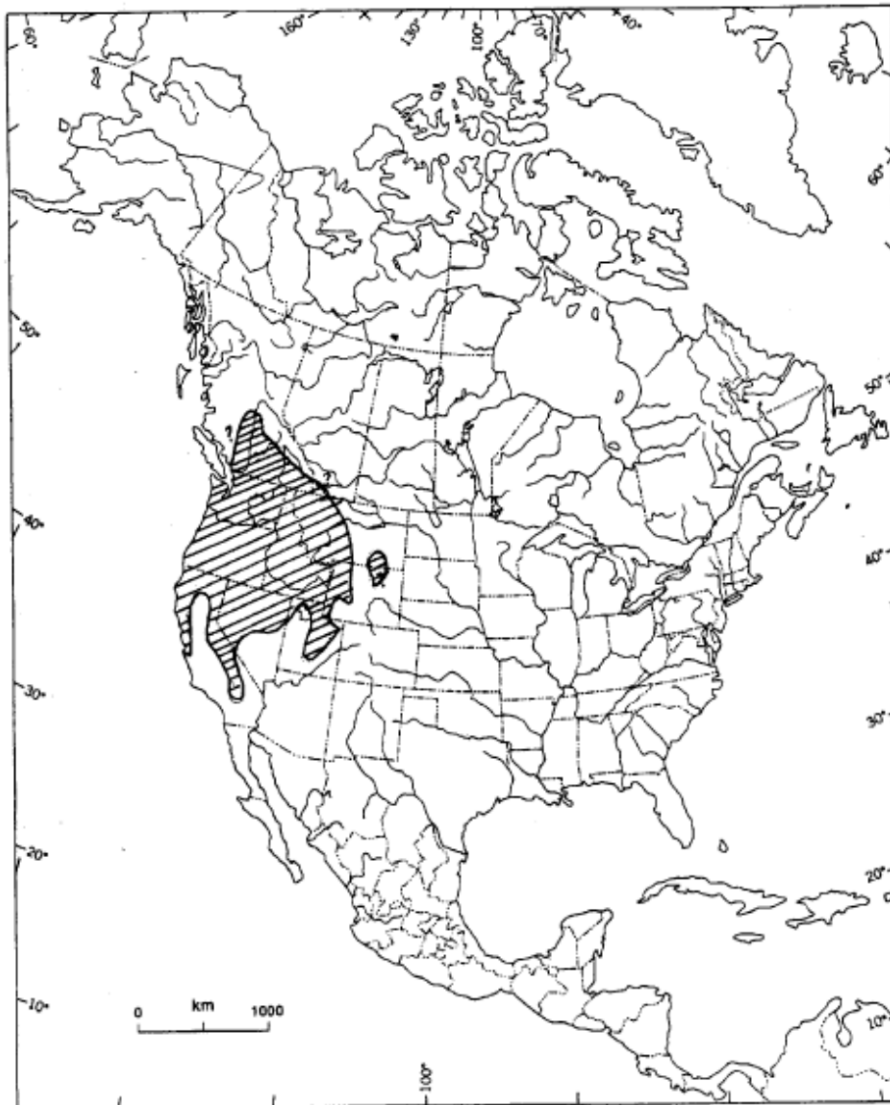


Figure 1. The Northern Rubber Boa distribution in Canada and the United States (after Stewart 1977 and Gregory and Cambell 1984). The distribution shown for the southwest corner of Alberta is probably incorrect (see Russell and Bauer 2000).

