PROPOSED

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

Management Plan for the Western Painted Turtle (*Chrysemys picta bellii*) Intermountain – Rocky Mountain population in Canada

Western Painted Turtle Intermountain – Rocky Mountain population

2017

Government of Canada
Gouvernement du Canada
Canada

Recommended citation:

Environment and Climate Change Canada. 2017. Management Plan for the Western Painted Turtle (*Chrysemys picta bellii*) Intermountain – Rocky Mountain population in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. 2 parts, 4 pp. + 31 pp.

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[1].

Cover illustration: © Jakob Dulisse

Également disponible en français sous le titre:
« Plan de gestion de la tortue peinte de l'Ouest (*Chrysemys picta bellii*), population intramontagnarde – des Rocheuses, au Canada [Proposition] »

ISBN
Catalogue no.

[1] http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1

MANAGEMENT PLAN FOR THE WESTERN PAINTED TURTLE (*CHRYSEMYS PICTA BELLII*) INTERMOUNTAIN – ROCKY MOUNTAIN POPULATION IN CANADA

2017

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 Painted Turtle – Intermountain – Rocky Mountain population (*Chrysemys picta *pop. 2) in British Columbia* (Part 2) under section 69 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for this management plan.

The federal management plan for the Western Painted Turtle Intermountain – Rocky Mountain population in Canada consists of two parts:

Part 1 – Federal Addition to the *Management Plan for the Painted Turtle – Intermountain – Rocky Mountain population (*Chrysemys picta *pop. 2) in British Columbia*, prepared by Environment and Climate Change Canada.

Part 2 – *Management Plan for the Painted Turtle – Intermountain – Rocky Mountain population (*Chrysemys picta *pop. 2) in British Columbia*, prepared by the British Columbia Ministry of Environment.

Table of Contents

Part 1 – Federal Addition to the *Management Plan for the Painted Turtle – Intermountain – Rocky Mountain population (*Chrysemys picta *pop. 2) in British Columbia*, prepared by Environment and Climate Change Canada

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[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 Environment and Climate Change is the competent minister under SARA for the Western Painted Turtle Intermountain – Rocky Mountain population and has prepared the federal component of this management plan (Part 1), as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the province of British Columbia as per section 66(1) of SARA. SARA section 69 allows the Minister to adopt all or part of an existing plan for the species if the Minister is of the opinion that an existing plan relating to wildlife species includes adequate measures for the conservation of the species. The Province of British Columbia provided the attached management plan for the Western Painted Turtle Intermountain – Rocky Mountain population (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment and Climate Change Canada.

Success in the 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 and Climate Change Canada or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Western Painted Turtle Intermountain – Rocky Mountain population 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 sections have been included to address specific requirements of the federal *Species at Risk Act* (SARA) that are not addressed in the *Management Plan for the Painted Turtle – Intermountain – Rocky Mountain population (*Chrysemys picta *pop. 2) in British Columbia* (Part 2 of this document, referred to henceforth as "the provincial management plan") and/or to provide updated or additional information.

Under SARA, prohibitions regarding the protection of species and their habitat do not apply to species of special concern. Conservation measures in the provincial management plan dealing with the protection of individuals and their habitat are still adopted to guide conservation efforts but would not result in federal legal protection.

1. 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.

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

The provincial management plan for the Western Painted Turtle Intermountain – Rocky Mountain population contains a short section describing the effects of management activities on other species (i.e., Section 9). Environment and Climate Change Canada adopts this section of the provincial management plan as the statement on effects of management activities on the environment and other species. The distribution of Western Painted Turtle Intermountain – Rocky Mountain population may overlap with that of many other federally-listed species at risk occurring in wetland habitats of south-interior and south-eastern BC that could be affected by management actions, including: Bent Spike-rush (*Eleocharis geniculata*), Great Basin Spadefoot (*Spea intermontana*), Lewis's Woodpecker (*Melanerpes lewis*), Monarch (*Danaus plexippus*), Northern Leopard Frog (*Lithobates pipiens*), Northern Rubber Boa (*Charina bottae*),

[3] www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[4] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1

Olive Clubtail (*Stylurus olivaceus*), Pallid Bat (*Antozous pallidus*), Short-rayed Alkali Aster (*Symphyotrichum frondosum*), Small-flowered Lipocarpha (*Lipocarpha micrantha*), Spotted Bat (*Euderma maculatum*), Toothcup (*Rotala ramosior*), Scarlet Ammannia (*Ammannia robusta*) Vivid Dancer (*Argia vivida*), Western Grebe (*Aechmophorus occodentalis*), Western Rattlesnake (*Crotalus oreganus*), Western Screech-Owl *macfarlanei* subspecies (*Megascops kennicottii macfarlanei*), Tiger Salamander Southern Mountain population (*Ambystoma tigrinum*), Western Toad (*Anaxyrus boreas*), Western Yellow-bellied Racer (*Coluber constrictor mormon*), Yellow Rail (*Coturnicops novebaoracensis*), and Yellow-breasted Chat *auricollis* subspecies Southern Mountain population (*Icteria virens auricollis*).

Conservation planning activities for Western Painted Turtle Intermountain – Rocky Mountain population will be implemented with consideration for all co-occurring species, with focus on species at risk, to avoid or minimize negative impacts to these species or their habitats. Some management actions for Western Painted Turtle Intermountain – Rocky Mountain population (e.g., research and monitoring, habitat conservation, public education and mitigation about general threats to the species) may promote the conservation of other species at risk that overlap in distribution and rely on similar habitat attributes.

Part 2 – Management Plan for the Painted Turtle – Intermountain – Rocky Mountain population (*Chrysemys picta* pop. 2) in British Columbia, prepared by the British Columbia Ministry of Environment

Management Plan for the Painted Turtle – Intermountain–Rocky Mountain Population (*Chrysemys picta* pop. 2) in British Columbia

Prepared by B.C. Ministry of Environment

BRITISH COLUMBIA

January 2017

About the British Columbia Management Plan Series

This series presents the management plans that are prepared as advice to the Province of British Columbia. 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 B.C. Recovery Planning webpage at:
<http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/recovery-planning>

Management Plan for the Painted Turtle – Intermountain–Rocky Mountain Population (*Chrysemys picta* pop. 2) in British Columbia

Prepared by the B.C. Ministry of Environment

January 2017

Recommended citation

B.C. Ministry of Environment. 2017. Management plan for the Painted Turtle – Intermountain–Rocky Mountain Population (*Chrysemys picta* pop. 2) in British Columbia. B.C. Ministry of Environment, Victoria, BC. 31 pp.

Cover illustration/photograph

Additional copies

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

<http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/recovery-planning>

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 the Painted Turtle – Intermountain–Rocky Mountain 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 involved.

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 Painted Turtles.

ACKNOWLEDGEMENTS

This management plan was prepared by Jakob Dulisse (consultant). Funding for this document was provided by Environment and Climate Change Canada. Permission to incorporate new information and maps from the draft COSEWIC status report (COSEWIC 2016 in press) was invaluable, with the threats assessment and associated table taken directly from this draft. The following people participated in the threats assessment: Kristiina Ovaska (facilitator), Ian Adams (consultant), Leigh-Anne Isaac (consultant), Bev McBride (COSEWIC Secretariat), Greg Wilson (B.C. Ministry of Environment), Julie Steciw and Orville Dyer (B.C. Ministry of Forests, Lands and Natural Resource Operations), and Sara Ashpole (consultant). Much of the information in this management plan comes from the comprehensive *Recovery Plan for the Painted Turtle – Pacific Coast Population (Chrysemys picta pop. 1) in British Columbia* (Western Painted Turtle Recovery Team 2016), as most of the biology and threats of the Intermountain – Rocky Mountain population (*Chrysemys picta* pop. 2) overlap with the coastal population. Leah Westereng and Louise Blight (B.C. Ministry of Environment), and Lindsay Anderson (B.C. Ministry of Forests, Lands and Natural Resource Operations), provided review comments.

EXECUTIVE SUMMARY

The Painted Turtle – Intermountain–Rocky Mountain population (*Chrysemys picta* pop. 2) was designated as of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2006) because "the number of turtles is likely small and declining and because of extensive loss of wetland habitats and proliferation of roads." It is listed as of Special Concern in Canada on Schedule 1 of the *Species at Risk Act*. In British Columbia, the taxon is ranked S2S3 (imperiled/vulnerable) by the B.C. Conservation Data Centre and is on the provincial Blue List. The British Columbia Conservation Framework ranks the Painted Turtle – Intermountain–Rocky Mountain population as a Priority 2 under Goal 3 (Maintain the diversity of native species and ecosystems).

The Painted Turtle is the only extant native turtle in British Columbia and, like many turtle species, has a relatively long lifespan, is slow to mature, has low reproductive rates, has high egg/hatchling mortality, and is dependent on specialized wetland/terrestrial habitat matrix.

