PROPOSED

Species at Risk Act
Recovery Strategy Series
Adopted Under Section 44 of SARA

Recovery Strategy for the Pacific Pond Turtle (*Actinemys marmorata*) in Canada

Pacific Pond Turtle



2015

Government of Canada
Gouvernement du Canada

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For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the SAR Public Registry[1].

Cover illustration: William Leonard

Également disponible en français sous le titre
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[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

RECOVERY STRATEGY FOR THE PACIFIC POND TURTLE (*Actinemys marmorata*) IN CANADA

2015

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 the Western Pond Turtle (*Actinemys marmorata*) in British Columbia* (Part 2) under Section 44 of the *Species at Risk Act.* Environment Canada has included an addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Pacific Pond Turtle in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery plan for the Western Pond Turtle (*Actinemys marmorata*) in British Columbia* prepared by Environment Canada.

Part 2 - *Recovery plan for the Western Pond Turtle (*Actinemys marmorata*) in British Columbia*, prepared by the British Columbia Ministry of Environment.

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PART 1 - Federal Addition to the *Recovery plan for the Western Pond Turtle (*Actinemys marmorata*) 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 recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress five years after the publication of the final document on the SAR Public Registry

The Minister of the Environment is the competent minister under SARA for the Pacific Pond Turtle, and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. It has been prepared in cooperation with the Province of British Columbia (B.C.). 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 Western Pond Turtle (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment Canada.

It was determined that the recovery of the Pacific Pond Turtle in Canada is not technically or biologically feasible. The species still may benefit from general conservation programs in the same geographic area and will receive protection through SARA and other federal and provincial legislation, policies, and programs.

The feasibility determination will be re-evaluated as part of the report on implementation of the recovery strategy, or as warranted in response to changing conditions and/or knowledge.

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

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements of SARA that are not addressed in the "Recovery plan for the Western Pond Turtle (*Actinemys marmorata*) in British Columbia, prepared by the British Columbia Ministry of Environment" (Part 2 of this document, referred to henceforth as "the provincial recovery plan") and to provide updated or additional information.

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, and are not being adopted by Environment Canada as part of the federal recovery strategy. Should critical habitat be identified, the assessment of whether particular measures or actions result in the protection of critical habitat under SARA will be assessed following publication of the federal recovery strategy.

1. Species Status Information

This section replaces the "Species Status Information" section in the provincial recovery plan.

Legal Designation: SARA Schedule 1 (Extirpated) (2005)

Table 1. Conservation Status of Pacific (=Western) Pond Turtle (from NatureServe 2012, B.C. Conservation Data Centre 2012, and B.C. Conservation Framework 2012).

Global (G) Rank*	National (N) Rank(s)*	Sub-national (S) Rank(s)*	COSEWIC Status	B.C. List	B.C. Conservation Framework**
G3G4; rounded: G3 (2011)	Canada: NX(2011) United States: N3N4 (2001)	Canada: British Columbia (SX) United States: California (S3), Idaho (SNA), Nevada (S3), Oregon (S2), Washington (S1)	Extirpated (2002); confirmed (2012)	Red	Highest priority: 2 under Goal 3

* Rank 1– critically imperiled; 2– imperiled; 3- vulnerable to extirpation or extinction; 4- apparently secure; 5– secure; H– possibly extirpated; SNR – status not ranked; X-extirpated
** The three goals of the B.C. Conservation Framework are: 1. Contribute to global efforts for species and ecosystem conservation; 2. Prevent species and ecosystems from becoming at risk; 3. Maintain the diversity of native species and ecosystems. Priority 1 is highest of 6 levels.

Globally, the species is on the IUCN Red List as Vulnerable (NatureServe 2013).

There are no confirmed historical records of the species from British Columbia since 1959, discounting records of released captives in the 1960s (COSEWIC 2002, 2012).

Historically, less than 1% of the global range of this species is believed to have been in Canada.

2. Recovery Feasibility

The recovery of the Pacific Pond Turtle is not considered technically and biologically feasible at the present time, for reasons that are outlined in the provincial recovery plan "Recovery Feasibility Summary" section. Recovery of the species is most likely to become biologically and technically feasible if relict populations are discovered in Canada, and/or if translocation from external sources in the United States of America is deemed feasible and appropriate.

3. Critical Habitat

Section 41(2) of SARA requires that if the recovery of a listed wildlife species is deemed not feasible, the recovery strategy must include an identification of the species' critical habitat to the extent possible. Critical habitat identification for the Pacific Pond Turtle is not possible at this time based on the available information. The former distribution of the species in the Lower Mainland of B.C. is virtually unknown, and the confirmed historical records are from areas that have suffered extensive habitat modification from human activities over the past half century. An identification of critical habitat may be included in a revised recovery strategy or action plan(s) if new information (e.g., on distribution, habitat usage and/or feasibility of reintroduction) becomes available.

4. 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 any of the Federal Sustainable Development Strategy's[4] (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.

[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

The provincial recovery plan contains a section describing the effects of recovery activities on other species (i.e., Section 6). Environment Canada adopts this section of the provincial recovery plan as the statement on effects of recovery activities on the environment and other species. Recovery planning activities for the Pacific Pond Turtle will be implemented with consideration of all co-occurring species at risk, such that there are no negative impacts to these species or their habitats.

5. References

B.C. Conservation Data Centre. 2012. BC Species and Ecosystems Explorer. B.C. Ministry of Environment Victoria, B.C. Available: http://a100.gov.bc.ca/pub/eswp/ (accessed February 2013).

B.C. Conservation Framework. 2012. Conservation Framework Summary: B.C. Ministry of Environment. Victoria, B.C. Available: http://www.env.gov.bc.ca/conservationframework/ (accessed February 2013).

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2002. COSEWIC assessment and status report on the Pacific Pond Turtle (*Clemmys marmorata*) in Canada. Ottawa, ON. vi + 17 pp. http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_pacific_pond_turtle_e.pdf (accessed February 2013)

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2012. COSEWIC status appraisal summary assessment and status report on Pacific Pond Turtle (*Clemmys marmorata*) in Canada. Ottawa, ON. ii + 10 pp.