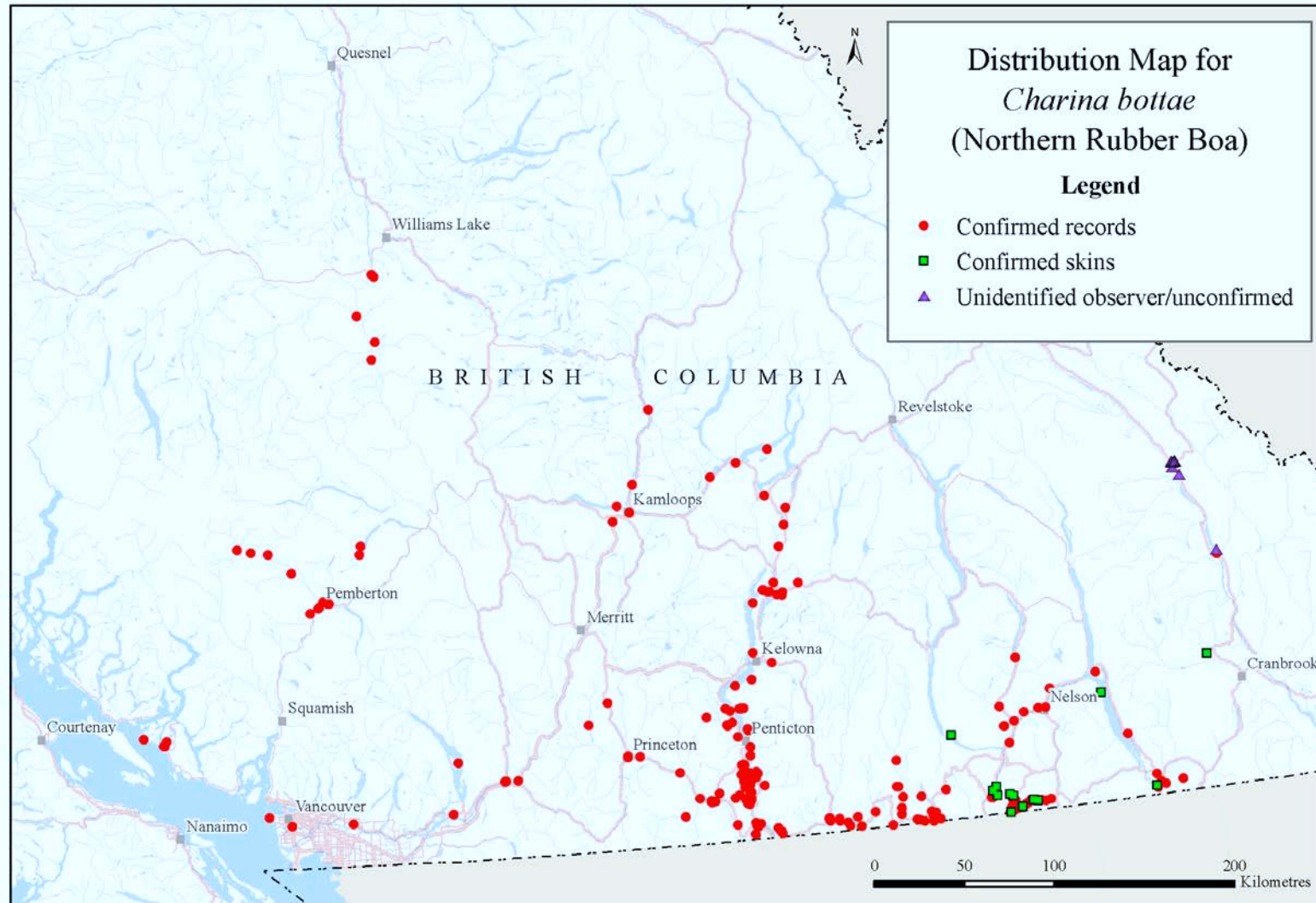


Figure 2. The distribution of the Northern Rubber Boa in British Columbia.

The two records for Vancouver (Marine Drive 1960 and UBC 1948; Figure 2) date back over 50 years and the lack of more recent records and the increased housing in these areas suggests that these individuals were from populations lost to development.

The record given in COSEWIC (2003) for the location near Quesnel (Cannings *et al.* 1999, presumably based on Keddie 1975) is incorrect (G. Keddie, pers. comm., 2014).² The correct location is in Figure 2 at the junction of the Chilcotin and Fraser rivers.

Although the Northern Rubber Boa is widely distributed in B.C. (Figure 2), it is not commonly found. The species has a cryptic and largely crepuscular or nocturnal habit (Ross 1931; Nussbaum *et al.* 1983; Dorcas and Peterson 1998), spending the days under cover (Dorcas and Peterson 1998; St. Clair 1999; Dulisse 2006, 2007). The exceptions are in spring upon emergence when they are observed basking (M. Sarell, pers. comm., 2014) and in summer when gravid females are basking (Dorcas and Peterson 1998). However, the snakes can be found by looking under natural cover objects (Dulisse 2006, 2007; P.T. Gregory, pers. comm., 2014; P. Rutherford, unpublished data) and therefore their abundance may be greater than the available data suggest.

3.3 Habitat and Biological Needs

In B.C., the Northern Rubber Boa occurs in humid mountainous regions and dry lowland areas (Matsuda *et al.* 2006), frequently associated with rock outcrops, rock piles, rock bluffs, or talus slopes (St. Clair 1999; Dulisse 2006, 2007; M. Pearson, pers. comm., 2014; M. Sarell, pers. comm., 2014). In the forested areas, the snakes are frequently in clearings, although under or near rocks (St. Clair 1999; Dulisse 2006; Matsuda *et al.* 2006). In the dry lowland areas, there may be no trees, but there are shrubs and grasses and rocks or talus slopes (M. Sarell, pers. comm., 2014). The Northern Rubber Boa persists in disturbed areas in Western Oregon (Hoyer 1974). The only record of Northern Rubber Boa from a semi-disturbed area in British Columbia is at Radium Hot Springs, British Columbia where they occur on a rocky outcrop adjacent to the hot springs pool (St. Clair and Dibb, 2004; R. St. Clair, pers. comm., 2014).

The Northern Rubber Boa requires specific features that allow the snakes to thermoregulate and overwinter. Habitat features for thermoregulation include soils loose enough for burrowing, rodent holes, leaf litter, woody debris (including logs and rotting stumps), rocks, rock outcrops, and talus slopes (Dorcas 1995 from Dorcas and Peterson 1997; Dorcas and Peterson 1998; St. Clair 1999; M. Sarell, pers. comm., 2014). Rock outcrops and talus slopes are also used as hibernacula (Dorcas and Peterson 1998; M. Sarell, pers. comm., 2014), although the Northern Rubber Boa also overwinter in forest soils (about 1 m below surface; St. Clair 1999 [cited by St. Clair and Dibb, 2004]) in compost and burn piles (M. Sarell, pers. comm., 2014) and in waste talus from a quarry operation (L.A. Lowcock, pers. comm., 2014).

² Keddie (1975) gave the location as the mouth of the Chilcotin River, but the coordinates were obtained from field maps and were inaccurate (G. Keddie, pers. comm., 2014).

