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

Recovery Strategy for the American Badger *jeffersonii* subspecies (*Taxidea taxus jeffersonii*) Western population and Eastern population in Canada

American Badger *jeffersonii* subspecies – Western population and Eastern population

2023

Government of Canada
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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry[1].

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[1] www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

RECOVERY STRATEGY FOR THE AMERICAN BADGER *JEFFERSONII* SUBSPECIES (*TAXIDEA TAXUS JEFFERSONII*) WESTERN POPULATION AND EASTERN POPULATION IN CANADA

2023

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 American Badger (Taxidea taxus) in British Columbia* (Part 2) under Section 44 of the *Species at Risk Act* (SARA). Environment and Climate Change Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the American Badger *jeffersonii* subspecies Western population and Eastern population in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Plan for American Badger (*Taxidea taxus*) in British Columbia*, prepared by Environment and Climate Change Canada.

Part 2 – *Recovery Plan for American Badger (*Taxidea taxus*) in British Columbia,* prepared by the British Columbia Badger Recovery Team for the British Columbia Ministry of Environment.

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Part 1 – Federal Addition to the *Recovery Plan for American Badger (*Taxidea taxus*) 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 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 Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the American Badger *jeffersonii* subspecies Western population and Eastern population, and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the province of British Columbia. 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 British Columbia Ministry of Environment led the development of the attached recovery plan for the American Badger (*Taxidea taxus*) in British Columbia (Part 2) in cooperation with Environment and Climate Change Canada and the Parks Canada Agency.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment and Climate Change Canada, Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the American Badger *jeffersonii* subspecies Western population and Eastern population, and Canadian society as a whole.

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

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

[2] www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

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

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

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

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

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

Acknowledgements

The federal addition was prepared by Megan Harrison, Greg Rickbeil, Ross Vennesland, and Kella Sadler (ECCC-CWS Pacific Region) with review and input from Matt Huntley,Thomas Calteau, Andres De Vleeschauwer, Tiana Colins, and Isabelle Ceillier (ECCC-CWS National Capital Region). Rich Weir and Karen Stefanyk (BC Ministry of Environment and Climate Change Strategy), Lindsay Anderson (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development), Todd Kohler (Department of National Defense), Diane Casimir (Parks Canada Agency), and Ian Adams (consultant) also contributed to the document through helpful reviews.

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 American Badger (*Taxidea taxus*) in British Columbia" (Part 2 of this document, referred to henceforth as "the provincial recovery plan") and to provide updated information. American Badger *jeffersonii* subspecies (*Taxidea taxus jeffersonii*) has two populations listed on SARA Schedule 1 – Western population and Eastern population; these designatable units only occur in British Columbia (B.C.). The provincial recovery plan uses the name American Badger (*Taxidea taxus*) in reference to the *jeffersonii* subspecies populations.

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. The section "Habitat Protection and Private Land Stewardship", and other statements in the provincial recovery plan referring to habitat protection may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however, whether particular measures or actions will result in protection of critical habitat under SARA will be assessed following publication of the final federal recovery strategy.

1. Species Status Information

This section replaces information on the SARA legal designations and conservation status for American Badger *jeffersonii* subspecies in Canada in Section 2 "Species Status Information" in the provincial recovery plan.

The legal designation for both American Badger *jeffersonii* subspecies – Western population and American Badger *jeffersonii* subspecies – Eastern population and on SARA Schedule 1 is Endangered (2003); the two Endangered populations were named and identified separately on SARA Schedule 1 in 2018.

Table 1. Conservation status of American Badger *jeffersonii* subspecies in Canada (from B.C. Conservation Data Centre 2020; NatureServe 2019). Information is not available for the Western and Eastern populations separately.

Global (G) Rank*	National (N) Rank*	Sub-national (S) Rank*	COSEWIC Status	SARA Status	B.C. List
G5 (2016)	Canada: N2 (2017)	British Columbia: S2 (2015)	Endangered (2012)	Endangered (2018)	Red List

*Rank 1- critically imperiled; 2- imperiled; 3- vulnerable to extirpation or extinction; 4- apparently secure; 5- secure; H- possibly extirpated; NR- status not ranked.

2. Population and Distribution Objective

This section replaces Section 5 “Recovery Goal and Objectives “ in the provincial recovery plan.

Population and Distribution Objective:

To recover the American Badger *jeffersonii* subspecies in Canada by improving the subspecies’ population resilience and stability within each distribution unit (Western and Eastern populations) in Canada, through (1) avoiding (new) and mitigating (existing) barriers to safe movement within Element Occurrences[4] (EOs), connective corridors and to/from the larger portions of the subspecies’ range in the United States of America (U.S.A.), and (2) preventing net loss of denning and foraging habitat within each EO. The quantitative minimum population target for the Western population is ≥250 mature individuals, and for the Eastern population is ≥160 mature individuals.

Rationale:

The American Badger *jeffersonii* subspecies was most recently re-assessed by COSEWIC as Endangered on the basis of low resilience – i.e., very small population size. Approximately 150–245 mature individuals are estimated to occur in the Western population and 100–160 in the Eastern population (COSEWIC 2012). Although no historical population data exist for American Badger *jeffersonii* subspecies in B.C., a decline from historical population levels has almost certainly occurred (American Badger Recovery Team 2008). Further, habitat quality and connectivity within each of the two populations has been reduced through human activity (road building and urban development) reducing safe movement and impeding gene flow, which may have consequences for both populations given their small sizes. The ranges of the two populations in B.C. are continuous with, and connected to, the range of the subspecies in the western U.S.A. Both the Western and Eastern populations in Canada are vulnerable to roadkill (habitat fragmentation by roads). Loss and degradation of foraging and denning habitat is also a concern.