Ministry of Environment. 2012. Recovery plan for the Western Pond Turtle (*Actinemys marmorata*) in British Columbia. Surrey, BC. 27pp.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer/ (accessed February 2013).

PART 2 - *Recovery plan for the Western Pond Turtle (*Actinemys marmorata*) in British Columbia*, prepared by the British Columbia Ministry of Environment

British Columbia Recovery Strategy Series

Recovery Plan for the Western Pond Turtle (*Actinemys marmorata*) in British Columbia



Prepared by Ministry of Environment

BRITISH COLUMBIA | Ministry of Environment

September 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 the Western Pond Turtle (*Actinemys marmorata*) in British Columbia

Prepared by the Ministry of Environment

September 2012

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>

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Disclaimer

This recovery plan has been prepared 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 may be modified in the future to accommodate new 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.

ACKNOWLEDGEMENTS

Kym Welstead (B.C. Ministry of Forests, Lands and Natural Resource Operations) and Vanessa Kilburn (Contracting Biologist, South Coast Conservation Program) wrote this document with revisions and input from Purnima Govindarajulu (B.C. Ministry of Environment). Funds from the Ministry of Water, Land, and Air Protection were used to fund the preparation of the first draft of this document in 2003. A special thanks for the detailed review by Leah Westereng. The document also benefited from reviews by Ross Vennesland (Parks Canada), and Brenda Costanzo (B.C. Ministry of Environment). Photos were generously donated by Ashok Khosla, Matthew Bettelheim, and Garth Hodgson. This document follows the B.C. guidance for recovery planning (Ministry of Environment, 2010a).

EXECUTIVE SUMMARY

The last sighting of the Western Pond Turtle[1] (*Actinemys marmorata*), was in 1996 and the species now considered to be extirpated from British Columbia and thus Canada. It is therefore ranked SX (extirpated) by the Conservation Data Centre and is on the provincial Red list. The B.C. Conservation Framework ranks the Western Pond Turtle as a priority 2 under goal 3 (maintain the diversity of native species and ecosystems). It is protected from capture and killing, under the B.C. *Wildlife Act*.

This species was designated as Extirpated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is listed as Extirpated in Canada on Schedule 1 of the federal *Species at Risk Act.* Globally, the Western Pond Turtle is considered to be vulnerable. In its remaining range in the United States, the Western Pond Turtle is also considered to be vulnerable.

Recovery is considered not to be biologically and technically feasible in the next 5 years. Recovery potential maybe revisited if relict populations are discovered or recovery is deemed feasible using Washington source Western Pond Turtles once they are recovered or stable.

RECOVERY FEASIBILITY SUMMARY

The recovery of the Western Pond Turtle in B.C. is not currently 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.

   No. There are no known individuals capable of reproduction in B.C. (and thus Canada), and the species is deemed to be extirpated from B.C. However, not all suitable Western Pond Turtle habitat have been surveyed, and it is possible that relict populations with individuals capable of reproduction could be found. There are individuals capable of reproduction in Washington but these populations are at critically low numbers. As such, translocation of Western Pond Turtles from Washington into B.C. is not considered possible in the next 5 years. This should be re-evaluated in 5 years to determine if individuals from Washington are available for reintroduction purposes in B.C. The feasibility criteria will also need to be re-evaluated if a relict population of Western Pond Turtle is discovered in B.C. within the next 5 years.

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

[1] Also known as the Pacific Pond Turtle, Pacific Freshwater Turtle, (Pacific) Mud Turtle, Pacific Terrapin, Northern Pond Turtle, and Northwestern Pond Turtle (Carl 1944; Gregory and Gregory 1999).

Yes. There is suitable remaining habitat for the species in its historical range in B.C., and additional suitable habitat can be made available through restoration efforts.

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

   Yes. Some of the threats identified for the species have been addressed and are unlikely to present a future threat to potential recovered populations (e.g., commercial exploitation of the species for human consumption). However, threats from habitat modifications, fragmentation, introduced species, diseases, inbreeding depression, and environmental contaminants would likely continue to impact recovered populations of Western Pond Turtle if not addressed prior to recovery attempts. However, some of these threats could be mitigated through recovery actions such as head-starting, habitat restoration etc..

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 for this species do exist and are being implemented in the state of Washington. Should a relict population be discovered in B.C. or if sufficient animals become available from Washington for a reintroduction program in B.C., the recovery techniques from Washington can be implemented and adapted for B.C. conditions.

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1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Date of Assessment: May 2012
Common Name (population):**Pacific Pond Turtle
Scientific Name:**_Actinemys marmorata_*
COSEWIC Status: Extirpated
Reason for designation: This species has not been observed in the Canadian wild in over 50 years.
Canadian Occurrence: British Columbia
COSEWIC Status History: Designated Extirpated in May 2002. Status re-examined and confirmed in May 2012.

* Committee on the Status of Endangered Wildlife in Canada.
** Common and scientific names reported in this recovery strategy follow the naming conventions of the British Columbia Conservation Data Centre, which may be different from names reported by COSEWIC (2002).