The Northern Rubber Boa is described as crepuscular or nocturnal (Ross 1931; Nussbaum *et al.* 1983) and has been seen in the Okanagan on summer evenings (P.T. Gregory, pers. comm., 2014; M. Sarell, pers. comm., 2014). Dorcas and Peterson (1998) found the Northern Rubber Boa active at cool body temperatures (T_b) at night (6–28°C, modal temperature 14°C). These activity periods were for foraging or moving to other retreats (Dorcas and Peterson 1998). All of the 23 snakes observed at night were active (Dorcas and Peterson 1998). However, this does not preclude diurnal observations: Dorcas and Peterson (1998) observed some snakes moving during the day; Northern Rubber Boas were seen basking in the spring, (M. Sarell, pers. comm., 2014); and gravid females were found during gestation in summer basking on rock outcrops (Dorcas and Peterson 1998). Northern Rubber Boas are not readily or frequently observed during the day in summer because they are under rocks or moving in and out of cover such as rodent burrows, woody debris, leaf litter, and rock crevices (Dorcas and Peterson 1998; St. Clair 1999; Dulisse 2006, 2007) for thermoregulation.

Although Northern Rubber Boas have been observed to be active at night at cool body temperatures, maximum and minimum body temperatures for various physiological processes exist. Dorcas *et al.* (1997) found the maximal rate of gastric digestion at a body temperature of 26.7°C with a thermal preference range (temperatures at $\geq 80\%$ of maximum performance rate) of 21.9–30.6°C. At body temperatures of 10°C or less, and 35°C or more, the snakes regurgitated their food (Dorcas *et al.* 1997). Dorcas and Peterson (1998) observed gravid females on rocks with body temperatures that straddled the preferred body temperature of 31.7°C. However, Dorcas and Peterson (1998) also observed low reproductive success (two females aborted the embryos when taken into the laboratory), which they attributed to unfavourable summer temperatures. Similarly, R. St. Clair, (pers. comm., 2014) found that some females aborted their young. In B.C., the Northern Rubber Boa is at the northern limit of its range and cool summer weather conditions can occur, which may prevent development of the young.

Hoyer and Stewart (2000a) suggest that there is a strong fidelity of Southern Rubber Boas to home sites. Of 21 recaptured snakes, 19 were within 8 m of the original capture site and 2 were 70–75 m away. Using locations for Northern Rubber Boas with the temperature-sensitive radio transmitters, St. Clair (unpublished data) found home ranges of two Northern Rubber Boas to be 0.298 and 1.203 ha, not including the hibernacula, which were outside, but close (actual distance not recorded) to the mapped summer locations (R. St. Clair, pers. comm., 2014), suggesting that the Northern Rubber Boa move within the summer range, and between the summer range and the hibernacula.

3.4 Ecological Role

Northern Rubber Boas provide food for predators and consume prey. Predators of the Northern Rubber Boa that occur in B.C. include the Desert Nightsnake (*Hypsiglena chlorophaea*), the Common Raven (*Corvus corax*), Red-tailed Hawk (*Buteo jamaicensis*), and Raccoon (*Procyon lotor*) (Dorcas and Peterson 1998; Hoyer and Stewart 2000b). Non-native predators include house cats (*Felis catus*; Dorcas and Peterson 1998). The habitat used by the Desert Nightsnake and Northern Rubber Boa overlap suggesting that the Desert Nightsnake may be an important predator. Basking snakes on rock outcrops and talus slopes are visible to predators, but the rock

crevices allow for rapid escape. In the evening, when the Northern Rubber Boas are moving, raccoons are also active and may encounter a snake. The extent of predation is not known. Northern Rubber Boas consume adult and juvenile small mammals and their nestlings, birds and their nestlings, lizards, lizard eggs, and snake eggs (Rodríguez-Roble *et al.* 1999; Hoyer and Stewart 2000b). There are only four records of food items for the Northern Rubber Boa in B.C.: three with small mammals in their stomach (R. St. Clair, unpublished data; J. Dulisse, unpublished data), and one with a small lizard in its stomach (P.T. Gregory, pers. comm., 2014). Both the live-bearing Northern Alligator Lizard (*Elgaria coerulea*) and the egg-laying Western Skink (*Plastiodon skiltonianus*) are found at the study site of St. Clair (1999) in Creston (Rutherford and Gregory 2001) and both lizards are also found with Northern Rubber Boas in other parts of the Columbia Basin (Dulisse 2006). These lizards and perhaps Western Skink eggs are probably an important food source for Northern Rubber Boa in these areas. The Northern Rubber Boa are small snakes and their effect on the prey populations is most probably negligible.

3.5 Limiting Factors

Limiting factors are generally not human induced and include characteristics that make the species less likely to respond to recovery/conservation efforts (e.g., inbreeding depression, small population size, and genetic isolation).

Three characteristics of the Northern Rubber Boa may act as limiting factors: reproductive traits, and thermal and habitat requirements.

Low reproductive rate

The Northern Rubber Boa is viviparous and has a low reproductive rate (2–8 young every 2 years or usually every 3–4 years; Hoyer and Storm 1992), delayed age at maturity (at least 4–5 years for females; Hoyer and Storm 1992), and probable extended longevity (> 20 years; R. Hoyer, unpublished data). These findings suggest that these snakes depend on longevity for fitness³ and would be negatively impacted by loss of only a few animals in a local area.