Wherever appropriate soil types occur, habitat suitability for American Badger *jeffersonii* subspecies is mainly driven by prey availability and is often ephemeral or based on human disturbance (e.g., horse pastures, pipeline rights of way, logging landings, burns). The dynamic nature of suitable habitat for the subspecies coupled with their ability to move long distances means that key types of habitat losses are those that result in irreversible change (permanent loss of habitat), and/or that introduce barriers to safe movement both within the species’ EOs and key connective corridors in B.C., and to/from the larger portions of the range in the U.S.A. The recovered condition of the subspecies in Canada is therefore associated with improved population resilience,

[4] Element occurrence: areas of core occurences (based on reported sightings), https://www.natureserve.org/conservation-tools/standards-methods/element-occurrence-data-standard

ongoing stability and improved connectivity, resulting from appropriate management of human-caused threats that cause irreversible habitat loss and/or fragmentation.

Notwithstanding the historical population decline, the Western and Eastern populations of American Badger *jeffersonii* subspecies in B.C. are at the northern edge of the subspecies' range, and were likely always small enough to be considered naturally precarious in Canada. It is likely that these two populations previously formed portions of one larger population connected via a contiguous American population, however, they are currently considered separate populations. The historical Western portion probably had more than 250 individuals but fewer than 1000 (aligning with COSEWIC assessment criteria for Threatened). The historical Eastern portion probably had fewer than 250 individuals (aligning with COSEWIC assessment criteria for Endangered). As such, the minimum population objective for the Western population is set at the numerical threshold for Threatened status (≥250 individuals), and the objective for the Eastern population is set at the upper bound of the current population estimate (≥160 individuals).

3. Critical Habitat

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

Critical habitat for American Badger *jeffersonii* subspecies Western and Eastern populations is identified in this recovery strategy to the extent possible based on the best available information. It is recognized that the critical habitat identified below is insufficient to achieve the population and distribution objectives for the species. A schedule of studies (Section 3.2) has been developed to provide the information necessary to complete the identification of critical habitat that will be sufficient to meet population and distribution objectives. The identification of critical habitat will be updated when the information becomes available, in a revised recovery strategy.

3.1 Identification of the species' critical habitat

American Badger *jeffersonii* subspecies need diggable soil and prey in order to sustain feeding / foraging and denning functions. They also need to be able to move safely across the landscape to access foraging and denning resources, the locations of which can shift over time as a consequence of natural disturbance and other processes. Critical habitat for American Badger *jeffersonii* subspecies is therefore comprised of two subtypes:

1. **safe movement critical habitat:** habitat that is necessary to support movement activities to sustain all other life functions, and
2. **core critical habitat:** habitat that is necessary to support feeding / foraging and denning functions in addition to safe movement**.**

The geospatial areas containing safe movement critical habitat and core critical habitat for American Badger *jeffersonii* subspecies are presented in Figures 1-15, wherever the following biophysical attributes occur.

Biophysical attribute description:

A description of the essential features and attributes of habitat for Badger *jeffersonii* subspecies that are required to support life history functions are provided in Section 3.3, Table 2 of the provincial recovery plan, and form the basis of the biophysical attribute description in Table 2 below.

Table 2. Summary of biophysical features and attributes of functions of critical habitat for American Badger *jeffersonii* subspecies Western population and Eastern population. Note that these are the real-world attributes that need to be identified on the ground in order to determine whether a given location is critical habitat. With the exception of the attributes used to describe diggable soils, these attributes did not inform the geospatial delineation of the area potentially containing critical habitat. That process is described in section 3.1.1.

Type	Life Function	Biophysical Feature(s)	Biophysical Attribute(s)
Safe movement critical habitat and Core critical habitat	Safe movement (which is necessary to sustain all other life functions: denning, foraging, and reproduction)	Barrier-free landscapes	Continuous habitat that is not impeded by anthropogenic barriers to safe movement, such as major roadways or large developed areas that lack safe passage corridors.
Core critical habitat	Denning and foraging	Diggable soils: soils consisting of unconsolidated material cohesive enough to permit both badgers and prey species to establish natal and over-wintering dens and for badgers to excavate prey, and deep enough to retain structure when burrowed into and provide energy-efficient burrowing and thermoregulatory advantages.	Areas with or without active dens that have the following soil attributes (see Apps *et al.* 2002; Duquette 2008; Ethier *et al.* 2010; Hoodicoff 2003; Hoodicoff and Packham 2007; Kinley *et al.* 2013; Klafki 2014; Messick and Hornocker 1981; Messick 1987; Soil Classification Working Group 1998; and Weir *et al.* 2003): - Soil Order***:** brunisol, regisol, chernozem, gleysol, or gray luvisol - Parent Material***:** lacustrine, glacio-lacustrine, fluvial, glacio-fluvial, aeolian, or glacial till - Soil Texture***:** sandy loam to clay loam (>15% - <40% clay) - Soil Depth: >1 m
		Dens**	Active dens, wherever they occur
	Foraging	Suitable areas for foraging: open habitats that have the potential to support fossorial prey species	Areas with or without active prey colonies, including natural grasslands, wet meadows, shrub-steppe, seeded dryland pastures, and open canopy forest having stem density <75 stems/hectare, and canopy closure <16% (Weir & Almuedo 2010).
		Prey**	Active prey colonies and prey, wherever they occur, including but not limited to Columbian Ground Squirrel (*Spermophilus columbianus*), Yellow-bellied Marmot (*Marmota flaviventris*), Northern Pocket Gopher (*Thomomys talpoides*), Muskrat (*Ondatra zibethicus*), Red-backed Vole (*Clethrionomys gapperi*), and Meadow Vole (*Microtus pennsylvanicus*) (Hoodicoff 2006).