The population is roughly estimated at 5000–10000 (COSEWIC 2016 in press) and is distributed within the province's interior over three distinct regional genetic units: the Cariboo, the Thompson-Okanagan, and the Kootenays (Jensen *et al*. 2014). The total number of locations is suspected to be greater than 200 (COSEWIC 2016 in press).

Road mortality is one of the main threats facing this species. Road proliferation is extensive and ongoing at low elevations throughout the range of this turtle, especially in the Okanagan. Adult females travelling to and from nesting sites are especially vulnerable to road mortality

The management goal is to maintain the Painted Turtle – Intermountain–Rocky Mountain population throughout the distribution within British Columbia, and where possible increase populations that are declining or have declined historically.

The Management Plan has the following four objectives.

1. Protect[1] habitat across the range of the population through legal and stewardship actions.
2. Mitigate road mortality and habitat destruction threats across the range of the population.
3. Complete an inventory across the range of the population, and monitor significant populations (> 50 individuals) and their responses to threats, protection, and mitigation actions.
4. Address key knowledge gaps including: potential impacts of agriculture/livestock; location of movement corridors; efficacy of road mortality protection and nest site enhancement projects; and potential impacts of invasive species.

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

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Assessment Summary: November 2016
Common Name: Western Painted Turtle – Intermountain – Rocky Mountain Population**
Scientific Name: *Chrysemys picta bellii* **
Status: Special Concern
Reason for Designation: This population occurs mainly in larger valleys, which have been subjected to extensive wetland loss and habitat alteration from human activities. The population is suspected to be declining because of continuing loss and fragmentation of habitats and road mortality. The number of turtles is likely small, and the population may become Threatened if threats are neither reversed nor managed with demonstrable effectiveness.
Occurrence: British Columbia
Status History: Designated Special Concern in April 2006. Status re-examined and confirmed in November 2016.

* Committee on the Status of Endangered Wildlife in Canada. Data Source: COSEWIC 2016 in press.
**Common and scientific names reported in this management plan follow the naming conventions of the B.C. Conservation Data Centre, which may be different from names reported by COSEWIC.

2 SPECIES STATUS INFORMATION

Painted Turtle – Intermountain–Rocky Mountain Population[a]

Legal Designation

FRPA:[b] No — B.C. *Wildlife Act*:[c] Schedule A — SARA:[d] Schedule 1 – Special Concern (2006)
OGAA:[b] No

Conservation Status[e]

B.C. List: Blue — B.C. Rank: S2S3 (2012) — National Rank: N2N3 (2006) — Global Rank: G5T2T3 (2008)

Subnational Ranks for other Painted Turtle (*C. p. bellii*) populations:[f] Alberta (S1), Manitoba (S4), Saskatchewan (SNR), Ontario (S3?), Arizona (S1), Colorado (S5), Illinois (S5), Missouri (S5), New Mexico (SNR), Oklahoma (S2), Texas (S1), Wisconsin (SNR), Wyoming (S4)

B.C. Conservation Framework (CF)[g]

Goal 1: Contribute to global efforts for species and ecosystem conservation.	Priority:[h] 6 (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[f]	Review Status Rank; Compile Status Report; Inventory; Monitor Trends; Review Taxonomy; Planning; List under *Wildlife Act*; Send to COSEWIC; Habitat Protection; Habitat Restoration; Private Land Stewardship; Species and Population Management; Review Resource Use

[a] Data source: B.C. Conservation Data Centre (2016) unless otherwise noted.
[b] No = not listed in one of the categories of wildlife that requires special management attention to address the impacts of forestry 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 British Columbia *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; Government of Canada 2002).
[e] S = subnational; N = national; G = global; T = refers to the subspecies level; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NR = unranked.
[f] Data source: NatureServe (2015) rankings for Western Painted Turtle (*Chrysemys picta bellii*).
[g] Data source: B.C. Ministry of Environment (2009).
[h] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

The overall body colour of the Painted Turtle *(Chrysemys picta)* is olive green to blackish with contrasting yellow stripes on the legs and neck and a bright red to faded pink/orange plastron (belly surface) having a dark mark in the middle (see cover photograph). Red and yellow markings are also often visible along the margin of the shell (carapace). Hatchling turtles, which have markings similar to adults, are approximately 3 cm in length, whereas adults range in length from 10 to 25 cm. Females are usually larger than males; males have longer front claws, a longer tail, and a more concave plastron toward the rear. Although the Painted Turtle is the only extant native turtle in British Columbia, it may be confused with the invasive Pond Slider (*Trachemys scripta*), which has become established at several sites in the Okanagan. Other Painted Turtle subspecies have been released in the province and are known to hybridize with *C. p. bellii* (Western Painted Turtle Recovery Team 2016). The Pond Slider can be differentiated from the Painted Turtle by the presence of a red "ear" stripe behind the eye and yellow (instead of red) on the plastron.

3.2 Populations and Distribution

3.2.1 Global Distribution and Abundance

The four Painted Turtle subspecies (*C. p. picta, C. p. marginata, C. p. dorsalis,* and *C. p. bellii*) are widely distributed across much of the United States and southern Canada (Figure 1). The Painted Turtle, *bellii* subspecies, is the only subspecies in British Columbia and occurs from southern Canada through the central and western United States south to Texas and into Mexico. In Canada, the subspecies occurs in southern Ontario, Manitoba, Saskatchewan, Alberta, and southern British Columbia (Figures 1 and 2).

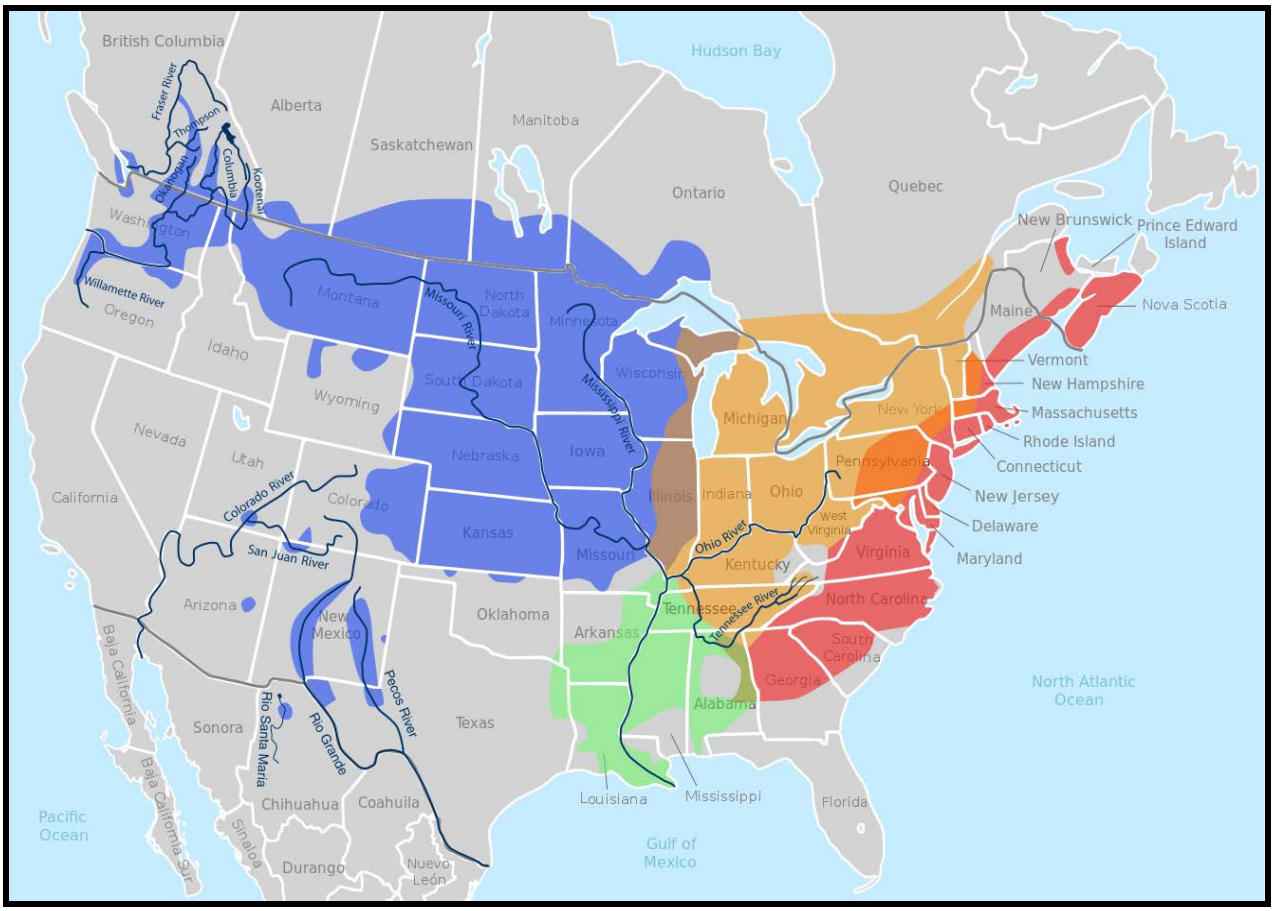

Figure 1. Distribution of Painted Turtles in North America (source: Wikimedia Commons). The Eastern Painted Turtle (*Chrysemys picta picta*) is shown in red; the centrally located Midland Painted Turtle (*C. p. marginata*) is shown in yellow; the Southern Painted Turtle (*C. p. dorsalis*), the smallest subspecies, is represented in green; and the Western Painted Turtle (*C. p. bellii*) is shown in blue. Intergrade areas (shaded between the four subspecies) occur where the subspecies have natural overlap in range and interbreed.