Thermal requirements

In B.C., the Northern Rubber Boa is at the northern limit of its distribution and inclement weather can adversely affect growth and/or reproduction in a given year. The Northern Rubber Boa is active at cool body temperatures (Dorcas and Peterson 1998), but higher body temperatures are required for physiological processes such as gastric digestion (Dorcas *et al.* 1997) and gestation (Dorcas and Peterson 1998). There is a minimum and maximum temperature for gastric digestion (see Section 3.3; Dorcas *et al.* 1997) and unfavourable summer temperatures or insufficient sunshine can prevent successful development of the young to parturition (Dorcas and Peterson 1998).

³ Fitness is the genetic contribution that an individual makes to future generations, which depends largely on the number of offspring an individual produces in a lifetime. In the case of the Northern Rubber Boa, the combination of delayed maturity and a small number of young only every few years suggests that a female depends on longevity (i.e., living a long time, possibly 20 years) to add a significant number of offspring to the population.

Habitat requirements

The Northern Rubber Boa requires appropriate habitat for thermoregulation and overwintering and the snakes must be able to move between these areas. In the Creston Valley Wildlife Management Area (St. Clair, 1999) and near Pemberton, BC (L.A. Lowcock, pers. comm., 2014) the overwintering hibernacula are near or within the relatively small summer range, suggesting that the snakes are found in localized habitats. The extent of movement in other parts of the range of the Northern Rubber Boa in British Columbia is not known. Appropriate basking areas also require crevices or openings for rapid escape from predators.

4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (Salafsky *et al.*, 2008). For purposes of threat assessment, only present and future threats are considered.⁴ Threats do not include limiting factors, which are presented in Section 3.5.⁵

For the most part, threats are related to human activities, but they can also be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, flooding) may be especially important when the species or ecosystem is concentrated in one location or has few occurrences, which may be a result of human activity (Master *et al.*, 2012). As such, natural phenomena are included in the definition of a threat, though they should be considered cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience, and is thus vulnerable to the disturbance (Salafsky *et al.*, 2008). In these cases, the effect on the population/ecosystem would be disproportionately large compared to the effect experienced historically.

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 Open Standards website (Open Standards 2014). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat “impact” is

⁴ Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master *et al.* 2012).

⁵ It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts (e.g., inbreeding depression, small population size, and genetic isolation).

calculated from scope and severity. For information on how the values are assigned, see [Master et al.](#) (2012) and table footnotes for details. Threats for the Northern Rubber Boa were assessed for the entire province (Table 1).

Table 1. Threat classification table for Northern Rubber Boa in British Columbia.

Threat # ^a	Threat description	Impact ^b	Scope ^c	Severity ^d	Timing ^e
1	Residential & commercial development	Negligible	Negligible	Extreme	High
1.1	Housing & urban areas	Negligible	Negligible	Extreme	High
1.2	Commercial & industrial areas	Negligible	Negligible	Extreme	High
1.3	Tourism & recreation areas	Negligible	Negligible	Slight	High
2	Agriculture & aquaculture	Low	Large	Slight	High
2.1	Annual & perennial non-timber crops	Negligible	Negligible	Extreme	High
2.3	Livestock farming & ranching	Low	Large	Slight	High
3	Energy production & mining	Negligible	Negligible	Extreme	High
3.2	Mining & quarrying	Negligible	Negligible	Extreme	High
4	Transportation & service corridors	Low	Large	Slight	High
4.1	Roads & railroads	Low	Large	Slight	High
5	Biological resource use	Negligible	Negligible	Negligible	High
5.1	Hunting & collecting terrestrial animals	Negligible	Negligible	Negligible	Insignificant /Negligible
5.3	Logging & wood harvesting	Negligible	Negligible	Negligible	High
6	Human intrusions & disturbance	Negligible	Negligible	Negligible	High
6.1	Recreational activities	Negligible	Negligible	Negligible	High
7	Natural system modifications	Unknown	Restricted - Small	Unknown	High
7.1	Fire & fire suppression	Unknown	Restricted - Small	Unknown	High
8	Invasive & other problematic species & genes	Negligible	Negligible	Negligible	High
8.1	Invasive non-native/alien species	Negligible	Negligible	Negligible	High
9	Pollution	Negligible	Negligible	Unknown	High
9.3	Agricultural & forestry effluents	Negligible	Negligible	Unknown	High
11	Climate change & severe weather	Unknown	Large - Restricted	Unknown	High
11.1	Habitat shifting & alteration	Not Calculated	Pervasive	Unknown	Low
11.2	Droughts	Unknown	Large - Restricted	Unknown	High

^a Threat numbers are provided for Level 1 threats (i.e., whole numbers) and Level 2 threats (i.e., numbers with decimals).

^b **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 threat 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 are unknown); Not Calculated: impact not calculated as threat is outside the assessment time (e.g., timing is insignificant/negligible [past threat] or low [possible threat in long term]); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

^c **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%; Negligible < 1%).

^d **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 3-generation timeframe, whichever is longer. The estimated generation time for this species is about 10 years (based on the time to maturity of 4–5 years for females in and possible longevity of > 20 years in Oregon) and 3 generations are estimated to be 30 years, so the severity time frame is 30 years. It is measured as the projected decline in the portion of the population subjected to the threat. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

^e **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.