2 SPECIES STATUS INFORMATION

Western Pond Turtle[a]		
Legal Designation:		
Identified Wildlife:[b] No	B.C. *Wildlife Act:*[c] Schedule A	SARA Schedule: 1-X (2005)
Conservation Status[d]		
B.C. List: Red	B.C. Rank: SX (2012)	National Rank: NX (2011)	Global Rank: G3G4 (2011)
Subnational Ranks:[e] CA: S3; NV: S3; OR: S2; WA: S1		
B.C. Conservation Framework (CF)[f]		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority:[g] 5 (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: 2 (2009)
CF Action Groups:	Compile Status Report; Planning; List under *Wildlife Act*; Send to COSEWIC; Habitat Protection; Habitat Restoration; Private Land Stewardship; Species and Population Management	

[a] Data source: B.C. Conservation Data Centre (2012) unless otherwise noted.
[b] 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).
[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] 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. U.S. data from NatureServe (2011).
[e] Data source: NatureServe (2011).
[f] Data source: Ministry of Environment (2010b).
[g] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

The Western Pond Turtle (*Actinemys marmorata)* is a medium-sized turtle at maturity (up to 210 mm in carapace length and a maximum weight of 1200 g) with a smooth, keel-less low-domed carapace that is olive, dark brown, or black in colouration (Figure 1; Stebbins 1985; Ashton *et al.* 1997). The carapace generally has a network of spots, flecks, or lines extending from the growth centre of each carapacial scute, although unmarked carapaces have also occasionally been observed (Stebbins 1985). The plastron consists of six pairs of scutes, and is cream or yellowish, with or without dark blotches (St. John 2002). Both sexes are similar in size, although mature adult males differ from mature adult females in having a concave plastron, a paler throat, and a shell that is usually flatter and less heavily marked; the vent is posterior to the rear edge of the carapace as opposed to at, or anterior to, the carapace edge as in the female (Carr 1952; Stebbins 1985). Hatchlings and juveniles have brown or olive keeled carapaces, with yellow on the edge of the marginals and on the head, limbs, and tail; the tail is nearly as long as the shell (Stebbins 1985). In B.C., two other species of freshwater turtles could be confused with this species. The native Western Painted Turtle (*Chrysemys picta*) has yellow lines on the head and neck and bright red markings on the plastron that are not present on the Western Pond Turtle. The introduced Red-eared Slider (*Trachemys scripta elegans*) has a high-domed wrinkled dark carapace with yellow lines on the head and neck and a bright red marking behind the eye that sets it apart from the Western Pond Turtle. Other Pond Sliders, hybrids or species of released pet turtles may also be present.



Figure 1. Western Pond Turtle showing characteristic low-domed carapace and yellow undersides (left); Right photo showing the speckling pattern on the neck and flecks on the shell. Photos used with permission from Matthew P. Bettelheim.



Figure 2. Western Pond Turtle juvenile showing the vertical side (plastron). Photo used with permission from Garth Hodgson.

3.2 Populations and Distribution

The Western Pond Turtle is thought to have historically ranged from the Baja Peninsula north into southwestern B.C., with a small population in Nevada (Cameron and St. Clair 2002). Today the range has contracted mostly to northern Baja California, California west of the Sierra Nevada, scant fragmented populations in western Oregon, and two small populations in Skamania and Klickitat counties in the Columbia Gorge in Washington (Figure 2; Hays *et al.* 1999; Cameron and St. Clair 2002). There are some new records of this species from California, mainly from the Sierra Nevada foothills (Buskirk 1990), and some isolated populations in the following locations that may represent introductions and may or may not be presently extant: Truckee, Carson, and Humboldt rivers in western Nevada; Snake River, Jerome County, Idaho; and Canyon Creek area, Grant County, Oregon (Cameron and St. Clair 2002).



Figure 3. Current global distribution of the Western Pond Turtle (Map used with permission by Matthew Bettelheim - www.bioaccumulation.wordpress.com).

The Canadian range of the species is thought to have historically been restricted to southwestern B.C. with unverified sightings on Vancouver Island (Figure 3). The first sightings of this species were from the Lower Mainland in the 1930s: one by K. Racy (McTaggart-Cowan 1938 *in* Cook *et al.* 2005) from Burnaby Lake in Burnaby, and another from a slough on the Jericho Golf Links in Vancouver in 1936 by Carl (Carl 1944 *in* Cook *et al.* 2005). Three additional known occurrences of the species were all reported by G.R. Ryder from 1956 to 1961 in Chadsey Creek and Little Sumas Lake in Chilliwack, and in Nathan Slough near Crescent Island in Langley (Cook *et al.* 2005). The sighting in 1966 (Gregory and Campbell 1984 *in* Cook *et al.* 2005) is thought to be an introduced Western Pond Turtles in Burnaby Lake (Cook *et al.* 2005).

Lord was the first naturalist to conduct herpetofaunal surveys in B.C. in 1866 and described the occurrence of the Western Pond Turtle as “I have seen them in nearly every lake and pond east and west of the Cascades” (*As cited in* Cameron and St. Clair 2002). His description of the turtle as “the general colour is olive, with darker markings, the under-portion being a brilliant yellow” is similar to modern-day descriptions of Western Pond Turtles (Cameron and St. Clair 2002). However, Lord’s misidentification of a juvenile Western Painted Turtle as a Western Pond Turtle renders his data questionable (McTaggart-Cowan 1938), suggesting that all of his sightings may have been of Western Painted Turtles.

In COSEWIC's Western Pond Turtle report, the authors have argued that this species was most likely native to the region because of its proximity to historical populations in the Puget Sound area of Washington (now extirpated), where climate and habitat characteristics are very similar (Cameron and St. Clair 2002). However, other reviewers have considered that the apparent sporadic occurrence of the species in B.C. is indicative of introduction, noting that all occurrences were known from urban areas several years following commercial exploitation and resulting introductions of other exotic turtle species (Gregory and Campbell 1984; Cook *et al.* 2005). Apart from anecdotal reports of Western Pond Turtle introductions into Burnaby Lake from 1961 to 1966 from Cook *et al*. (2005), there is no concrete evidence to establish that the Western Pond Turtle was an introduced species in B.C. COSEWIC is the governing scientific body on wildlife conservation in Canada; given that COSEWIC recognized the Western Pond Turtle as a native species the precautionary principle should be applied, and all historical and potential extant relict populations should be considered native unless proven otherwise by genetic or other conclusive historical evidence.