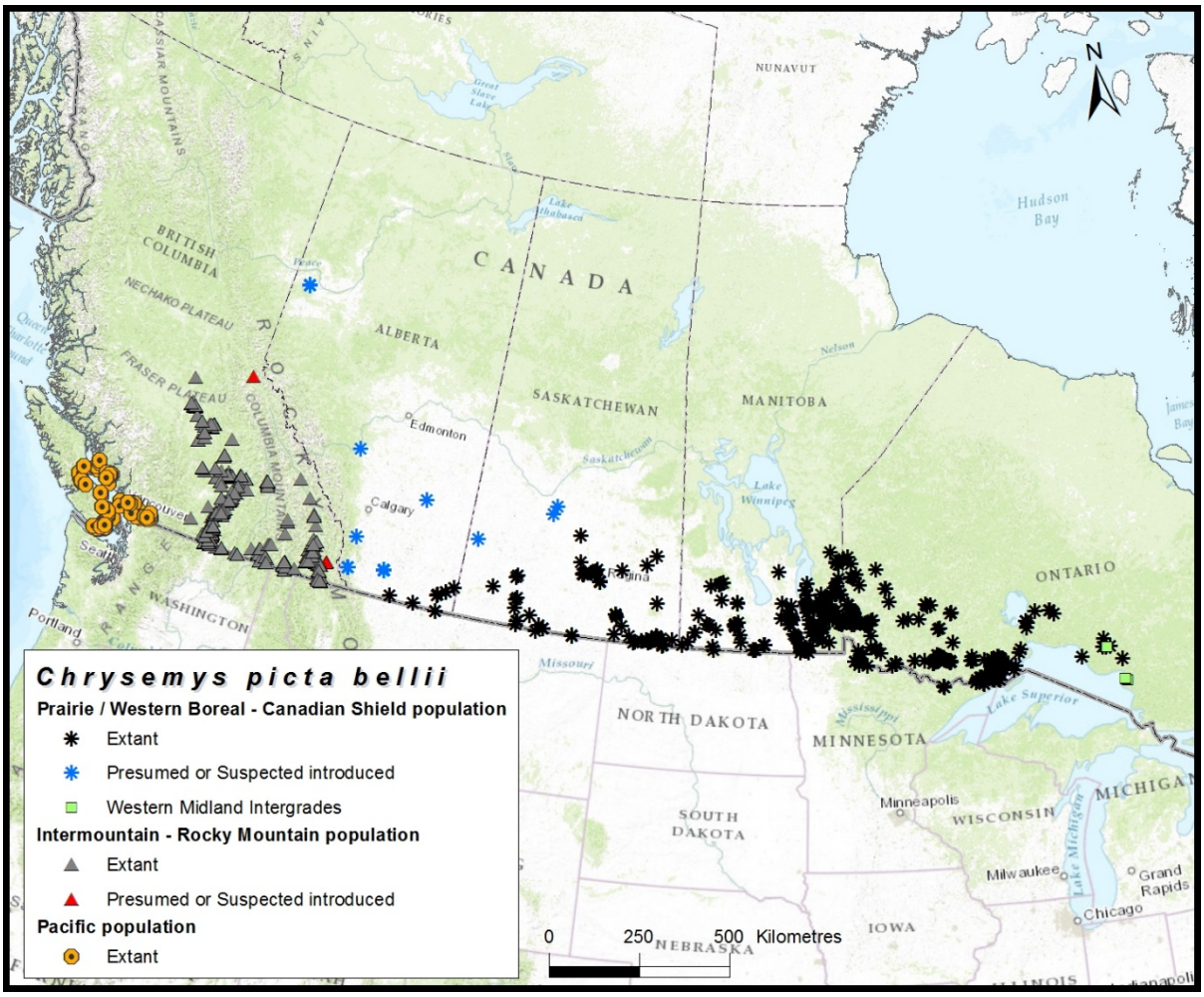

Figure 2. Painted Turtle (*C. p. bellii* subspecies) distribution in Canada (source: COSEWIC 2016 in press).

3.2.2 Distribution and Abundance in British Columbia

Two populations of *C. p. bellii* occur in British Columbia (Figure 2), the Intermountain – Rocky Mountain Population, which is confined to lower elevations and valley bottoms in the southeastern portion of the province, east of the Cascade Mountains and north to Williams Lake; and the Pacific Coast Population, which has a limited distribution occurring only in southwestern B.C.

The Painted Turtle – Intermountain–Rocky Mountain population occurs in the following locations:

- Kootenay and Columbia River drainages in the Rocky Mountain trench north to Yoho National Park, including Cranbrook, Kimberley, Invermere, and Revelstoke;
- Kootenay Lake area, including near Salmo, Creston, Argenta, and Nelson;
- Lower Columbia River area, including Castlegar and Trail;
- Kootenay/Boundary area, including Christina Lake and Grand Forks;

- Thompson and Okanagan River valleys, including Osoyoos, Kelowna, Vernon, Armstrong, Shuswap Lake, and Kamloops
- Southern Cariboo region including 100 Mile House and Williams Lake areas.

The provincial distribution of the Painted Turtle – Intermountain–Rocky Mountain population includes several presumed or suspected introduced populations, including Fernie, Clearwater, and McBride (Figure 2; COSEWIC 2016). The total provincial population is roughly estimated at 5000–10000 (COSEWIC 2016 in press) in three distinct regional genetic units (Jensen *et al*. 2014), including the Cariboo with 130–160 individuals (Steciw, pers. comm., 2016), the Thompson-Okanagan with 1215–1852 (COSEWIC 2016 in press), and the Kootenays with 1834–2252 (various sources; see Appendix 1). The total number of locations is not known but suspected to be greater than 200 (COSEWIC 2016 in press).

Effective population estimation for this species is difficult owing to the logistics and time required for multi-year trapping and recapture studies (Isaac 2014). Examples of important known populations are listed in Appendix 1.

3.3 Habitat and Biological Needs of the Painted Turtle

A comprehensive description of habitat and biological needs of the Painted Turtle can be found in the *Recovery Plan for the Painted Turtle – Pacific Coast Population* (Western Painted Turtle Recovery Team 2016).

Painted Turtles occupy both aquatic and terrestrial habitats year round (Table 1). Aquatic habitat includes wetlands, small lakes, or slow-moving streams with mud bottoms and aquatic vegetation. This habitat is required by the species for foraging, daily movement, and mating. The water in the wetland must be relatively warm, at least 1 m deep for overwintering and proximal to suitable terrestrial nesting sites. Basking sites, such as logs, emergent rocks or exposed, protected shoreline habitat, are also required by Painted Turtles for survival (thermoregulation, metabolic processes, etc.). Terrestrial habitat is required for nesting adult females, egg/hatchling development, and migration (to and from nesting sites, and between wetlands). Females leave their aquatic habitat in May–July and may travel overland as far as 200 m where a nest is excavated in well-drained soil at a sunny, sparsely vegetated location. Clutch size ranges from 6 to 18 eggs and hatchling sex is determined by nest temperatures during weeks 7–10 of incubation. Janzen (1994) found that in Iowa, Painted Turtle hatchling sex was determined by mean temperatures during the month of July. Eggs incubated at higher temperatures (≥ 29°C) produce female hatchlings, lower temperatures (≤ 26°C) produce male hatchlings, and a pivotal temperature of 28°C produces an equal number of males and females (Western Painted Turtle Recovery Team 2016). In British Columbia, Painted Turtle – Intermountain–Rocky Mountain Population eggs hatch in the late summer or fall of the laying season, and most hatchlings remain underground in the nest until spring, when they emerge and migrate to aquatic habitat. Warmer summer and early fall weather likely increases fall emergence; for example, at Elizabeth Lake, the percent of hatchlings emerging in the fall ranges from 7 to 19% (Clarke, pers. comm., 2016). Some Painted Turtle hatchlings at Niskonlith Lake also likely emerge in the fall (Ballin, pers. comm., 2016). Although egg and hatchling mortality is high because of predation and winter

freezing, the physiological limitations of hatchlings likely prevent them from overwintering in aquatic habitat during their first winter (Packard and Packard 2001). Nest temperatures generally need to remain above –8°C for overwintering hatchlings not to freeze (Packard and Packard 2001) and COSEWIC (2006) states that hatchling mortality from freezing increases as nest temperatures drop below –4°C.