*Represented within provincial Soils Information Finder Tool (SIFT) database (https://www2.gov.bc.ca/gov/content/environment/air-land-water/land/soil/soil-information-finder), and so used as a basis for delineating areas within which core critical habitat is potentially found.

** Both active dens and active prey colonies are included as critical habitat, where they occur; however, critical habitat is not restricted to locations with active dens/prey. Areas with suitable soil and surface vegetation but no currently active dens/prey colonies also qualify as critical habitat because of the ephemeral nature of dens and prey and the potential for other areas with appropriate soil and surface vegetation to support badger denning and prey in the future.

American Badger *jeffersonii* subspecies is able to utilize dynamic/ephemeral habitat types (e.g., temporary clearings resulting from forest harvest); therefore, locations of core critical habitat may change over time. Within the broader 'units containing core critical habitat', the location of core critical habitat will need to be determined on a case-by-case basis.

Areas that do not contain the biophysical attributes required by the species at any time are not identified as core critical habitat. Examples of excluded areas are those that have human-built structures or surfaces that replace suitable open vegetation and prevent access to soils (e.g., existing buildings and human infrastructure; compacted or paved surfaces). Areas with high groundwater tables (i.e., above 1 m) that would prohibit successful burrowing are also excluded (e.g., fens, bogs, edges of wetlands).

Areas within core or safe movement critical habitat that are functionally isolated from any adjacent source populations as a consequence of being completely surrounded by existing barriers at the local scale (e.g., grassy median in a divided highway with continuous concrete barriers on both sides, or an urban park surrounded by developed neighbourhoods) are also not identified as critical habitat.

3.1.1 Information and methods used to identify critical habitat

Safe movement critical habitat

American Badger *jeffersonii* subspecies must be able to undertake safe movement in order to access dispersed and temporally/spatially dynamic foraging, denning and mating opportunities. Sightings of American Badger *jeffersonii* subspecies have been concentrated within seven EOs and associated connective corridors, delineated based on overlays of key habitat attributes with extensive point location data from research projects, surveys and public sightings reports (Section 3.2, provincial recovery plan; Rich Weir, personal communication, 2020). While it is recognized that the species has been detected outside of these areas, the defined EOs and associated connective corridors represent the best current approximation of landscape units occupied by American Badger *jeffersonii* subspecies in British Columbia, or the areas that the species must be able to freely and safely move within to sustain all life functions. Safe movement critical habitat for American Badger *jeffersonii* subspecies is thus identified within the bounds of the seven EOs and associated connective corridors.

Core critical habitat

To support denning and foraging life functions, American Badger *jeffersonii* subspecies requires soils consisting of unconsolidated material cohesive enough to permit both badgers and prey species to establish natal and over-wintering dens, and for badgers to excavate prey (Weir & Almuedo 2010, Kinley et al. 2014). The attributes of soils with these characteristics are summarized in Table 2. Core critical habitat for American Badger *jeffersonii* subspecies is thus identified within the seven EOs and associated connective corridors through applying a selection of the represented attributes from Table 2 to provincial soils mapping.

3.1.2 Geographic information

The geospatial areas containing safe movement and core critical habitat for American Badger *jeffersonii* subspecies are identified within the seven EOs and adjacent connective corridors (Figure 1-15):

Western Population:

- Northern Cariboo (Figure 1)
- Southern Cariboo (Figure 2)
- North Thompson (Figure 3)
- South Thompson (Figure 4)
- Nicola (Figure 5)
- Similkameen (Figure 6)
- North Okanagan (Figure 7)
- South-central Okanagan (Figure 8)
- South Okaganan Boundary (Figure 9)
- Boundary (Figure 10)

Eastern Population:

- Creston / Yahk (Figure 11)
- Northern Rocky Mountain Trench (Figure 12)
- Central Rocky Mountain Trench (Figure 13)
- Southern Rocky Mountain Trench (Figure 14)
- Elk Valley (Figures 14 & 15)