4.2 Description of Threats

The Northern Rubber Boa is not well studied in British Columbia and much of the information about this species is from Oregon and Idaho. The threat assessment is based on what is known, but, the suggested consequences are – as indicated in the description of the threats – frequently based on more general literature and speculation. In addition, the wide distribution of the Northern Rubber Boa was also considered to compensate for localized disruptions. This is reflected in the scope and severity ratings.

The overall province-wide Threat Impact for this species is low.⁶ This overall threat considers the cumulative impacts of the multiple threats given in Table 1. While the greatest threats are in the threat level categories agriculture and aquaculture, and transportation and service corridors, these threats are assessed as having low impact (expected median rate of population reduction or range decline 3%) (Table 1). Details are discussed below under the Threat Level 1 headings.

IUCN-CMP Threat 1: Residential & commercial development (negligible impact)

The large range of the Northern Rubber Boa in B.C. (Figure 2) suggests that the overall scope due to residential and commercial development will be negligible. However, where development does occur, the severity will be extreme and immediate due to loss of habitat and individuals and possible isolation of populations, and reduced movement corridors. For example, the two records for Vancouver (Marine Drive, 1960 and UBC, 1948; Figure 1) probably represent individuals from historical populations lost to development. Such development will continue and can have a high local impact. For example, a housing development that is planned on Northern Rubber Boa habitat in the South Coast region could eliminate at least six dens, one of which is used by > 25 Northern Rubber Boa (L.A. Lowcock, pers. comm., 2014). Mitigation measures are possible but may not be economically feasible, leading to the loss or decline of this currently healthy Northern Rubber Boa population.

IUCN-CMP Threat 2: Agriculture & aquaculture (low impact)

This threat is due largely to vineyards and ranching. The vineyard development is primarily restricted to the Okanagan and Similkameen valleys, and the area of potential new vineyard development in the next 10 years within the range of the Northern Rubber Boa is considered to be less than 1% (negligible). However, the development of a new vineyard results in extreme and immediate loss of habitat, particularly because the rocky areas essential for Northern Rubber

⁶ The overall threat impact was calculated following Master *et al.* (2012) using the number of Level 1 Threats assigned to this species where timing = High or Moderate, which included 2 Low, 4 Negligible, and 3 Unknown (Table 1). The overall threat impact considers the cumulative impacts of multiple threats.

Boas are frequently eliminated during development of the vineyard resulting in extreme severity (70–100% loss of the population).

Ranchlands extend throughout the Okanagan and north through the central interior resulting in a large scope. The effect of ranching will be some loss of habitat due to grazing and trampling, particularly with respect to cover (rocks, rodent holes, debris), which is required by the Northern Rubber Boa. Highly grazed and trampled areas by livestock – if present – may also limit movement by the Northern Rubber Boa resulting in isolated populations or limited movement between summer and overwintering habitat. The reduced cover may have an indirect effect on food availability due to loss of habitat for small mammals, an important food source. The severity due to ranching is slight.

IUCN-CMP Threat 3: Energy production & mining (negligible impact)

Any activities associated with energy production and mining will be localized resulting in a negligible scope. New mines are expected in B.C., although the locations are unknown. Quarrying for gravel can destroy rocky habitat, an important habitat requirement for the Northern Rubber Boa. Mining activities such as quarrying and blasting can also result in direct mortality of individuals. Thus where this activity occurs, the severity of this threat is extreme; however, the scope of this threat is negligible and so the impact is negligible.

IUCN-CMP Threat 4: Transportation & service corridors (low impact)

The road networks across B.C. within the range of the Northern Rubber Boa are extensive, resulting in a large scope. During construction of new roads, habitat will be destroyed and individuals will be killed (e.g., Summit Environmental Consultants 2010). This will also occur due to maintenance of existing roads. The Northern Rubber Boa is found along roads at night (M. Sarell, pers. comm., 2014; P.T. Gregory, pers. comm., 2014) and the observations include both live and dead snakes (P.T. Gregory, pers. comm., 2014). But the numbers are fewer than those for the larger Western Rattlesnake ([*Crotalus oreganus*](#)) and Gopher Snake ([*Pituophis catenifer*](#)), which are more visible and intentionally killed by some motorists. The severity due to traffic, the construction of new roads, and road maintenance is slight.

IUCN-CMP Threat 5: Biological resource use (negligible impact)

The Northern Rubber Boa is not a targeted species for collectors and, unlike the larger Western Rattlesnake and Gopher Snake, they are not intentionally destroyed. The range of the Northern Rubber Boa is significantly greater than either the Western Rattlesnake or Gopher Snake, which are restricted to the southern dry interior. In addition, the Northern Rubber Boa is a small snake and spends much of its time under cover, so is not visible to most people. The hibernacula contain only small numbers of individuals and are not a target for collectors.

The Northern Rubber Boa is found in a variety of habitats, including forests; particularly in clearings within the forests where there is cover such as woody debris and rocks (Dorcas 1995, cited by Dorcas and Peterson 1998; St. Clair 1999; Dulisse 2006). Logging and wood harvesting activities are active in the west Kootenays, which is one of the important locations for the Northern Rubber Boa (Figure 2). Harvesting will have an immediate impact due to the machinery and activity in the forests that will kill some snakes and prey items, but given the

large range of the Northern Rubber Boa, the scope and severity are negligible. Overall impact due to harvesting is thought to be negligible.