There have been no recent sightings of the Western Pond Turtle in B.C. and thus no known extant occurrences. Historical population abundance data for the species are lacking and thus population trend data are not available. Since the 1800s, the Western Pond Turtle has experienced declines throughout its range in the United States, particularly in the northern part and southern third of its range; it is estimated that between 10,000 and 1,000,000 individuals survive in the wild across the remaining range of the Western Pond Turtle (NatureServe 2011). Likely less than 1% of the world's population of Western Pond Turtle ever resided in Canada. Relict populations, if they exist, are suspected to be very low in numbers. Because rare species are often difficult to locate due to very small population sizes (Kery 2002), there is a remote likelihood that individuals of this species still persist at some sites, and increased efforts in conducting systematic surveys for the species could lead to the discovery of relict populations in B.C.

3.3 Needs of the Western Pond Turtle

3.3.1 Habitat and Biological Needs

Aquatic habitat

The Western Pond Turtle uses both aquatic and terrestrial habitats extensively to complete its life cycle. Aquatic habitat in which the Western Pond Turtle may be found includes rivers, creeks, small ponds and lakes, marshes, and slow-moving sloughs, in both permanent and ephemeral waterbodies up to 2000 m in elevation (Bury 1986a; Holland 2006). This species appears to prefer habitats with areas of extensive cover (logs, algae, vegetation) and basking sites (boulders, logs, vegetative banks) and generally avoids areas of open water (Holland 1994). In Washington and Oregon, the species is most frequently found in ponds or small lakes (Hays *et al.* 1999). In at least one site in northern California, deep large pools with logs, branches, or boulders were favored sites (Bury 1972). The highest densities of Western Pond Turtle have been recorded in warm, shallow lakes and sloughs in California (Holland 1991). This species has also been documented in large river systems, such as in the Sacramento River in California, as well as in smaller intermittent streams and in brackish water (Hays *et al.* 1999). Western Pond Turtles use

aquatic habitats primarily for foraging, thermoregulation, and avoidance of predators. Dispersal along aquatic corridors has also been observed (Rosenberg *et al.* 2009)

The Western Pond Turtle generally inhabits less developed areas and avoids aquatic habitats that have been human-altered, such as canals and dammed impoundments like reservoirs (Reese and Welsh 1998a). Modification to waterways can reduce habitat suitability by increasing water velocity, reducing water temperature, and reducing bank vegetation along the waterway (Reese and Welsh 1998a). Juvenile Western Pond Turtles are more severely affected by these changes than are adults, since juveniles show a greater dependency on aquatic habitats (Reese and Welsh 1998b). However, this species has occasionally being found in irrigation ditches, sewage treatment ponds, and canals (Reese and Welsh 1997). This species will also aestivate during summer drought periods by burrowing into the muddy bottoms of streams or pools (Bury 1986a; Ernst *et al.* 1994).

Terrestrial habitat

Terrestrial habitat is required for basking, nesting, dispersal, hibernating, and aestivating (Ernst *et al*. 1994; Holland and Bury 1998). Overland movement peaks during the spring and fall, as the Western Pond Turtle moves upland in search of suitable nesting habitat, mates, hibernacula, or in response to drought or flooding conditions (Holland 1991a; Hays *et al.* 1999; Rathbun *et al*. 2002). Adults, juveniles and sub-adults may spend considerable time away from water in terrestrial refuges, especially during winter months. In California, radio-tracked Western Pond Turtles spent 34–191 (mean, 111) consecutive days buried under leaf litter (5-10 cm deep) in woodland and coastal sage scrub habitats, mainly from October to February (n = 34; Rathbun *et al*. 2002). In Washington, juveniles and sub-adults were found on land 138-311 days of the year (mean, 215; Vander Haegen *et al.* (unpubl. MS) as cited in Rosenberg *et al*. 2009). Terrestrial refuges may be up to 500 m from the water's edge, and a mean distance of 203 m has been recorded (n = 10; Reese and Welsh 1997). Western Pond Turtles generally choose elevated terrestrial refuges, up to 38 m above the waterbody, and will often move among multiple terrestrial refuges in between bouts of basking (Rathbun *et al.* 2002). In Washington, terrestrial overwintering sites are associated with the Garry oak (*Quercus garryana*) woodlands where turtles overwinter burrowed under shrubs and logs (Hays *et al.* 1999). However, Western Pond Turtles show flexibility in their choice of overwintering habitat and not all adults hibernate terrestrially; instead, some individuals remain in aquatic habitat throughout the winter months (Rathbun *et al.* 2002). Juveniles may also overwinter aquatically, in aggregations (Holland 1994; Slavens 1995), although hatchlings usually overwinter in the nest, especially in the northern parts of the range (Holland 1994; Reese and Welsh 1997).

Reproduction and nesting habitat

Western Pond Turtles mate in April-May, laying 1–2 clutches of eggs (1-13 – average 6 egg; Ernst and Lovich 2009) between April and August, with peak laying likely occurring in June and mid-July in most parts of its range; the timing of egg laying varies with the region (Rathbun *et al.* 1992). Western Pond Turtle may skip a breeding year if resources are scant (Rosenbery *et al.* 2009). Eggs are laid in shallow nests 7-12 cm (Ernst and Lovich 2009) with incubation lasting 94-122 days (Bury and Germano 2008 as cited in Rosenberg *et al.* 2009).

Western Pond Turtles are associated with waterbodies that are adjacent to open terrestrial habitat with good solar exposure and low canopy cover such as oak savannah, prairie, or pasture (Hays *et al.* 1999), which provide nesting opportunities. Suitable nesting habitat is characterized as being in open, dry areas on riparian banks or in fields with a southern exposure in well-drained loam (sand/silt/clay) soils having a low slope (generally < 16°) and elevated above the waterbody (between 0.5 and 17.5 m) up to a few hundred metres from the water's edge (Nussbaum *et al.* 1983; Holland 1994; Reese and Welsh 1997; Rathbun *et al.* 2002). Individuals are known to migrate for more than one kilometer between their usual home range and a suitable nesting site, generally along a stream course (Rathbun *et al.* 1992). In Washington, Western Pond Turtle nests are generally found within 200 m of the water's edge (Rosenburg 2009). In the Mojave River, California, nesting migration of females can be as far as 585 m from the water with a mean distance of 195 m (Lovich and Meyer 2002). Similarly, Holland and Bury 1998, in California, observed nests are an average of 46 m (n = 275) from water, but have been found up to 402 m away. Occasionally females remain overnight at a nesting site before they return to the water the following morning (Rathbun *et al.* 1992).