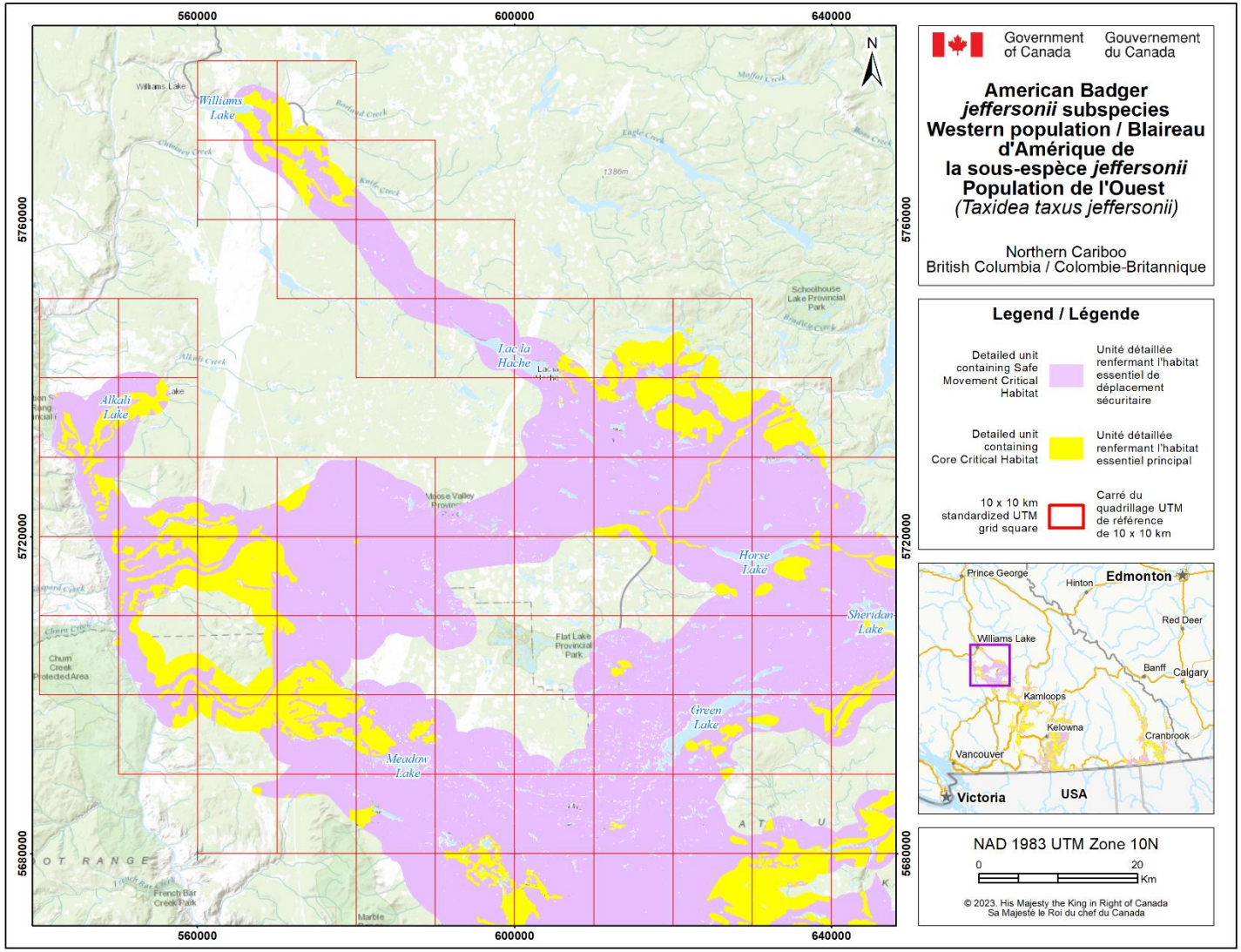

Figure 1. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the Northern Cariboo, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