IUCN-CNP Threat 6: Human intrusion & disturbance (negligible impact)

Recreational activities that disturb the snakes or their habitat are a threat. Rock climbing or exploring talus slopes and rock outcrops can damage over-wintering habitat. In the Pemberton (BC) area, Lowcock and Woodruff (2014) found dead Northern Rubber Boas on mountain bike trails and one trail crossed a talus area that included a subsurface basking area used most of the summer and a hibernacula used by about 20 snakes. This threat is localized resulting in a negligible scope and severity. However, this is based on the wide distribution of the Northern Rubber Boa and the extent of mountain biking across the range is not known.

IUCN-CNP Threat 7: Natural system modifications (unknown impact)

The locations of past fires in B.C. (www.bcfire.ca/history/firelocations.htm) cover the distribution of the Northern Rubber Boa (Figure 2), but the areas burned by fires in the south Kootenays—and presumably the province—are highly variable (Utzig *et al.* 2011), giving a scope of restricted to small (Table 1). The two main characteristics of fires that determine the abundance and distribution of animals are intensity and rate of spread and these depend on the interaction of the vegetation and the physical conditions (Whelan 1995). The intensity varies both horizontally (fireline energy) and vertically (up to canopy and down in soil) and determines the patchiness and loss of shelter and food for reptiles and the conditions in the years following the fire (Friend 1993; Whelan 1995). The Northern Rubber Boa is found under cover such as rocks and at depth in the soil (Dorcas and Peterson 1998; St. Clair 1999; Dulisse 2006) suggesting that it could survive some fires, but the conditions for each fire are unknown. The effect of fire suppression on the area burned is controversial (Cumming 2005; Bridge *et al.* 2005), but controlled burns are sometimes recommended to enhance snake habitat, particularly to remove vegetation that covers rocky basking areas (K. Larsen, pers. comm., 2014). Also, after a fire, new vegetation appears and the number of small mammals increases (Friend 1993), which are important prey for the Northern Rubber Boa. The unknowns about the conditions for each fire result in an unknown severity; however, there will be immediate impact followed by the potential for improved conditions after the fire. However, loss of a few Northern Rubber Boa in an area can adversely affect the population numbers due to their apparent dependence on longevity for fitness (see Section 3.5, Limiting Factors, and footnote 3).

The mean area burned—at least in the south Kootenays—is increasing due to climate change, with a predicted minimum increase from the baseline (1919–2008) of 4 times in the 2050s for the south Kootenays. These increases are due largely to an increase in the mean monthly maximum temperature for the hottest month (July or August) and the climatic moisture deficit (Utzig *et al.* 2011) (see IUCN-CMP Threat 11).

IUCN-CMP Threat 8: Invasive & other problematic species and genes (no impact calculated)

Dorcas and Peterson (1998) found that domestic cats were an important predator of the Northern Rubber Boa. If the cats found the snakes in the evenings, when the snakes were more likely active (Dorcas and Peterson 1998; P.T. Gregory, pers. comm., 2014), individuals would most probably be killed. Given the large distribution of the Northern Rubber Boa and the locations

away from developments and people (Dulisse 2006, 2007; M. Sarell, pers. comm., 2014), this threat is negligible.

IUCN-CMP Threat 9: Pollution (negligible impact)

Numerous types of pesticides may be used in vineyards and orchards (Wilson *et al.* 2001; Bostanian *et al.* 2009; Gregoire *et al.* 2010; Bishop *et al.* 2013). The possible effect on the Northern Rubber Boa would be indirect due to bioaccumulation from food, but no data are available. Also, the extent of pesticide use and the actual effect on the snakes are not known. Orchards and vineyards are an important land use in the Okanagan and Similkameen valleys, which also provide important Rubber Boa habitat (Figure 2). This results in an unknown severity, but negligible scope. If pesticides do accumulate in the Northern Rubber Boa, they could result in death or an inability to reproduce resulting in an immediate effect.

IUCN-CMP Threat 11: Climate change & severe weather (unknown impact)

The impact of climate change is based on a climate scenario, which calculates changes due to specific greenhouse gas emissions in a global climate model (GCM) (Murdock and Spittlehouse 2011). The GCM is tested using available historical—called baseline—climatic data (up to a given year, which depends on the study); the changes are calculated as the difference between the baseline climate and the projected future climate over different periods of time, frequently in 30-year blocks (Murdock and Spittlehouse 2011; Utzig *et al.* 2011; Wang *et al.* 2012). Different combinations of emissions and models are available and the factors to consider when choosing the most appropriate model are addressed by Murdock and Spittlehouse (2011).

The impact due to climate change is unknown. Although many projections are beyond the 10-year scope of these threat assessments, two possible consequences of climate change warrant mention: habitat shifting and alteration, and droughts.

Wang *et al.* (2012) used a known climate scenario to predict the future distribution of ecosystems in B.C. They found that the geographic distribution of climatic conditions for different ecosystems has shifted since 1970 and the predicted climatic conditions (2020, 2050, and 2080) appropriate for grasslands, dry forests, and moist continental cedar–hemlock forests will expand substantially. These include the habitats where the Northern Rubber Boa are found (St. Clair 1999; Matsuda *et al.* 2006; Dulisse 2006, 2007; M. Sarell, pers. comm., 2014), resulting in a large to restricted scope. Increased habitat may be beneficial to the snakes.