Adult and subadult turtles overwinter on the bottom of wetlands, either on top of the substrate or by burrowing into the soft sediment on the bottom. Overwintering sites usually have well-oxygenated water less than 2 m deep that does not freeze solid to the bottom (Western Painted Turtle Recovery Team 2016).

Distances between breeding, summer, and overwintering habitats may be several hundred metres. Safe connectivity corridors are also required for dispersal and gene flow to new sites and between occupied sites. These movement corridors require suitable cover (protection from predation and disturbance) without physical barriers to movement (e.g., roads). Interconnected wetlands provide the best connectivity, but overland movements of several hundred metres are known to occur (COSEWIC 2016 in press).

Table 1. Summary of essential functions, features, and attributes of Painted Turtle – Intermountain–Rocky Mountain population habitat in British Columbia.

Life stage	Function[a]	Feature(s)[b]	Attributes[c]
Juvenile and Adult	Foraging and reproduction (April–September)	Aquatic wetland habitat	Pond, wetland, or small lake habitat with slow-moving or still water and muddy bottoms with submerged and emergent vegetation. Summer water temperatures between 15 and 30°C. Wetland must have water with a minimum depth of over 1 m year round.
Juvenile and Adult	Basking/ thermo-regulation (April–September)	Emergent or floating logs, emergent rocks or foreshore haul-out sites	Supports to rest on such as floating logs, vegetation mats, swimming platforms, docks, etc. Open shoreline areas with good sun exposure. Free of disturbance, which will consistently interrupt thermoregulation.
Juvenile and Adult	Overwintering /brumation (October–April)	Aquatic habitat with muddy or silty bottom	May overwinter on wetland bottom or burrow up to 1 m under substrate. Dense emergent vegetation, tussocks, or vegetation mats. Water must be well oxygenated and turtles prefer water less than 2 m deep and often within 10 m of shore.

Adult female, egg, hatchling	Reproducing, developing (egg), over-wintering, and emergence (hatchling) (May–April)	Nest site	Nest sites usually within 150 m but up to 200 m of water. Limited barriers between wetland and nest site. Sunny spot with loose to dense, well-drained soil, gravel, or silt. Nest sites often slope in southerly direction with good solar exposure. Soil depth 8–14 cm; sparse vegetation. Sites without invasive plants (see Threat 8, Table 2); roots of invasive plants must not grow through egg clutch (killing hatchlings or preventing emergence). Constant nest temperatures above 29°C during incubation will produce female hatchlings and temperatures below 27°C will produce males; both sexes produced when nest temperatures fall within the 27–29°C. Winter soil temperatures greater than –4°C.
Juvenile and Adult	Daily movement and dispersal (April–October)	Aquatic and terrestrial habitat	Normal seasonal movement (i.e., for nesting) may be up to several hundred metres overland; movements can also occur within waterways. No barriers to movement and suitable vegetation for cover.

[a] Function: a life-cycle process of the species (e.g., breeding, denning, nursery, rearing, feeding/foraging, and migration).
[b] Feature: the essential structural components of the habitat required by the species.
[c] Attribute: the building blocks or *measurable* characteristics of a feature.

3.4 Ecological Role

Young Painted Turtles are carnivorous, consuming small invertebrates and small vertebrates (e.g., fish and frogs), but begin to eat plant material as they grow larger into omnivorous adults (Matsuda *et al*. 2006). In addition to invertebrate and vertebrate prey items, adults will consume a wide variety of aquatic vegetation and will scavenge for carrion (Western Painted Turtle Recovery Team 2016), thus playing an important role in proper wetland function and nutrient cycling.

The charismatic and colourful Painted Turtle is the only extant native freshwater turtle species in British Columbia and, as such, can be used as an effective mascot and "umbrella" species for wetland conservation in the province.

Peripheral populations of species with a broad distribution (like the Painted Turtle in British Columbia) are often important to the overall population because, if the species becomes endangered (e.g., due to climate change), the species' range will often collapse toward its periphery. In North America, this is often the northern and western edges of a species' range (Channell and Lomolino 2000; Fraser 1999). Peripheral populations also often contain unique genetic material that may be important for the long-term survival and evolution of the species (Fraser 1999).

3.5 Limiting Factors

Limiting factors are generally not human-induced and include characteristics that make the species less likely to respond to management/conservation efforts.

Painted Turtles share limiting factors with many turtle species of the world: they have a relatively long lifespan (likely over 50 years), are slow to mature (sexual maturity is reached in 8–10 years for males and 12–15 years for females), have low reproductive rates, high egg/hatchling mortality (predation and freezing during winter), dependence on specialized wetland/terrestrial habitat matrix, and limited dispersal ability. Because the Painted Turtle is at the northern limit of its range in British Columbia, it is likely often surviving near physiological limits, and so may be more vulnerable to stochastic events and climate change. Therefore, even low levels of human-caused adult mortality can result in population declines.

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; adapted from Salafsky *et al.* (2008). For purposes of threat assessment, only present and future threats are considered.[2] Threats presented here do not include limiting factors,[3] which are presented in Section 3.5.

[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.* 2012).

[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 management/conservation efforts (e.g., inbreeding depression, small population size, and genetic isolation).

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. 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 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 Painted Turtle – Intermountain–Rocky Mountain population were assessed for the entire province (Table 2).

Table 2. Threat classification table for Painted Turtle – Intermountain–Rocky Mountain Population in British Columbia (COSEWIC 2016 in press). Note: A description of the threats included in this table are found in Section 4.2.

Threat #[a]	Threat description	Impact[b]	Scope[c]	Severity[d]	Timing[e]
1	Residential & commercial development	Low	Small	Serious	High
1.1	Housing & urban areas	Low	Small	Serious	High
1.2	Commercial & industrial areas	Low	Small	Extreme	High
1.3	Tourism & recreation areas	Low	Small	Moderate	High
2	Agriculture & aquaculture	Low	Pervasive	Slight	High
2.1	Annual & perennial non-timber crops	Low	Small	Moderate	High
2.3	Livestock farming & ranching	Low	Pervasive	Slight	High
4	Transportation & service corridors	Medium–Low	Pervasive	Moderate–Slight	High
4.1	Roads & railroads	Medium–Low	Pervasive	Moderate–Slight	High
5	Biological resource use	Low	Large	Slight	High
5.1	Hunting & collecting terrestrial animals	Low	Small	Slight	High
5.4	Fishing & harvesting aquatic resources	Low	Large	Slight	High
6	Human intrusions & disturbance	Low	Restricted–Small	Slight	High
6.1	Recreational activities	Low	Restricted–Small	Slight	High
7	Natural system modifications	Low	Large	Slight	High

Threat #[a]	Threat description	Impact[b]	Scope[c]	Severity[d]	Timing[e]
7.1	Fire & fire suppression	Unknown	Small	Unknown	High
7.2	Dams & water management/use	Low	Large	Slight	High
8	Invasive & other problematic species, genes & diseases	Unknown	Large–Restricted	Unknown	High
8.1	Invasive non-native/alien species/diseases	Unknown	Large	Unknown	High
8.2	Problematic native species/diseases	Unknown	Unknown	Unknown	High
9	Pollution	Unknown	Large	Unknown	High
9.1	Domestic & urban waste water	Unknown	Small	Unknown	High
9.3	Agricultural & forestry effluents	Unknown	Large	Unknown	High
9.4	Garbage & solid waste	Unknown	Small	Unknown	High
11	Climate change & severe weather	Unknown	Pervasive	Unknown	Moderate
11.2	Droughts	Unknown	Pervasive	Unknown	High
11.3	Temperature extremes	Unknown	Large	Unknown	High
11.4	Storms & flooding	Unknown	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. The median rate of population reduction for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75%), 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 three-generation time frame. For this species, a generation time of 15 years was used, resulting in severity being scored over a 45-year time frame (COSEWIC 2016 in press). Usually measured as the degree of reduction of the species' population. (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 three 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 overall province-wide Threat Impact for this species is High–Medium (COSEWIC 2016 in press).[4] This overall threat considers the cumulative impacts of multiple threats. The highest impact threat is transportation and service corridors (Medium–Low). Other threats include: residential and commercial development, agriculture and aquaculture, human intrusions and disturbance, and natural system modifications (all estimated to be Low; Table 2). Details are discussed below under the Threat Level 1 headings.