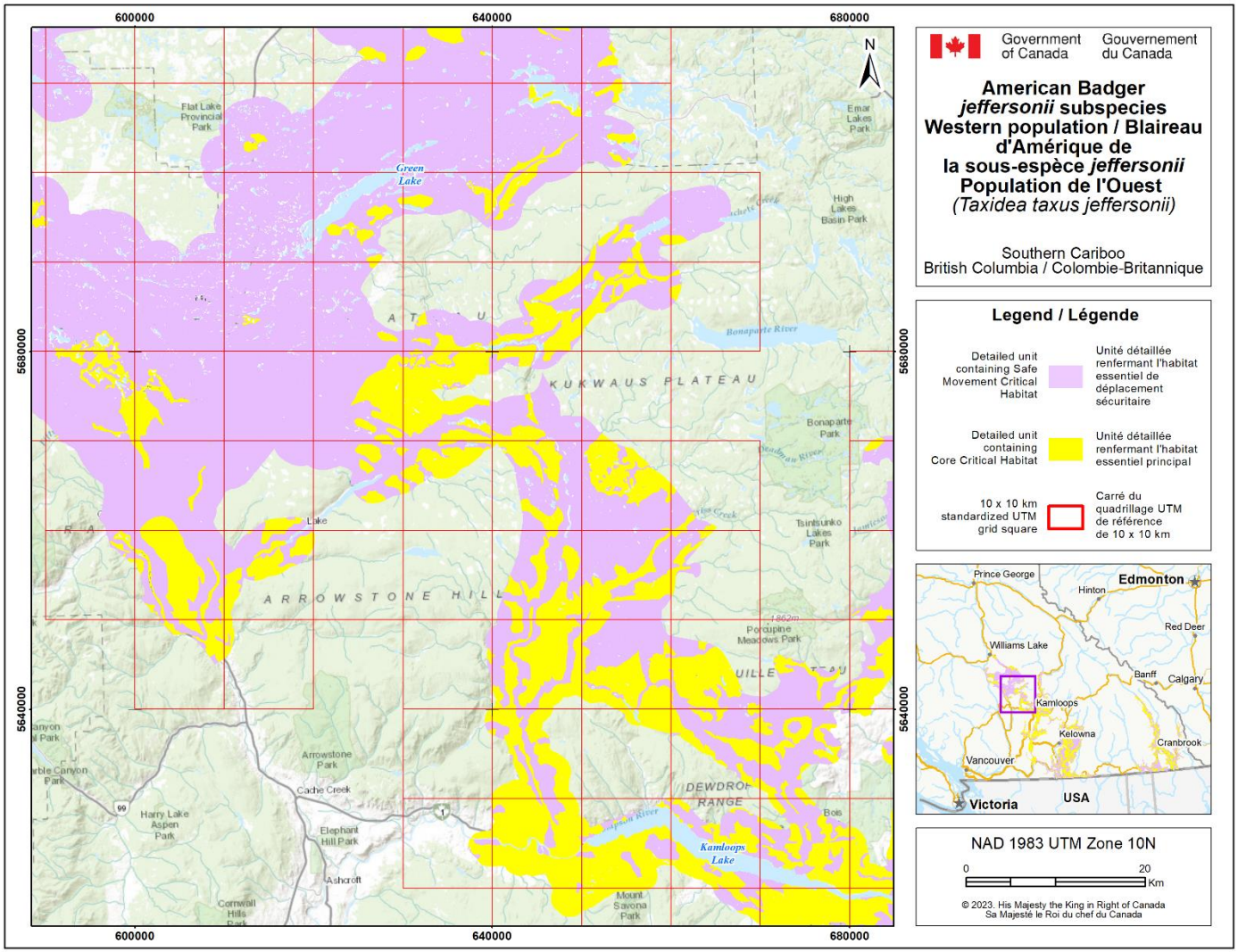

Figure 2. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the Southern Cariboo, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

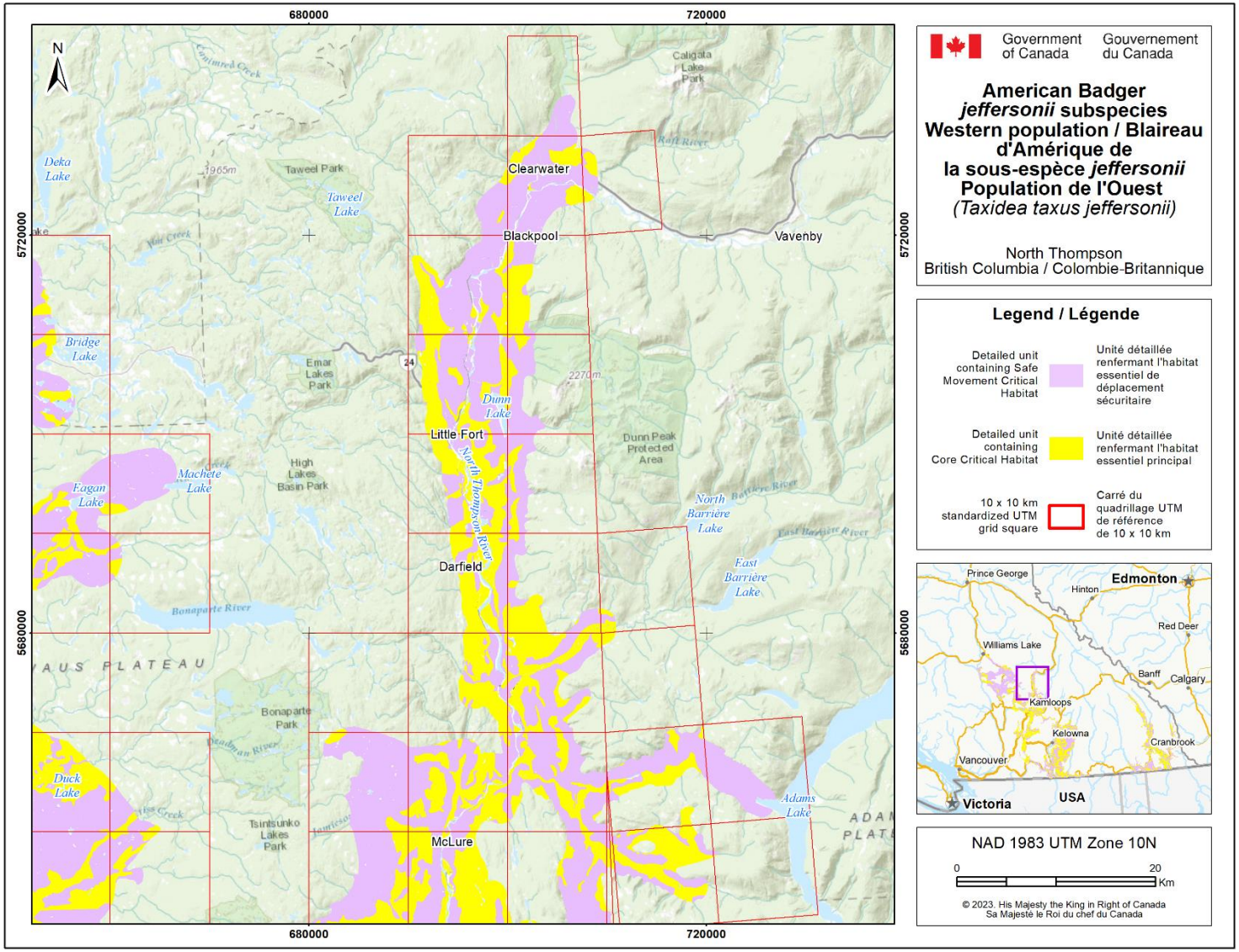

Figure 3. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the North Thompson, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