Good solar exposure is crucial and thus south facing exposed slopes with limited surrounding vegetative cover appear to be the preferred nesting sites (Rosenburg 2009; Rathbun *et al.* 1992), although areas where vegetation consists of sparse forbs and grasses with a few scattered shrubs and trees are used by nesting Western Pond Turtles (Holland 1994; Reese and Welsh 1997). This type of habitat is characteristic of oak–pine savannahs and grasslands, which were historically fire-maintained ecosystems that have been altered as a result of fire suppression initiatives (Hays *et al.* 1999). Fire suppression allows for conifer encroachment (Douglas-fir) into open habitat, thereby potentially reducing the availability of suitable nesting sites (Crawford and Hall 1997). In B.C., there remain only two relict patches of oak–savannah habitat in the Lower Mainland (Sumas Mountain in Chilliwack and near Yale in the Fraser Canyon; Fuchs 2001); these areas might have served as important nesting habitat for this species at one time.

Nest inundation (high water levels) has been observed during the fall and winter after hatching but prior to emergence but Holte's (1998 as cited in Rosenberg 2009) study suggests survivorship declines the longer nests were inundated (decreased survivorship >76 days under water).

Activity patterns and basking habitat

Like other freshwater turtle species, the Western Pond Turtle is most active when water temperatures are above 15 °C (Holland and Bury 1998). In the northern part of its range, the active season ranges between February to April through October to mid-November; in the south, the species can be active year-round (Stebbins 1985). The Western Pond Turtle is diurnal and starts foraging around sunrise, leaving the water to bask when the sun first falls on basking sites; basking occurs periodically throughout the day and peaks from 0900 to 1000 on sunny days (Bury 1972).

Since the Western Pond Turtle spends a large portion of its time engaging in thermoregulatory behaviour like basking, suitable basking habitat may be an important attribute for habitat suitability (Reese and Welsh 1998a; Ernst *et al.* 1994). This species has been found to be associated with vegetative banks, which afford adequate basking habitat while providing some

protection from predators (Reese and Welsh 1998a). Western Pond Turtles found in cooler water, such as in sections of the Trinity River in California, appear to require more basking habitat than those individuals found in warmer water sections; in cooler water, the species will also regularly haul out on rocks and logs as well as on the riverbank (Reese and Welsh 1998a).

3.3.2 Ecological Role

Western Pond Turtles are omnivorous, feeding mainly on aquatic invertebrates, although they also occasionally scavenge carrion and opportunistically prey on small vertebrates such as frogs and fish (Holland 1985, 1994; Bury 1986b). Aquatic plants such as rushes (*Scirpus* spp.) and cattails (*Typha* spp.) are eaten, though rarely (Holland 1985), and incidental ingestion of filamentous green algae can occur while eating other prey items (Holland 1991). Hatchling and juvenile Western Pond Turtles, like other fresh water turtles, serve as prey for avian and terrestrial predators such as coyotes and raccoons (Janzen *et al.* 2000).

3.3.3 Limiting Factors

Some life history attributes such as slow developmental rates and late sexual maturation naturally limit turtle populations. Many of these life history characteristics are accentuated at the northern extent of their range (Litzgus and Brooks 1998). For instance, in Washington, female Western Pond Turtles do not reach sexual maturity until 10–15 years of age (Hays *et al.* 1999), although in more southern localities Western Pond Turtles are capable of reproduction at 8–10 years of age or at a carapace length of 135–140 mm (Ernst *et al.* 1994). The difference in age of sexual maturity is likely due to shorter summers and lower overall temperatures that delay growth in the northern part of the species' range (Hays *et al.* 1999).

Clutch size and frequency are also lower in northern populations; Holland and Bury (1998) reported that females often alternate years for laying clutches in northern areas, whereas in California, females produce clutches every year and lay two clutches in some years. High levels of nest predation (91.4% - Holland 1994) are also common in freshwater turtle populations; in some areas, predation of nests can approach 100% (Holte 1998 and Marchand and Litvaitis 2004). For long-lived species with low fecundity and low rates of embryo and hatchling survival, it is imperative that subadult and adult survivorship is high for maintenance of a stable population (Reese and Welsh 1998b; Congdon *et al.* 1993).

As a result of the above limiting factors, the Western Pond Turtle in B.C. may have had small population sizes that were naturally vulnerable to stochastic local extinctions.

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 low development rates and late maturation, which are considered limiting factors.

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 (globe, nation, or subnation). For purposes of threat assessment, only present and future threats are considered[2]. Threats presented here do not include biological features of the species or population such as inbreeding depression, small population size, and genetic isolation; or likelihood of regeneration or recolonization for ecosystems, which are considered limiting factors[3].

4.1 Threat Assessment

The threat classification used in this document 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).

As no locations are known for this species, threats cannot be scored for scope[4] or severity[5] to determine individual threat impacts[6] nor is it possible to calculate the overall province-wide[7] Threat Impact for this species at this time.

4.2 Description of Threats

Potential historical threats to Western Pond Turtle in B.C. are discussed below under the Threat Level 1 headings (Threat Level 2 headings provided in brackets). Some of these threats may be

[2] 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.* 2009).

[3] 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.

[4] 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%)

[5] 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%)

[6] 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%).

[7] The overall threat impact is calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species. The overall threat considers the cumulative impacts of multiple threats.

ongoing should a relict population be discovered in B.C. or if reintroduced populations were established in the future.