Threat 1. Residential & commercial development

Historically, 85% of natural wetlands have been lost in the South Okanagan (Lea 2008; Sarell 1990). Most Painted Turtle – Intermountain–Rocky Mountain populations are in rural areas, but some occupied sites occur in urban and developed areas, especially in the Okanagan. Encroachment and modification of habitat used for egg-laying, basking, and dispersal in riparian areas (e.g., near lawns and docks) are issues at many of these sites (Sarell, pers. comm., 2016). Many occupied sites are located within existing recreational areas and parks (Table 3), but the development of new recreational areas in turtle habitat is not considered likely (COSEWIC 2016 in press).

Foreshore management practices on park beaches, including mechanical vegetation removal and tilling, has recently been highlighted as potentially affecting Painted Turtle – Intermountain–Rocky Mountain population nesting sites (Patterson, pers. comm., 2016)

In addition to direct habitat loss, residential and commercial development leads to additional threats (see below).

Threat 2. Agriculture & aquaculture

Agricultural activities, such as crop planting, near turtle habitat may cause habitat loss/disturbance to egg-laying and dispersal habitats adjacent to wetlands (Western Painted Turtle Recovery Team 2016). Cattle grazing is affecting wetlands in many areas within its range (Forest Practices Board 2002; Dulisse and Boulanger 2016). Negative habitat impacts from cattle grazing are not well known for Painted Turtles but are known for the Yellow Mud Turtle (*Kinosternon flavescens*; Tuma 1993) and the Western Pond Turtle (*Emys marmorata*; Hays *et al*. 1999), and include reduction in terrestrial and aquatic habitat quality (Tuma 1993) and direct mortality caused by trampling of adults and nests (Fidenci 2000).

Currently, range use plans in the East Kootenays do not always adequately address wetland and habitat concerns for this species within Crown tenure areas (Krebs, pers. comm., 2016).

[4] 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 0 Very High, 0 High, 1 Medium–Low, and 4 Low (Table 2). The overall threat impact considers the cumulative impacts of multiple threats.

Agricultural impacts will likely increase in severity over time as wetland habitats become drier because of climate change (refer to Threat 11 for additional details).

Threat 4. Transportation & service corridors

Road mortality is one of the main threats facing this species. Road proliferation is extensive and ongoing at low elevations throughout the range of the Painted Turtle – Intermountain–Rocky Mountain population, especially in the Okanagan. Adult females travelling to and from nesting sites are especially vulnerable to road mortality. For example, some populations of Western Pond Turtles (*Actinemys marmorata*) near heavily roaded areas are male-biased, which may be related to adult female road mortality (Spencer *et al*. 2007). Female Painted Turtles often preferentially choose roadsides as nest sites because these areas are often free of shading vegetation and the soil conditions are suitable. Road mortality can also affect turtles dispersing between habitats and, therefore, effectively fragment wetlands, preventing connectivity. Hatchlings are also vulnerable to road mortality when they leave the nest and migrate to aquatic habitat.

Routine grading of gravel roads near Painted Turtle – Intermountain–Rocky Mountain population wetlands is also a concern. For example, yearly grading occurs along roads adjacent to Duck Lake in the Creston Valley Wildlife Management Area where the road shoulders and ditches are scraped (Beaucher, pers. comm., 2016). This may affect nesting females and eggs/hatchlings along the road shoulders (commonly used as nesting habitat) nearly year round (from May to March).

Threat 5. Biological resource use

Known occurrences of human disturbance or mortality issues in the Okanagan area include capture of turtles (to keep as pets), harassment from children, mortalities from shooting, and possible harvesting for human consumption (Dyer, pers. comm., 2016). Direct persecution is known to occur. For example, in 2006, J. Hobbs (pers. comm., 2016) observed several (3–4) dead adult Painted Turtles that appeared to have been shot at Ripley/Madden Lakes in the Okanagan. Overall population impacts from these activities are not known.

Although the scope is small, some turtles are likely collected opportunistically to keep as pets, removing them from the breeding population. For example, a nesting female was observed being collected near Elizabeth Lake (Glass, pers. comm., 2015) and similar events have been observed in the Okanagan (Sarell, pers. comm., 2016) and Lower Mainland (Western Painted Turtle Recovery Team 2016). Breeding females are likely the most at risk because they need to leave the safety of the water for nesting. Overall population impacts from these activities are not known.

Recreational fishing may also affect Painted Turtles. For example, at Sawmill Lake, a popular fishing site near Oliver stocked with Rainbow Trout (*Oncorhynchus mykiss*), several Painted Turtles with injured lower jaws were found (Sarell, pers. comm., 2016), possibly a result of being caught with sport fishing gear. Fishing-related mortalities have also been noted at other sites in the province (Western Painted Turtle Recovery Team 2016). Direct predation on Painted Turtle from adult fish stock is known from some sites in British Columbia (Western Painted Turtle Recovery Team 2016).

Threat 6. Human intrusions & disturbance

Many Painted Turtle – Intermountain–Rocky Mountain populations occur at small lakes in parks or recreation areas where disturbance to nesting and basking turtles is caused by human activities, including hiking, dog walking, and various watersports (motorized and non-motorized). For example, disturbance of nesting females by hikers and their dogs is a known issue at Creston Valley (Isaac 2014). Habitat damage and disturbance from off-road vehicle use in riparian areas is a concern in the Okanagan (Sarell, pers. comm., 2016) and other areas (Western Painted Turtle Recovery Team 2016). Disturbance of nest sites can result in direct mortality of eggs (Maltby 2000) and can also cause females to nest at sub-optimal sites, which may lead to reduced reproductive success (Western Painted Turtle Recovery Team 2016).

Threat 7. Natural system modifications

In several valley bottoms within the range of the Painted Turtle – Intermountain–Rocky Mountain population, previous hydroelectric developments have led to the loss of extensive wetland habitat through flooding of large areas (especially in the Columbia Basin), but similar projects are unlikely in the future. Basaraba (2014) found that fluctuating water levels in the Arrow Lakes Reservoir near Revelstoke did affect habitat availability for Painted Turtles, but nesting occurred above the high-water mark and additional habitat was created during seasonal flooding. Wood and Hawkes (2015) found little evidence of increased Painted Turtle mortality, nest flooding, or predation related to reservoir operations.

Local irrigation dams and water withdrawal may affect turtle habitats in some areas, but the overall severity is estimated as slight. Many waterways and wetlands in the drier portions of this species range, including the East Kootenays (Krebs, pers. comm., 2016) and Thompson regions (Iredale 2009), have been modified with weirs for irrigation of both crops and livestock. Although Painted Turtles may use this artificial or enhanced habitat, dam structures can prevent natural movement of turtles (Western Painted Turtle Recovery Team 2016). In addition, non-natural water level fluctuations in these modified wetlands may affect turtles (through sudden de-watering, fluctuating and low water levels during dry months and winter) in many areas, including the Thompson region (Iredale 2009).

Wildlife requirements are often inadequately considered when water licenses are issued for agricultural withdrawal. Without adequate government enforcement or follow-up regarding maximum water volume withdrawals, the complete draining of Painted Turtle wetlands is possible. For example, a pond in the Okanagan was completely drained after a license was issued for water withdrawal for private vineyard irrigation. This action resulted in a mass emergence of Painted Turtles from this pond, likely affecting the local resident turtle population (through increased mortality, exposure to predators, and road mortality risk) at this site (Hobbs, pers. comm., 2016).

An estimated 85% of natural wetlands have been lost in the South Okanagan (Lea 2008; Sarell 1990). Vegetation removal and dredging projects for yellow iris (*Iris pseudacorus*) and Eurasian water-milfoil (*Myriophyllum spicatum*) may affect turtle habitat through aquatic and riparian habitat alteration and possible destruction of nests (Western Painted Turtle Recovery Team 2016), but the severity is unknown.

Threat 8. Invasive & other problematic species, genes & diseases

The roots of invasive plants, including spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), at Painted Turtle – Intermountain–Rocky Mountain population nest sites are known to grow around/through eggs and hatchlings when they are in the nest, which can cause direct mortality or prevent successful hatching/emergence in the spring (Clarke and Gruenig 2003). Invasive plants (including lawn grasses) also reduce the quality of nesting habitat because they can provide too much ground cover (resulting in less solar exposure) and the root systems make nest excavation more difficult. Painted Turtle nesting sites in Creston Valley are frequently overgrown with spotted knapweed and hawkweed (*Hieracium* sp.; Isaac 2014).

Invasive aquatic plants can reduce the aquatic habitat quality for Painted Turtles. Emergent invasive plants such as yellow iris, purple loosestrife (*Lythrum salicaria*), and pond lily (*Nuphar lutea*) can affect aquatic and foreshore habitat by choking out native plants used for foraging and shelter (Western Painted Turtle Recovery Team 2016). Submergent plants such as Eurasian water-milfoil can become over-dominant in some wetlands, which may affect Painted Turtles (Sarell, pers. comm., 2016); these plants can displace native plants, reduce Painted Turtle basking and nesting opportunities, and can become so dense that they impede Painted Turtle movement in wetlands (Western Painted Turtle Recovery Team 2016).