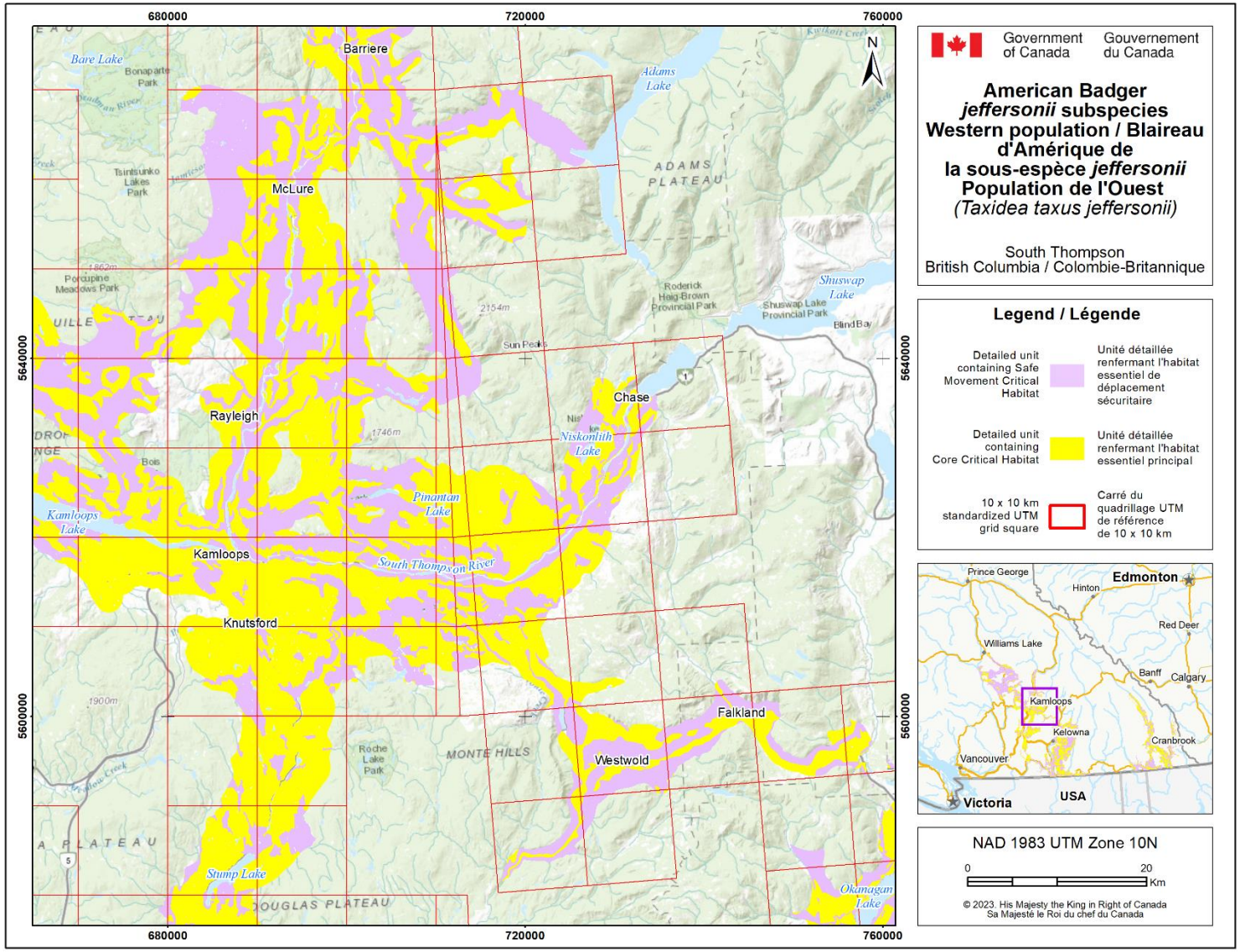

Figure 4. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the South Thompson, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