IUCN-CMP Threat 1.0 – Residential & commercial development
[1.1 Housing & urban areas; 1.2 Commercial & industrial areas]
Loss of suitable Western Pond Turtle habitat in B.C.'s Lower Mainland/Fraser River Valley as a result of development for housing and urban areas was likely one of the main driving factors behind this species' extirpation from the province. To exemplify the severity of the problem, wetland loss across the whole of the Lower Mainland/Fraser River Valley between the early 1800s and late 1900s has been estimated to be as high as 87% (Boyle *et al*. 1997). In the Fraser River Delta alone, 99.9% of the seasonal wet meadows and 84.6% of the bog habitat have been lost since 1880 (Butler and Campbell 1987). Due to ongoing residential and commercial development in the Lower Mainland, any potential Western Pond Turtle reintroduction habitat would mainly be located in parks and protected areas but even here suitable surrounding upland habitat is limited as a result of surrounding urbanization.

IUCN-CMP Threat 2 – Agriculture and aquaculture
[2.1 Annual & perennial non-timber crops]
This threat likely impacted Western Pond Turtle populations in the Lower Mainland/Fraser River Valley of B.C. between the early 1800s and late 1900s, when vast areas of the lower Fraser River Valley were drained for conversion to agricultural lands (e.g., the 11,700 ha Sumas Lake wetland). In fact, most of the known historical occurrences of Western Pond Turtle in B.C. are from the Chilliwack area, which once had extensive wetlands including the original Sumas Lake (Cook *et al.* 2005) and oak–savannah habitat. Sumas Lake has been ditched and drained for agriculture and only two relict patches of the oak–savannah habitat remain (Fuchs 2001). This habitat loss is potentially irreversible. Ongoing agriculture in the range of the Western Pond Turtle limits the available habitat should reintroduction efforts be established in the future.

IUCN-CMP Threat 4 – Transportation and service corridors [4.1 Roads & railroads]
The extent to which road-related mortality impacted the Western Pond Turtle in B.C. remains unknown, but was likely at one time a serious threat since the creation of dense road networks in the Lower Mainland/Fraser River Valley went hand in hand with urban and agricultural development and expansion in this area. Adult Western Pond Turtles have been frequently seen crossing roads in agricultural areas of California (Reese and Welsh 1997), and hatchlings are also at high risk of road mortality as they move between nesting sites and aquatic habitat (Holland 1991 *as cited in* Ashton et al. 1997). Potholes and divots in the road may also increase the risk of mortality, as Western Pond Turtles like to rest in the warm pools of water (Ashton et al. 1997). Like other species of turtles, the Western Pond Turtle has a limited ability to recover from high adult mortality (Klemens [ed.] 2000). Compton (1999) estimated that by removing three adult Wood Turtles (*Clemmys insculpta*) annually, a hypothetical population of 100 individuals would be extirpated in only 50 years.

Transportation and service corridors fragment turtle populations and habitat, limiting gene flow and creating impassable barriers between important habitat components (Reese and Welsh 1998a, 1998b). In the Columbia Gorge region of Washington and Oregon, DNA fingerprinting of Western Pond Turtles showed a lack of dispersal and gene flow between sites, with high genetic similarity within sites and significant genetic divergence between sites (Gray 1995 *as cited in*

Hays et al. 1999). Adult Western Pond Turtles are highly mobile, moving between aquatic habitats and using terrestrial habitats regularly; one would expect them to show high genetic variability within sites and low genetic divergence between sites. Thus roads likely presented a major threat to the Western Pond Turtle in B.C., both by causing direct mortality and by reducing genetic variability and increasing the likelihood that a population would become extirpated (Joyal *et al.* 2001), especially in areas where roads run parallel to watercourses (Holland 1991).

IUCN-CMP Threat 5 – Biological resource use [5.4 Fishing & harvesting aquatic resources]

There is no concrete evidence that the Western Pond Turtle was commercially harvested at one time in B.C., but there is a high likelihood that it was based on the commercial exploitation trends for this species in neighbouring Washington. There is some archeological evidence that turtles were used by First Nations groups in the Lower Mainland/Fraser River Valley. Two turtle fragments have been found, including a plastron fragment found at a 3500- to 4500-year-old site called St Mungo at the south end of the Alex Fraser Bridge (Ham *et al.* 1986), and a piece of turtle bone worked into a pendant, which was uncovered at a 1500- to 2500-year-old site on Crescent Beach (Percy 1974). Both of these artifacts are thought to have been used for decorative or ceremonial purposes and are located in the Museum of Vancouver (plastron fragment; artefact # DgRr-2.4196) and in the Simon Fraser Archaeology Museum (bone in pendant; artifact # DgRr-1:400). Unfortunately, neither of these artifacts has been identified to species and so could be either Western Painted Turtle or Western Pond Turtle, but these artifacts provide evidence of human resource use of turtles in this region.

It appears that commercial exploitation of the Western Pond Turtle for human consumption was likely the initial cause of population declines across its range in the United States (Nussbaum *et al.* 1983; Hays *et al.* 1999). In 1884, True is quoted as saying that the Western Pond Turtle was "almost constantly for sale in the markets of San Francisco" (Carr 1952). Evidence of declines occurred as early as 1879 when Lockington reported that the species had become scarce in areas where it was once abundant (Carr 1952). The Western Pond Turtle was likely harvested to a lesser extent by the native peoples of California even before European settlement (Ernst *et al.* 1994), and it is possible that turtles (possible Western Pond Turtles) were harvested by First Nations peoples in B.C. as well.

Although it is illegal to keep Western Pond Turtles as pets, it is likely that some are still illegally collected for the pet trade, but the extent to which this occurs remains undetermined (Holland 1991). Commercial harvest of turtles will not be an ongoing threat to relict or reintroduced populations, as this activity is illegal in the Canadian range of the Western Pond Turtle. Commercial harvest of Western Pond Turtles is also now prohibited throughout the United States (Ashton *et al.* 1997).

Other forms of resource use that are known to impact Western Pond Turtles in the United States include incidental catch by fishermen and death by gunshot wound (Ashton *et al*. 1997). Western Pond Turtles have been caught routinely on fishing tackle leading to significant injury, scaring, weight loss or starvation (when ingested or unable to feed) and death. Holland (1991) reported 3.6% of turtles in a study in Oregon had ingested fish hooks and 6% had scaring or were found

dead in Sierra Nevada. Discarded fishing hooks and line are commonly found in many of the lakes in the Lower Mainland (pers. observation, P. Govindarajulu) as sport fishing in urban lakes is promoted strongly in B.C. Entanglement with fishing tackle might pose a threat to Western Pond Turtles if they were reintroduced to these lakes in the future.