Non-native Pond Sliders (released pets) have become established and co-occur with Painted Turtles at numerous sites in the province, and are known to survive the winter and reproduce (Western Painted Turtle Recovery Team 2016). Pond Sliders pose threats to Painted Turtles through increased competition for resources, exposure to novel diseases, and possible hybridization (Invasive Species Specialist Group 2016). Pond Sliders are usually released into wetlands in urban and suburban parks and recreational areas (Sarell, pers. comm., 2016). A 2009 South Okanagan inventory found adult and juvenile Pond Sliders at three of 13 sites surveyed (Lukey *et al*. 2010).

Although non-native American Bullfrogs (*Lithobates catesbeianus*) have largely been exterminated from the Okanagan (Govindarajulu, pers. comm., 2016), the species has recently been confirmed in the Kootenay region near known Painted Turtle sites (Manley, pers. comm., 2016). Bullfrogs likely alter wetland prey communities and are also known to eat hatchling Painted Turtles in British Columbia (Jancowski and Orchard 2013; Beckmann *et al*. 2015).

Native, "subsidized predators," such as Raccoons (*Procyon lotor*), Striped Skunks (*Mephitis mephitis*), Coyotes (*Canis latrans*), and Common Ravens (*Corvus corax*), can become problematic predators of eggs and hatchlings at some sites. Populations of many of these predators are increasing, especially near human habitation, and may be affecting some Painted Turtle – Intermountain–Rocky Mountain populations (Western Painted Turtle Recovery Team 2016), including those at Elizabeth Lake, Cranbrook (Clarke and Gruenig 2003), and the Creston Valley (Isaac 2014). Roads may increase access to and abundance of nest and hatchling predators (e.g., skunks and coyotes) near wetlands—for example, nest predation rates may be higher adjacent to West Creston Road in the Creston Valley (Isaac 2014).

Threat 9. Pollution

In some areas, sewage seepage may increase siltation and reduce food availability (Western Painted Turtle Recovery Team 2016), but this may also increase habitat quality through increased nutrient loads and their effects on increasing aquatic vegetation growth. Pharmaceuticals entering waterways through sewage may affect Painted Turtles, but the impacts are unknown. Negative impacts from agricultural pesticides and fertilizers entering waterways are possible—this issue may be a concern in some areas of the Creston Valley (Isaac 2014). Illegal pesticide application has been known to occur in wetland habitat in British Columbia (Hobbs and Vincer 2015), which may affect the Painted Turtle – Intermountain–Rocky Mountain population (Hobbs, pers. comm., 2016), although the scale of this occurrence is unknown. Industrial chemicals, heavy metals, and pesticides are harmful to turtles, with effects that include disrupted immune systems, smaller eggs, reduced growth rates of hatchlings, altered sex determination, and behavioural impacts (Oregon Department of Fish and Wildlife 2015); however, it is not known whether this is an issue within the range of the Painted Turtle – Intermountain–Rocky Mountain population.

Threat 11. Climate change & severe weather

The impacts of climate change and severe weather on turtle populations are currently unknown but are expected to increase in the future, correlated with predictions of other climate change impacts (Western Painted Turtle Recovery Team 2016).

The Painted Turtle depends on specific temperature/thermoregulation regimes, which may make it especially sensitive to changing temperature/humidity and temperature extremes (Western Painted Turtle Recovery Team 2016). Because turtles have temperature-dependent sex determination, climate change may skew sex ratios over time (COSEWIC 2016 in press). Janzen (1994) suggested that a 2°C increase of mean temperature in July (when hatchling sex is determined) could skew the sex ratio at a given site and that a 4°C increase could eliminate male offspring from the population. Climate change models in the Columbia Basin predict warmer summers and wetter winters (Utzig 2013). Wetlands in British Columbia's southern Interior are already declining in extent because of climate change; for example, Coelho (2008) noted a 54–63% decrease in wetland surface water area in the Lac du Bois grasslands between 1992 and 2012. Many wetlands in the southeast Kootenay region have dried up in the last several decades and many showed signs of drying/warming stress during the exceptionally hot, dry summer of 2015 (Dulisse and Boulanger 2016). The drying trends in wetland habitat could affect the Painted Turtle – Intermountain–Rocky Mountain population, especially at small wetlands in the driest areas of the species' range, by causing loss of habitat and changing movement patterns. These impacts could be exacerbated by some of the other threats listed above, including increased pressure on wetlands by cattle and water withdrawal for human needs.

During the winter of 2003–2004, a mass "winter kill," involving large numbers of Painted Turtles, occurred at a wetland near Haha Lake in the East Kootenays (Manley, pers. comm., 2016). Although not confirmed, the cause of death may have been from a severe winter freezing event (regional climate change models have predicted that these events will increase in frequency and severity [Holt *et al*. 2012]), or related to low or changing oxygen levels in the lake.

5 CURRENT MANAGEMENT FRAMEWORK

Several organizations or partnerships (e.g., Wetland Stewardship Partnership) and directional documents exist, including *A Wetland Action Plan for British Columbia* (Wetland Stewardship Partnership 2010) and the *Columbia Basin Riparian and Wetlands Action Plan – Draft* (Fish and Wildlife Compensation Program 2014). Focused implementation of these plans would benefit Painted Turtles.

The new *Water Sustainability Act* (Province of British Columbia 2015) may afford some protection for wetlands (Dyer, pers. comm., 2016; Fletcher, pers. comm., 2016).

No legal protection is currently available for Painted Turtle habitat on private land. Protection on private land is obtained through voluntary stewardship agreements, conservation covenants, sale of private lands by willing vendors, land use designations, and/or protected areas. The Painted Turtle is listed under the provincial *Wildlife Act* so the species is afforded legal protection on both provincial and municipal public land; turtles cannot be lawfully handled, trafficked, moved, or otherwise disturbed without a permit.

Potential exists to add the Painted Turtle – Intermountain–Rocky Mountain population to the list of species at risk under the *Forest and Range Practices Act* (Province of British Columbia 2002). This would allow the establishment of wildlife habitat areas on Crown land. Although forestry practices are not likely affecting much of this species' habitat, the creation of these areas would benefit the Painted Turtle in some areas where range practices are a concern (Fraser, pers. comm., 2016).

Currently, highway mortality issues for this species are considered during the referral process by the Ministry of Forests, Lands and Natural Resource Operations, the Ministry of Environment, and the Ministry of Transportation and Infrastructure. Environmental assessment and mitigation is implemented by registered professional biologists hired by the Ministry of Transportation and Infrastructure (Steciw, pers. comm., 2016). Nevertheless, this referral model is not formally required and a more consistent application could benefit the Painted Turtle – Intermountain–Rocky Mountain population (Steciw, pers. comm., 2016). Several road mortality issues are also addressed by non-governmental stewardship groups, which use funds obtained through conservation grants.

6 MANAGEMENT GOAL AND OBJECTIVES

6.1 Management Goal

The management goal is to maintain populations of the Painted Turtle – Intermountain–Rocky Mountain Population throughout the distribution within British Columbia, and where possible increase populations that are declining or have declined historically.

6.2 Rationale for the Management Goal

A 5–10% population decline is suspected to have occurred over the last decade and is expected to continue over the next 10 years (COSEWIC 2016 in press). Although an actual decline in adult Painted Turtle – Intermountain–Rocky Mountain population numbers is not confirmed, the documented past and continuing loss of wetland habitat implies likely population decline. The management goal is to prevent further decline and reverse the negative trend where feasible by implementing the management plan detailed here.

6.3 Management Objectives

The following are the management objectives for the Painted Turtle – Intermountain–Rocky Mountain population.

1. Protect[5] habitat across the range of the population through legal and stewardship actions.
2. Mitigate road mortality and habitat destruction threats across the range of the population.
3. Complete an inventory across the range of the population, and monitor significant populations (> 50 individuals) and their responses to threats, protection, and mitigation actions.
4. Address key knowledge gaps in threat impacts and effectiveness of recovery actions through research.

7 APPROACHES TO MEET OBJECTIVES

7.1 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 2009). Status of the action group for this species is given in parentheses.

Compile Status Report (complete)

- COSEWIC report completed (COSEWIC 2006; 2016 in press).

Send to COSEWIC (complete)

- Painted Turtle – Intermountain–Rocky Mountain population assessed as of Special Concern (COSEWIC 2006; 2016 in press).

[5] Protection can be achieved through various mechanisms, including: voluntary stewardship agreements, conservation covenants, sale by willing vendors of private lands, land use designations, protected areas, and mitigation of threats.