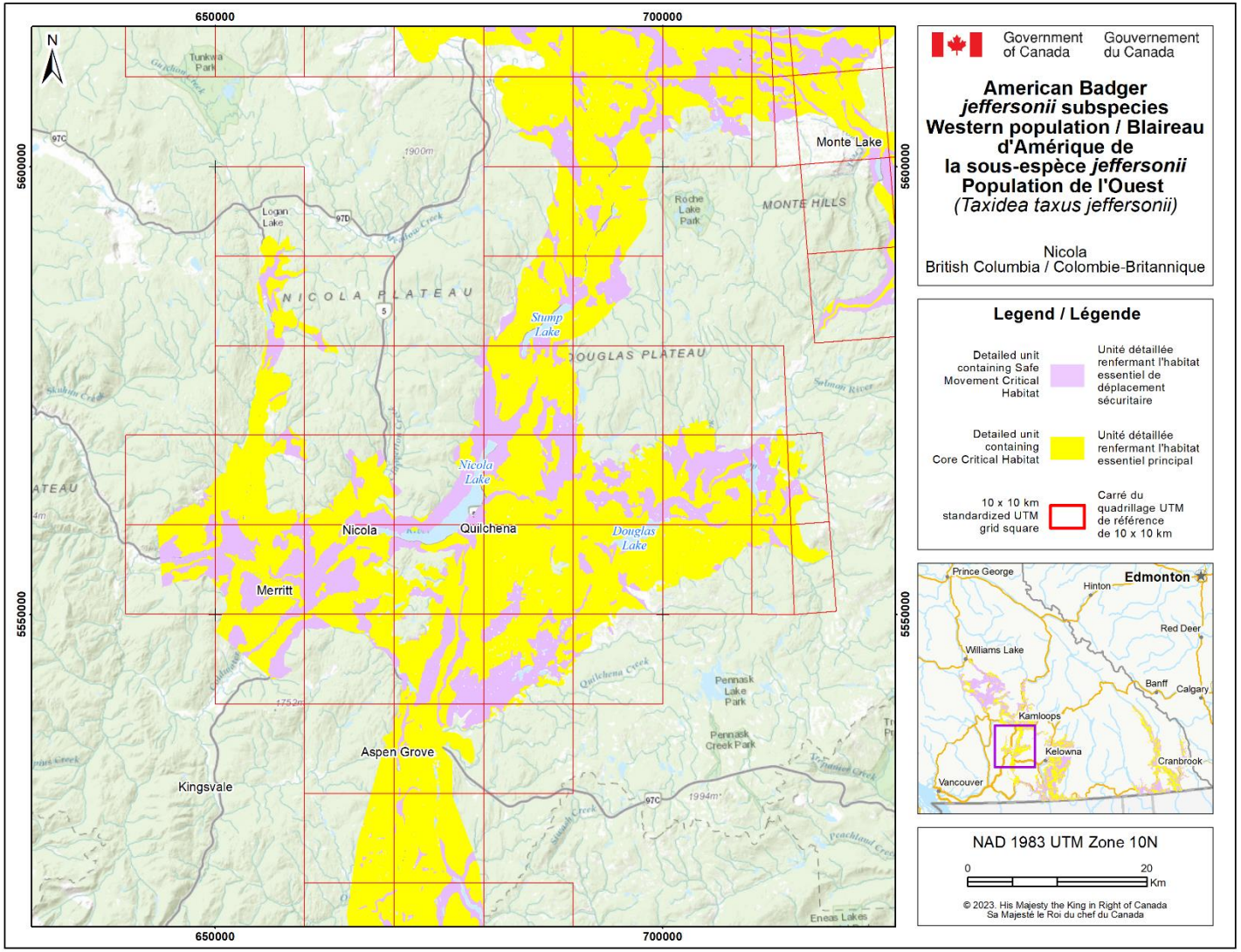

Figure 5. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the Nicola, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met**.**