Also associated with climate change is drought (Bonsal *et al.* 2004). The B.C. Interior is susceptible to drought due to the variability of precipitation in time and space (Bonsal *et al.* 2004), resulting in a large to restricted scope. The severity that drought may have is unknown; however, it could modify the habitat and limit the available cover for effective thermoregulation for the Northern Rubber Boa resulting in loss of some individuals. Drought may also have an indirect effect on the Northern Rubber Boa due to possible loss of prey availability; however, this is considered under IUCN-CNP Threat 7.3.

5 MANAGEMENT GOAL AND OBJECTIVES

5.1 Management Goal

The management goal is to maintain the current area of occupancy and distribution of the Northern Rubber Boa within British Columbia.

5.2 Rationale for the Management Goal

The Northern Rubber Boa has a reasonably large distribution (Figure 1), but it is difficult to detect. This may be a function of its behaviour—crepuscular and nocturnal, and being under cover objects much of the daytime—or it may also be simply that local populations are small. The Northern Rubber Boa seems to depend on longevity for fitness (see Section 3.5, Limiting Factors, and footnote 3) and thus loss of even a few individuals can limit the recruitment of new individuals to a population. In B.C., the Northern Rubber Boa is at the northern limit of its distribution (Figure 1). It has specific thermal requirements and unfavourable weather in one season can affect reproductive success (Dorcas and Peterson 1998) or probably digestive efficiency (Dorcas *et al.* 1997) and growth. It also has habitat requirements for thermoregulating and overwintering and must be able to move between the two areas. These characteristics of the Northern Rubber Boa suggest that loss of individuals, habitat destruction or modification, and inclement weather may seriously affect the local populations. However, there are many unknowns about the Northern Rubber Boa in B.C. including the distribution and size of local populations, and the locations of overwintering sites and their position relative to summer habitats. When more information is known it may be possible to set a more specific management goal.

5.3 Management Objectives

1. To protect suitable habitat across the range of the Northern Rubber Boa.⁷
2. To mitigate threat impacts to local populations where necessary.
3. To address current knowledge gaps in the range distribution of the Northern Rubber Boa.
4. To assess population size at various locations and habitat across the range to refine the provincial population estimate.
5. To address knowledge gaps in habitat requirements including thermoregulation, refuge, foraging, and overwintering habitats.

⁷ Protection can be achieved through various mechanisms including: voluntary stewardship programs, conservation covenants, sale by willing vendors on private lands, land-use designations, and protected areas.

6 APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Underway

The following actions have been categorized by the action groups of the B.C. Conservation Framework (B.C. Ministry of Environment 2010). Status of the action group for this species is given in parentheses.

Compile Status Report (complete)

- COSEWIC report completed (COSEWIC 2003).

Send to COSEWIC (complete)

- Northern Rubber Boa assessed as Special Concern (COSEWIC 2003).

Planning (complete)

- B.C. Management Plan completed (this document, 2015).

Habitat Protection and Private Land Stewardship

- The Northern Rubber Boa, which occurs in the Creston Valley Wildlife Management Area (St. Clair 1999), is protected by the *Creston Valley Wildlife Act* (www.crestonwildlife.ca/about/willdlife_act).
- The Northern Rubber Boa is found in two ecological reserves: Campbell Brown Ecological Reserve just south of Vernon, and Doc English Bluff Ecological Reserve near Williams Lake. This habitat is afforded protection under the *Ecological Reserves Act* (www.bclaws.ca/civix/document/id/complete/statreg/966103_01).
- There is one record for the Northern Rubber Boa from Elision Provincial Park. There are also several large provincial parks and protected areas within the distribution of the Northern Rubber Boa (e.g., Garibaldi Park, Manning Park, Kootenay National Park, Lac du Bois Grasslands Protected Area, Fintry Provincial Park and Protected Area, Kalamalka Lake Protected Area, Kalamalka Lake Park, White lake Protected Area, and West Arm Provincial Park). This habitat is afforded protection under the *Park Act* (www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96344_01).
- The Northern Rubber Boa occurs in some areas where species at risk can occur (e.g., Western Skink, Gopher Snake). It may benefit from habitat protection mechanisms put in place for these other species (www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm).
- The vision of the South Okanagan – Similkameen Conservation Program (SOSCP) is to maintain a “healthy environment that sustains the diversity of indigenous plants and animals while enriching people’s lives” (www.SOSCP.org/). The Northern Rubber Boa is

not on the list of species of concern by SOSCP, but conserving habitat for other species, such as the gopher snake, may indirectly protect the Northern Rubber Boa.

Species and Population Management (in progress)

- The best management practices (BMPs) for amphibians and reptiles in urban and rural environments in British Columbia have been compiled (Ovaska *et al.* 2003). BMPs promote the development of housing away from potential hibernacula and sensitive south-facing rock outcrops, installation of snake fencing, and outreach. This may help the Northern Rubber Boa in parts of its range (e.g., some den sites in the Okanagan where it occurs with other species such as Gopher Snakes and Western Rattlesnakes and the Pemberton area).

6.2 Recommended Management Actions

Table 2. Recommended management strategies for the Northern Rubber Boa.