Planning (in progress)

- British Columbia Management Plan, completed (this document, 2017).

Inventory (in progress)

- Kikomun Creek Provincial Park (St. Clair 2001).
- Painted Turtle inventory: Cariboo Region (Neill 2001).
- "Presence not detected" survey for the Painted Turtle Intermountain–Rocky Mountain population throughout the Thompson region (Iredale 2009).
- Kinbasket and Arrow Lakes Reservoirs: Amphibian and reptile life history and habitat use assessment (Hawkes and Tuttle 2010).
- Inventory (unpublished) in the Thompson (Ballin), Okanagan (Lukey; Ashpole), and Scout Island at Williams Lake (Govindarajulu, pers. comm., 2016).

Monitor Trends (in progress)

- Niskonlith Lake Painted Turtle monitoring (ongoing): Long-term Painted Turtle inventory, population assessment, monitoring, and conservation project (Ballin, pers. comm., 2016).
- Kinbasket and Arrow Lakes Reservoirs: Amphibian and reptile life history and habitat use assessment (Hawkes and Tuttle 2010).
- Revelstoke Reach Painted Turtle Monitoring Program (Wood and Hawkes 2015): 10-year study to determine effects of BC Hydro Arrow Lake Reservoir water level fluctuations on local turtle population.
- Ecology of a focal wetland species: Western Painted Turtle in the Creston Valley (Isaac 2014): ongoing project on ecology, road mortality mitigation, and public outreach; population estimation ongoing.

Habitat Protection and Private Land Stewardship (in progress)

- Okanagan Similkameen Stewardship Society: Wetland landowner outreach program since 1994; negotiates voluntary management agreement with landowners; habitat enhancement, including invasive plant control, installation of nesting beaches and basking log, pond construction, buffer enhancement; community stewardship initiatives, conservation group coordination activities (Skinner, pers. comm., 2016).
- Wetland Stewardship Partnership: *A Wetland Action Plan for British Columbia* (Wetland Stewardship Partnership 2010).
- Fish and Wildlife Compensation Program: *Columbia Basin Riparian and Wetlands Action Plan* (Fish and Wildlife Compensation Program 2014).
- Okanagan Wetlands Strategy: Phase 1 (Patterson *et al*. 2014) designed to identify and protect or restore Okanagan wetlands.
- Painted Turtle – Intermountain–Rocky Mountain populations are known to occur at several protected sites (see Table 3), which may offer some protection to both individuals and habitat from Threats 1, 2, 4, 5, 6, and 7.

- *Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia* (Province of British Columbia 2014) were developed to protect individuals during land development activities (e.g., housing construction).
- *Best Management Practices for Amphibian and Reptile Salvages in British Columbia* (B.C. Ministry of Forests, Lands and Natural Resource Operations 2016) were developed to protect individuals during industrial development activities (e.g., highway construction).
- Basking logs have been installed at Grohman Narrows Provincial Park (Fish and Wildlife Compensation Program) and at other locations throughout British Columbia.
- Road mortality reduction (fencing), nest site enhancement, and predator deterrent projects are ongoing at Elizabeth Lake, Argenta Marsh, Creston Valley, Revelstoke (all via BC Hydro's Fish and Wildlife Compensation Program).

Species and Population Management (in progress)

- *Painted Turtle (Chrysemys picta belli) Nest Site Enhancement and Monitoring, Elizabeth Lake, Cranbrook, BC* (Clarke and Gruenig 2006).
- 1998 to present: Ongoing project combining fencing to prevent Highway 3 road kills at Creston and to provide alternative nest sites on the lake side of highway (Isaac 2014).
- Mission Ponds, Williams Lake: Ongoing highway mortality reduction project; silt fencing was unsuccessful in 2012 (Triton 2012).

Table 3. Painted Turtle – Intermountain–Rocky Mountain populations occurring on protected land.

Site	Comments
Kikomun Creek Provincial Park	Significant population
Premier Lake Provincial Park	Park encompasses southern portion of lake
Jim Smith Provincial Park	Park encompasses southern portion of lake
Champion Lakes Provincial Park	Higher elevation site; likely introduced population
Grohman Narrows Provincial Park	Grohman Pond; likely introduced population
Nancy Greene Lake Provincial Park	Higher-elevation site; likely introduced population
Wild Horse Canyon, Okanagan Mountain Provincial Park	Last observed in 1999
Myra-Bellevue Provincial Park	Small pond in park
Niskonlith Lake Provincial Park	Part of occupied site is within park
Argenta Marsh	Fish and Wildlife Compensation Program conservation property
Bummers Flats	Fish and Wildlife Compensation Program conservation property
Wolf Creek Wetland	Ducks Unlimited conservation wetland
Scout Island	Nature Trust of British Columbia
Numerous locations, including Chichester Wetland Park, Hill Spring Pond, Blair Pond, Redlich Pond, Mill Creek Linear Park and several sites along Mission Creek	City of Kelowna Municipal Parks

South Okanagan Wildlife Management Area	Provincial conservation land
The Nature Trust Twin Lakes Ranch	The Nature Trust of British Columbia
Mission Creek	
McGuire Lake Park	District of Salmon Arm Park
White Lake Provincial Park	Park encompasses only a portion of lake
Creston Valley	Significant population; Creston Valley Wildlife Management Area

7.2 Recommended Management Actions

Table 4. Recommended management actions for the Painted Turtle – Intermountain–Rocky Mountain Population.

Objective	Actions to meet objectives	Threat[a] or concern addressed	Priority[b]
1, 2	Conduct priority ranking of sites occupied by the Painted Turtle – Intermountain–Rocky Mountain Population to focus habitat protection (legal and or stewardship approach) and threat mitigation (road mortality habitat degradation) efforts; priority sites should have significant turtle populations (to be defined in the ranking process) and be distributed across the range of the taxon (Cariboo, Thompson-Okanagan and Kootenay).	All threats	Essential
1	Implement provincial and regional wetland action plans.	Limiting factors; all threats	Essential
1	Promote Painted Turtle habitat conservation with all levels of government (federal, provincial, regional, municipal), land managers, and private landowners to inform and encourage best management practices; methods in Ovaska *et al*. (2004), Tesche (2014), and Oregon Department of Fish and Wildlife (2015). • Pursue private land incentive programs. • Develop and implement site-specific management plans with land managers/users/owners for occupied locations (considering site-specific threats mitigation measures). • Work with willing landowners/managers to mitigate threats (e.g., fencing of riparian areas to prevent disturbance by people, pets, and livestock; pollution reduction); where landowners are willing, implement formal conservation covenants or stewardship agreements. • Reduce wetland habitat impacts from cattle grazing and ATV use through stakeholder outreach and exclusion fencing; redirect ATV trails and boat launches or provide alternate nesting areas. • Include management recommendations that will help provide protection, restore habitat features, and reduce impacts to Painted Turtle survival. • Incorporate wetland conservation measures into local ecosystem restoration program prescriptions.	All threats	Essential
1	Identify sites where water use impacts turtles and develop options for protecting environmental flow needs; undertake education and outreach about Painted Turtle habitat requirements to statutory decision makers involved in applications regarding wetlands.	Limiting factors; all threats	Essential
1	Update the Provincial Identified Wildlife list under the BC *Forest and Range Practices Act*, to specifically include Painted Turtle (allowing the creation of wildlife habitat areas).	1, 2, 3	Necessary
1	Post educational signage at known occurrence sites; address conservation issues regarding disturbance, persecution, fishing, invasive species, etc.; encourage reporting of turtle observations; develop provincial signage templates.	Limiting factors; 5, 6, 8	Necessary