Acts of intentional harm to turtles have not been documented in B.C. as they have been in other parts of the range. Documented instances include shooting turtles because they are thought to predate on game fish and waterfowl, killing turtles for "fun" or target practice (Holland 1991 *as cited in* Ashton *et al.* 1997), and landowners shooting Western Pond Turtles for fear that they may lose property rights under the *Endangered Species Act* in the United States (Ashton *et al.* 1997).

IUCN-CMP Threat 6 – Human intrusions and disturbance [6.1 Recreational activities]
The Western Pond Turtle appears to be relatively sensitive to disturbance. Holland (1991 *as cited in* Ashton et al. 1997) found that human presence, including boats, vehicular traffic (especially all-terrain), and foot and bicycle traffic, can negatively affect all facets of turtle behaviour and impact upland dispersal movements of Western Pond Turtles. Disturbance affecting the frequency and duration of basking or foraging may be particularly detrimental to gravid females, leading to a delay in egg maturation and subsequent laying (Hays *et al.* 1999). Furthermore, during the nesting season, vulnerable nesting females in areas of high human disturbance are at risk of collection and harvesting (Garber and Burger 1995), and/or they may be forced to lay nests under less than ideal environmental conditions to avoid human disturbance, resulting in limited survival of offspring (Maltby 2000). Human pets, especially dogs, also pose a threat at nesting sites, destroying eggs and hatchlings, and mutilating nesting adults (Hays *et al.* 1999).

There is no information available regarding the historical impact of this threat on the Western Pond Turtle in B.C. However, since urban and agricultural development and expansion and concomitant human intrusion and disturbance was rampant in the Lower Mainland/Fraser River Valley during the time the species is thought to have occupied the area, likely this threat was important in the extirpation of the Western Pond Turtle. This threat is potentially ongoing should a relict population be discovered or a reintroduced population established in B.C. in the future.

IUCN-CMP Threat 7 – Natural system modifications [7.2 Dams & water management/use]
Waterbodies, wetlands, watercourses, rivers, streams, and surrounding upland oak–savannah habitats in the Lower Mainland/Fraser River Valley have undergone extensive modifications for human benefit in the past.

Aquatic habitats that can be used by turtles for basking and foraging have been modified through channelization, irrigation, and dams. These water diversionary techniques reduce suitability of habitat for the Western Pond Turtle by changing water velocity and temperature, reducing bank vegetation, and creating physical barriers to movement (Reese and Welsh 1998a). As human populations increase and waterbodies continue to be managed for human benefits, aquatic habitat and surrounding upland areas will be continuously modified, altered or eliminated, particularly affecting nesting habitat. These changes will likely lead to increased rates of predation on nesting females, nests, or hatchlings, and/or exposing hatchlings to dangerous environmental conditions post-hatching (Hays *et al.* 1999). Habitat creation and restoration may be necessary to mitigate

this threat if reintroduction of Western Pond Turtles to their historic range in B.C. is to be contemplated.

IUCN-CMP Threat 8 – Invasive and other problematic species and genes
[8.1 Invasive non-native/alien species; 8.2 Problematic native species]
Introduced species and unnaturally high densities of native predators are a threat to the Western Pond Turtle throughout its range, and this threat likely played an important role in the extirpation of the species from B.C. (Cameron and St. Clair 2002). The American Bullfrog (*Lithobates catesbeianus*), which was introduced across the range of the Western Pond Turtle in the late 1800s and early 1900s (Lampman 1946), is now found throughout the range of the Western Pond Turtle (Bury and Whelan 1985). Bullfrogs are known to prey on juvenile Western Pond Turtles (Moyle 1973; Cook 1984) and can limit recruitment (Hays *et al.* 1999). Introduced game fish, like the Largemouth Bass (*Micropterus salmoides*), also may prey upon juveniles, although to a lesser extent since they are restricted to deeper waters than American Bullfrogs (Holland 1991).

A number of turtle species have also been introduced across the range of the Western Pond Turtle and could contribute to their decline. The introduced Pond Slider is found in many wetlands within the Western Pond Turtle range in B.C. Pond Sliders have been introduced around the world and are thought to outcompete native turtles for basking sites (Cadi and Joly 2003), affect space use and habitat selection through release of semiochemicals avoided by native turtles (Polo-Cavia *et al.* 2009), outcompete native turtle populations by growing faster and reproducing better (Cadi and Joly 2004), and have been implicated as the vector for the spread of a lethal Upper Respiratory Disease-like syndrome to Western Pond Turtles (Ashton *et al.* 1997). This disease has caused declines of Western Pond Turtle populations in California, Oregon, and Washington (Holland 1994; Ashton *et al.* 1997). In addition, introduced Snapping Turtles (*Chelydra serpentina*) are found occasionally in B.C. and adult Snapping Turtles prey on juvenile turtles (St. John 2002).

Raccoons (*Procyon lotor*) are major predators on turtles and turtle eggs (Christiansen and Gallaway 1984), and are superabundant in suburban areas due to the availability of garbage, pet food, and other human-associated food sources (Klemens 2000). Striped Skunks (*Mephitis mephitis*) and Coyotes (*Canis latrans*) are also human-subsidized predators that prey on turtle eggs and can severely limit recruitment (Ashton *et al.* 1997). Introduced Virginia Opossums (*Didelphis virginiana*) are also possible predators of Western Pond Turtle eggs and hatchlings as they are known to eat hatchling Midland Painted Turtles and Snapping Turtles in their native range (Hamilton 1958). Currently opossums are found in the lower Fraser River Valley and on Hornby Island in B.C.. Although several studies suggest that turtle population stability is reliant on adult and juvenile survivorship and is much less influenced by egg and hatchling survival, in urbanized landscapes, where populations suffer from severely limited recruitment (up to 100% mortality), high predator density is a threat to the survival of remaining Western Pond Turtle populations (Spinks *et al.* 2003).