Obj. no.	Conservation Framework action group	Management action	Threat ^a or concern addressed	Priority ^b	Timeline
1	Habitat Protection Land Stewardship	Determine land tenure and priority areas for conservation: <ul style="list-style-type: none"> Identify areas that are afforded protection within the range of the Northern Rubber Boa (e.g., parks, ecological reserves) Identify the locations of priority areas on other Crown lands, within municipal and regional boundaries or on private land 	<ul style="list-style-type: none"> Knowledge gap Knowledge gap 	<ul style="list-style-type: none"> Necessary Necessary 	2016 2016
1	Habitat Protection Land Stewardship	Secure priority areas and work with municipal and regional governments to conserve habitats using legislative tools and zoning guidelines <ul style="list-style-type: none"> Contact private owners to discuss and encourage voluntary stewardship Assess possible acquisition of private lands that have high conservation value including the presence of other species at risk 	1.1, 1.2, 2.1, 2.3, 4.1 1.1, 1.2, 2.1, 2.3, 4.1 1.1, 1.2, 2.1, 2.3, 4.1 1.1, 1.2, 2.1, 2.3, 4.1	<ul style="list-style-type: none"> Necessary Necessary Necessary Necessary 	2018 2018 2018 2018
2	Species and population management	Assess local population impacts due to agricultural practices (e.g., new vineyard developments) in areas where the Northern Rubber Boa is known to occur. Identify required habitat for the Northern Rubber Boa and determine and apply, if possible, mitigation measures	2.1	<ul style="list-style-type: none"> Essential / Necessary depends on the location	Assessed annually
2	Species and Population Management	Assess local population impacts of road mortality of Northern Rubber Boa where the Northern Rubber boa is known to occur: <ul style="list-style-type: none"> Encourage reporting of road kills by persons able to identify the species Identify roads where there is known mortality of Northern Rubber Boa and indicate whether these roads are within protected areas Apply appropriate mitigation procedures 	4.1	<ul style="list-style-type: none"> Necessary 	Assessed annually
3 & 4	Habitat Protection	Develop and implement inventory and population monitoring strategies: <ul style="list-style-type: none"> Identify appropriate locations across the range of the Northern Rubber Boa for initial surveys, with emphasis on existing protected areas, and conduct initial surveys 	<ul style="list-style-type: none"> Knowledge gap 	<ul style="list-style-type: none"> Necessary 	2016

Obj. no.	Conservation Framework action group	Management action	Threat^a or concern addressed	Priority^b	Timeline
		<ul style="list-style-type: none"> • Use the results of the initial surveys to identify 5–6 priority areas across the range of the Northern Rubber Boa for further studies • Estimate population sizes of Northern Rubber Boa in the priority areas using mark-recapture techniques • Develop an ongoing monitoring program for the priority areas 	<ul style="list-style-type: none"> • Knowledge gap • Knowledge gap • Knowledge gap 	<ul style="list-style-type: none"> • Necessary • Necessary • Necessary 	2016 2017/18 2019
5	Habitat Protection	Determine habitat requirements for populations in the priority areas: <ul style="list-style-type: none"> • Locate overwintering sites within each priority area • Identify the summer habitats associated with known and new den sites • Determine home ranges and movements between the overwintering dens and summer habitats 	<ul style="list-style-type: none"> • Knowledge gap • Knowledge gap • Knowledge gap 	<ul style="list-style-type: none"> • Necessary • Necessary • Necessary 	2017/18 2017/18 2017/18

^a Threat numbers according to the IUCN-CMP classification (see Table 1 for details).

^b 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 any time that was feasible).

6.3 Narrative to Support Management Actions Table

There is little information about the Northern Rubber Boa in British Columbia. Therefore, a first step should be to learn more about the species. Because the Northern Rubber Boa has a wide distribution, specific areas referred to here as priority areas, should be identified with the intent of protecting them. Suggested criteria for selecting these priority areas include: available data; location in a park or other protected area; high prospect of no future disturbance; and located where on-going monitoring is feasible. The priority areas should also be distributed across the range of the Northern Rubber Boa and represent the diversity of habitat where these snakes have been found.

Priority areas can be used to obtain information about the habitat use and biology/ecology of the Northern Rubber Boa as well as effects of impacts due to roads and potential impacts due to agricultural practices. These areas would also be those chosen to initiate inventory and population monitoring strategies. Focusing on priority areas does not obviate the importance of trying to protect areas where these snakes are known to occur.

7 MEASURING PROGRESS

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

Measures for Objective 1

- The ownership of the land of the priority areas is determined by 2016.
- Efforts to secure priority areas (if required) are initiated by 2018.

Measures for Objective 2

- If required, the mitigation procedures as a result of new vineyards are prepared for discussion with landowners within three months.
- The plans for new roads and road maintenance are summarized each year and mitigation plans outlined as appropriate.
- The record of roadkills is updated yearly and, if necessary, mitigation plans are outlined.

Measures for Objective 3

- The initial surveys across the range of the Northern Rubber Boa and the locations of the 5–6 priority areas are established by 2016.

Measures for Objective 4

- The population estimates of the Northern Rubber Boa in the priority areas are completed by 2018.
- The ongoing monitoring program for the Northern Rubber Boa is initiated by 2019.

Measures for Objective 5

- The overwintering sites and the summer habitats for thermoregulation and feeding are located in each of the priority areas by 2018.
- The home ranges and the movements between the overwintering areas and summer habitats are mapped by 2018.

8 EFFECTS ON OTHER SPECIES

Negative management impacts on other species are not expected since habitat conservation actions will target natural conditions with minimized human impacts.

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