Objective	Actions to meet objectives	Threat[a] or concern addressed	Priority[b]
1, 2	Work with diking commission (e.g., Creston Valley Wildlife Management Area) on the timing and methods for vegetation clearing activities that do not use pesticides/herbicides.	7	Necessary
1	Incorporate Painted Turtle conservation measures and considerations into range use plans.	2, 7	Necessary
1	Explore how the *Water Sustainability Act* (Province of British Columbia 2015) may afford some protection for wetlands used by Painted Turtles (i.e., protecting environmental flows so that turtles benefit).	1, 2, 3	Beneficial
2	As Painted Turtles respond well to artificial nest sites placed in safer locations (i.e., away from a road), reduce road mortality at priority sites by the installation of exclusion fencing, underpasses, and artificial/enhanced/protected nest sites. • Work with the Ministry of Transportation and Infrastructure to formalize an approach that addresses road mortality issues; improve referral process and cooperation between government ministries. • Promote the use of a contact list of qualified government and consulting biologists to inform implementation of mitigation measures.	4, 6	Essential
2	Improve, expand, and/or restore the area, extent, and quality of seasonally occupied habitats (e.g., nesting sites, overwintering sites, basking sites, foraging areas, and dispersal/connecting habitat) at high priority sites.	1, 2, 4, 5, 6, 7	Essential
2	Employ prevention, early detection, and control measures for invasive species potentially threatening Painted Turtles and their habitat; target species include yellow iris, purple loosestrife, Eurasian water-milfoil, Pond Slider, and American Bullfrog; develop provincial guidance for removal of Pond Sliders as a priority.	8	Essential
2	Rehabilitate/manage aquatic and associated upland nesting habitat to ensure that it remains suitable for Painted Turtle; minimize or eliminate the threats that limit habitat suitability or connectivity.	1, 2, 4, 5, 6, 7	Essential
2	Develop guidelines for habitat rehabilitation and make them available to park managers, stakeholders, funding bodies, and agencies (e.g., Fisheries and Oceans Canada, Habitat Conservation Trust Fund) for implementation to avoid inadvertent impacts during enhancement works for other species; objective is to reduce habitat loss and for no net loss following development.	6	Necessary
2	Enhance/create safe, suitable nesting areas away from roads and other areas of high turtle or hatchling mortality; use vegetation removal and fencing and/or nest cages to limit human, domestic pet, and subsidized predator disturbance to nesting females and nests, where necessary to prevent declining turtle numbers.	4, 6, 8	Necessary
2	Ensure water quality and quantity are maintained or improved at high risk sites. Ensure that changes in hydrological condition are minimized or improved to protect foraging, overwinter, and basking habitat.	7, 9	Necessary

Objective	Actions to meet objectives	Threat[a] or concern addressed	Priority[b]
2	In recreational areas, minimize damage to habitat caused by erosion and destruction of riparian vegetation; restrict intensive recreational activities and motorized boats use along occupied streams.	6	Necessary
2	Reduce injury and mortality from fisheries or other recreational activities (motorized boats) by delineating no-fishing and/or no boating zones.	5, 6	Necessary
2	Install nest protection measures to improve survivorship and recruitment by reducing predation and physical impacts to at-risk nests at sites with unsustainable declines; reduce disturbance at nesting sites from pedestrian traffic by redirecting trails, alternate nesting beaches, and/or barriers/fences; restore or enhance basking sites and overwintering sites.	1, 2, 6, 8	Beneficial
3	Complete a comprehensive inventory across the Intermountain–Rocky Mountain population's range; distribution limits and baseline population and sub-population size should be determined before monitoring efforts.	All threats	Essential
3	Conduct long-term population monitoring of several representative subpopulations; this can be done in coordination with other long-term monitoring initiatives (e.g., amphibians or waterfowl); estimate baseline population parameters using capture-mark-recapture, radio-telemetry, and other suitable techniques; monitor nesting success, predation rates, and population demographics.	Knowledge gap	Beneficial
4	Address important knowledge gaps through inventory and research; key questions include: • Investigate potential impacts from cattle and ungulate use of wetlands. • Identify location of migration/movement corridors within and between habitats. • Reasons for unexplained adult mortality and mass die-offs. • Efficacy of road mortality reduction measures (e.g., underpasses, fencing, and signage). • Efficacy of newly created and enhanced habitats to ensure these are effective (e.g., hatchling sex ratio at new nesting sites). • Impacts from target invasive species (efforts should focus on current range/population status of the Pond Slider: monitoring of known sites, further inventory, control measures, and public education). • Investigate potential impacts of non-native fish stocking of lakes with key Painted Turtle populations (potential impacts may include competition, hooking, predation, and human disturbance); review stocking policy (if necessary) when results are known.	Knowledge gap	Necessary

[a] Threat numbers per the IUCN–CMP classification (see Table 2 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 at any time that was feasible).

8 MEASURING PROGRESS

Measuring the progress of some objectives will be difficult because the Painted Turtle is a long-lived species; therefore, changes at the population-level are not likely to be observed for many years. The following measures of success should be underway within 5 years.

Measurable for Objective 1

- Priority conservation ranking of occupied sites completed (e.g., ranked high, medium, or low) and protection measures in place (e.g., through legal or stewardship action/covenant mechanisms, etc.).

Measurable for Objective 2

- Threats clarified at high priority sites (identified through Objective 1) and site-specific threat mitigation and habitat enhancement/restoration prescriptions underway.

Measurable for Objective 3

- Comprehensive inventory is underway and range map/Conservation Data Centre database updated.
- Monitoring program at select priority sites initiated.
- Increased number of organizations monitoring turtles (non-government or government).

Measurable for Objective 4

- Priority research projects initiated to address key knowledge gaps (e.g., measuring efficacy of mitigation efforts, identification of important movement corridors, investigating potential impacts from livestock and invasive species).

9 EFFECTS ON OTHER SPECIES

Management activities for the Painted Turtle – Intermountain–Rocky Mountain population should be implemented with consideration for all co-occurring native species, particularly those with an at-risk designation, so that no significant negative impacts occur to these species or their habitats. Habitat protection actions should benefit wetland habitats and many fish and wildlife species that depend on them. In British Columbia, an estimated 500 species of plants and animals are associated with wetland habitat, including approximately 70 species at risk (Wetland Stewardship Partnership 2010).

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APPENDIX 1. Examples of known locations of Painted Turtle – Intermountain–Rocky Mountain Population in British Columbia

Population/Location	Status[b] description and source	Land tenure
Creston	Extant 2013–2014: 236 total, 199 adults (COSEWIC 2016 in press); B.C. Conservation Data Centre estimates over 1000 turtles	Crown land: Creston Valley Wildlife Management Area
Ashfire Pond, Newgate area	Extant 2008; more than 140 turtles reported in 1998 (B.C. Conservation Data Centre)	Private land
Kikomun Creek Provincial Park, southeast of Cranbrook	Extant 2005: 800–900 (B.C. Ministry of Environment, Lands and Parks 1998; B.C. Conservation Data Centre)	Kikomun Creek Provincial Park
Elizabeth Lake, Cranbrook	Extant 2003: 174 nesting females recorded during monitoring (Clarke and Gruenig 2003)	Nature Conservancy of Canada; much of the nesting likely occurs on Highway 3A right-of-way.
Williamson Lake and Airport Marsh, near Revelstoke	Extant 2010–2011: 160–325 adults (Basaraba 2014)	Some Crown and private at Williamson Lake; Crown land at Airport Marsh.
Erie Lake, west of Salmo	24 adult turtles observed in 2016: overall wetland population is likely higher; road mortality is an issue on adjacent Highway 3 (J. Dulisse, unpubl. data)	Mainly private with limited Crown on north shore of lake.
Rosebud Lake, south of Salmo	200 turtles at the lake in 2006 (B.C. Conservation Data Centre)	Private and Crown land
Champion Lakes, west of Salmo	Extant 2004: over 100 individuals seen (B.C. Conservation Data Centre)	Champion Lakes Provincial Park
Manly Creek, Manly Oxbow near Grand Forks	50 adults seen in 2012 (B.C. Conservation Data Centre)	Crown land
Gardom Lake, north of Enderby	41 turtles observed in 2009 (Iredale 2009)	Private with a public park on the north side of the lake.
Vernon Commonage, south of Vernon	2009: turtles occur in approximately 20 small lakes and wetlands in this area; 310 turtles were reported at the north end of MacKay Reservoir in 2004 (B.C. Conservation Data Centre)	Private and Crown land
Chichester Wetland, Rutland	Extant 2009: population estimated at 40 (B.C. Conservation Data Centre)	City of Kelowna municipal park.
Blair Pond, Redlich Pond, Mill Creek Linear Park, north Kelowna	Extant 2009: population at Blair Pond estimated at 218 (B.C. Conservation Data Centre)	All three sites on City of Kelowna municipal park.

Population/Location	Status[b] description and source	Land tenure
Seven sites along Mission Creek, south Kelowna	Extant 2015: 13 turtles observed at three sites in 2013 (B.C. Conservation Data Centre)	Some sites within City of Kelowna municipal parks.
Niskonlith Lake	Extant 2015: 200–300 adults (B.C. Conservation Data Centre); 462 (COSEWIC 2016 in press); 386 (Ballin, pers. comm., [year])	Niskonlith Lake Provincial Park on northwest corner of Lake, but turtles occur in small ponds and shallow water at south end of lake; mixed Crown and private.
Pat Lake, west of Kamloops	Extant 2012: Population estimated at 150 in 2011 (B.C. Conservation Data Centre)	Crown land
Cummings Lake, Mission Ponds area, near Williams Lake	Extant 2001: 30 turtles observed in 1989; turtles occur in a series of four lakes, 1–3 km southwest of Williams Lake (B.C. Conservation Data Centre)	Private land
Scout Island, Williams Lake	Extant 2001: 16 turtles observed (B.C. Conservation Data Centre)	Nature Trust of British Columbia

[a] This is not a comprehensive list of occurrence sites.

[b] Extant: occurrence has been recently verified as still existing.