The extent to which these threats contributed to the historical decline of the Western Pond Turtle is not known. These threats will remain ongoing should a relict population be discovered or a reintroduced population established in the Lower Mainland region in the future.

IUCN-CMP Threat 9 – Pollution [9.3 Agricultural & forestry effluents]
There is no information on the potential role played by contaminants in extirpation of the species from B.C., however pollution from agricultural pesticides and herbicides is high in the Lower Fraser Valley (Wan *et al.* 2005; Woudneh *et al.* 2009). In other species of freshwater turtles, chemical contamination is known to result in developmental abnormalities and cause endocrine disruption resulting in skewed sex ratios in turtles with temperature-dependent sex determination (Crews *et al*. 1995; Shelby-Walker *et al*. 2009). There is also a reasonable probability of oil and diesel spills along the major highways bisecting the historic range of Western Pond Turtles in B.C. Diesel spills have been documented to cause swollen eyes, and sloughing skin in Western Pond Turtles (Bury 1972; Luke and Sterner 2000), and oil and other polyaromatic hydrocarbons have caused increased mortality, chromosomal damage, tumor development, scoliosis, carapace distortion, and other deformities in turtles (Matson *et al.* 2005; Bell *et al.* 2006; De Lathouder *et al*. 2009). Rotenone is a substance used to kill unwanted fish species is thought to affect the Western Pond Turtle (Fonttenot e*t al.* 1994; McCoid and Bettoli 1996). However, the use of rotenone is highly controlled in B.C. and preliminary data show that Western Painted Turtles were not affected by current application methods (Richie 2008).

IUCN-CMP Threat 11 – Climate change and severe weather [11.2 Droughts]
Changes in weather patterns, possibly as a result of climate change, could cause increased drought conditions; drought conditions are known to impact Western Pond Turtle populations by causing loss of habitat, changing movement patterns, eliminating prey base, and increasing predation on adult turtles (Hays *et al.* 1999). At one site in California, a population of Western Pond Turtles was lost due to increased predation pressures, when a stream dried up and forced Western Pond Turtles to move overland (Hays *et al.* 1999). Another prolonged drought in California resulted in up to 85% declines in populations of Western Pond Turtles in some areas, and complete elimination of populations in other areas, possibly because an inability to forage during the drought resulted in turtles having insufficient fat reserves for overwinter survival (Hays *et al.* 1999).

5 CONSERVATION APPROACH

The recovery of the Western Pond Turtle in B.C. is <u>not</u> considered technically and biologically feasible based on the criteria outlined by the Government of Canada (2009) in the next 5 years. However, there is a possibility that ongoing biodiversity/wildlife surveys might discover a relict population of Western Pond Turtles and recovery actions may then become necessary. Also, once Western Pond Turtle populations in Washington are stabilized and increasing, there might be potential for using these Western Pond Turtles for reintroduction efforts in B.C.

Finding relict populations is the highest priority action as these populations would be an important asset to the existing Western Pond Turtle gene pool as they would likely be genetically divergent and distinct from U.S. populations. Recovery of the species is most likely to become biologically and technically feasible if relict populations are discovered. If no relict populations of Western Pond Turtle are discovered in B.C after intensive survey effort, translocation could be considered as a conservation approach for the species. Translocation using captive-bred populations from the United States is expected to be biologically and economically challenging. Future Western Pond Turtle populations in B.C. would face several threats associated with small

populations such as demographic and environmental stochasticity and reduced genetic variation (Caughley 1994). Anthropogenic threats would need to be identified and addressed in survival and recovery habitats through habitat protection, restoration, and management; and continued management intervention would likely be required over the long term. Lack of genetic variability is a long-term consideration and may limit the potential recovery of Western Pond Turtle populations in B.C. as it has elsewhere (Gray 1995).

Long-term establishment of self-sustaining populations in B.C. is likely dependent on the success of Western Pond Turtle recovery efforts in Washington, not only as a source population for translocation to B.C. but for establishing long-term natural population dynamics through the entire range. Currently, extensive management and recovery efforts are underway for the species in Washington, including habitat acquisition, enhancement, surveys, toxicology research, a captive rearing program, head-starting (raising juvenile turtles to reduce initial mortality), predator removal, and translocations (Hays *et al.* 1999). These actions have proved successful at decelerating the decline of remaining Western Pond Turtle populations in Washington, although the populations are still not fully self-sustaining and will continue to require management intervention (Hays *et al.* 1999). Recovery of these populations could over time (potentially > 100 years) lead to natural recolonization of the historic range in B.C. Dispersal of individuals from this area to the Lower Mainland may have historically been an important component of natural population dynamics and genetic variability in Western Pond Turtle populations in B.C. Isolated populations in B.C will be more prone to extinction if they are not continuous with populations from the Puget Sound area (Lande 1988). Thus, any recovery efforts initiated for the species in B.C. should occur concurrently with recovery efforts in Washington.

6 EFFECTS ON OTHER SPECIES

There are no recovery actions planned for the Western Pond Turtle in the next 5 years. However, if translocation of the species is considered, its effects on non-target recovery species in the Lower Mainland/Fraser River Valley will need to be taken into account. The Western Painted Turtle, for example, is a Red-listed species in B.C. that has been found living sympatrically with the Western Pond Turtle in northern Oregon and at one of two locations in Washington (Nordby 1992; Hays *et al.* 1999). Competition for basking sites may occur at sites with limited available habitat (Bury and Wolfheim 1973). Other species at risk whose ranges and habitats overlap with that of the Western Pond Turtle include the Red-legged Frog (*Rana aurora*), the Oregon Spotted Frog (*Rana pretiosa),* and the Pacific Water Shrew (*Sorex bendirii*). The needs of these species would need to be considered prior to proceeding with translocation.

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