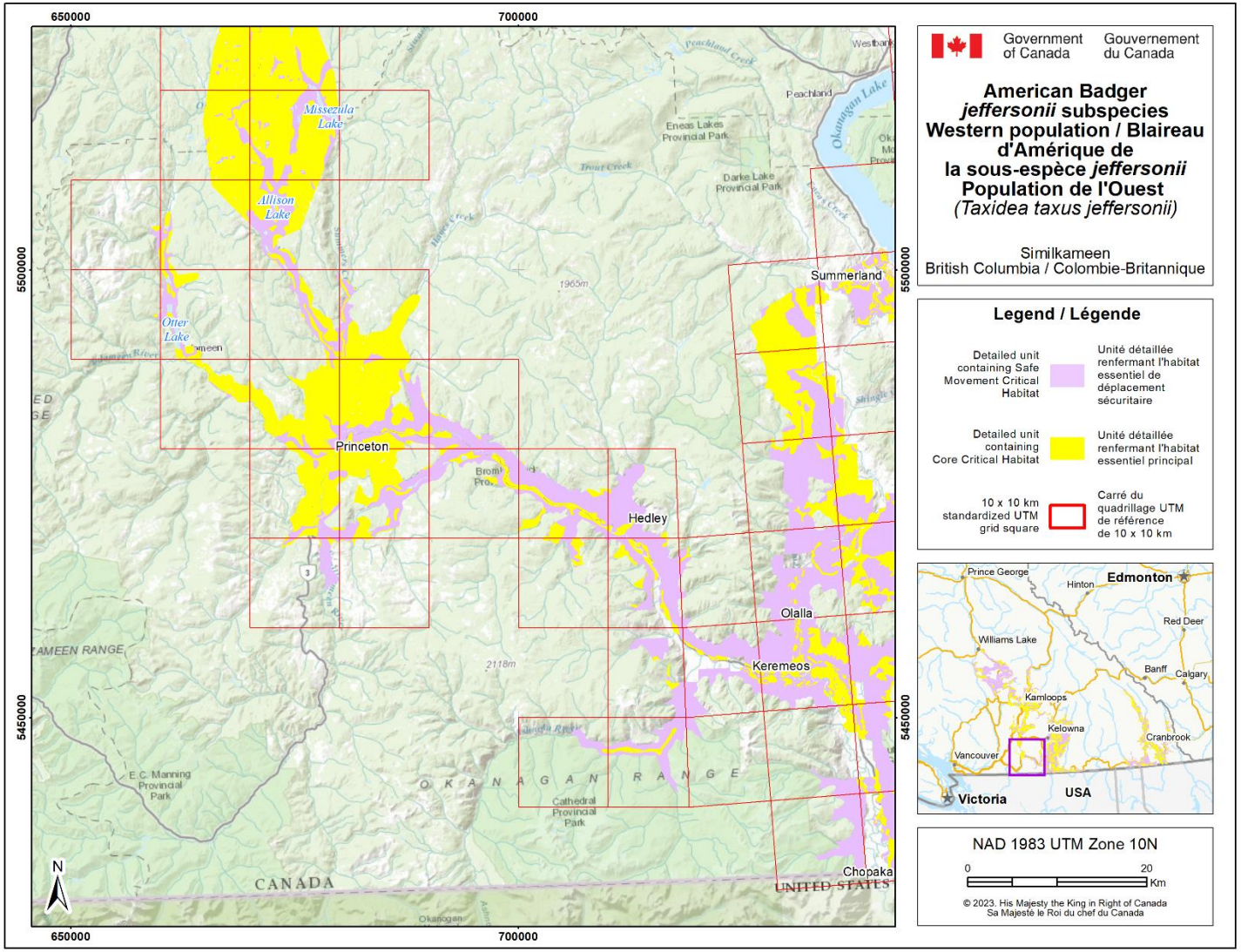

Figure 6. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the Similkameen, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met**.**

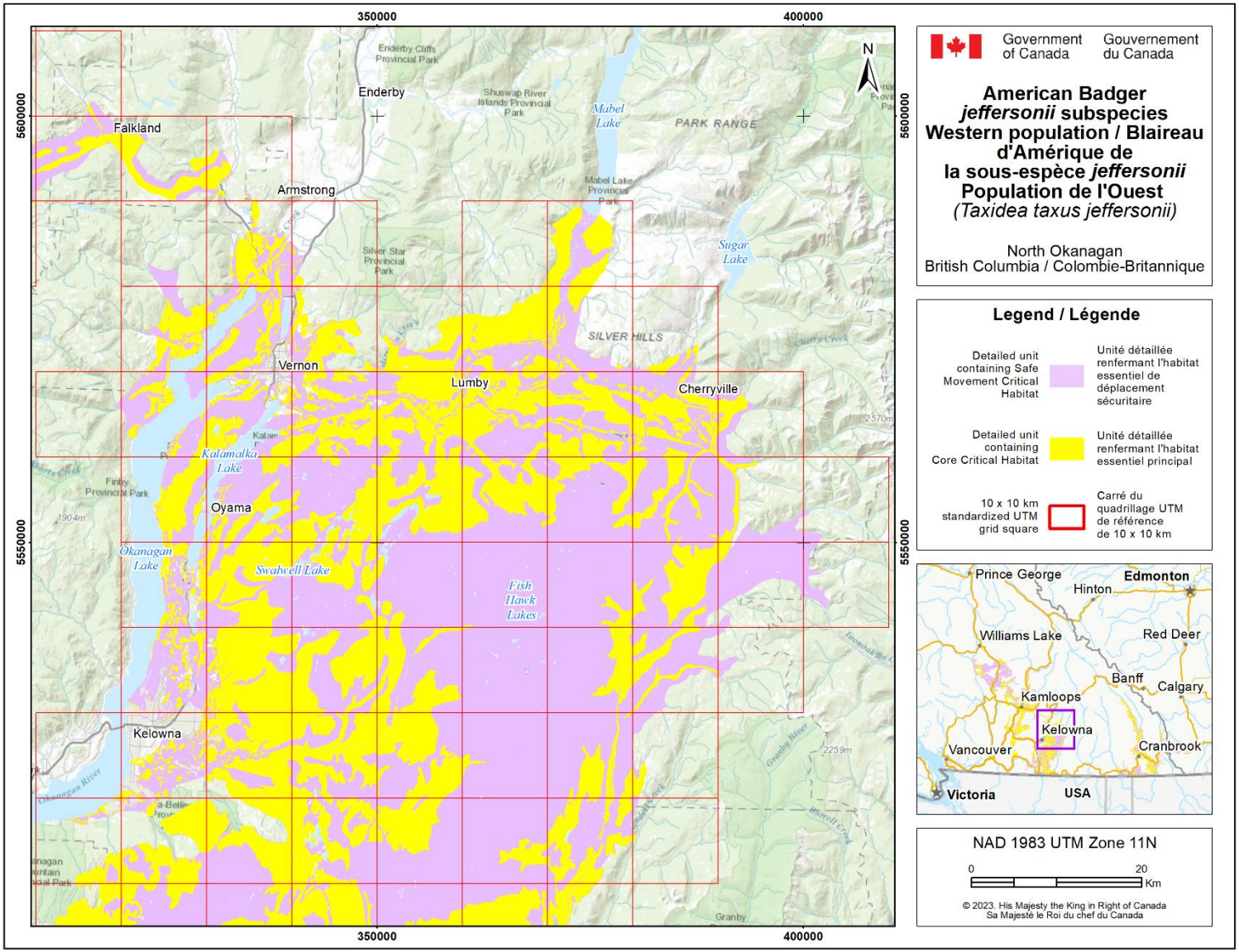

Figure 7. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the North Okanagan, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

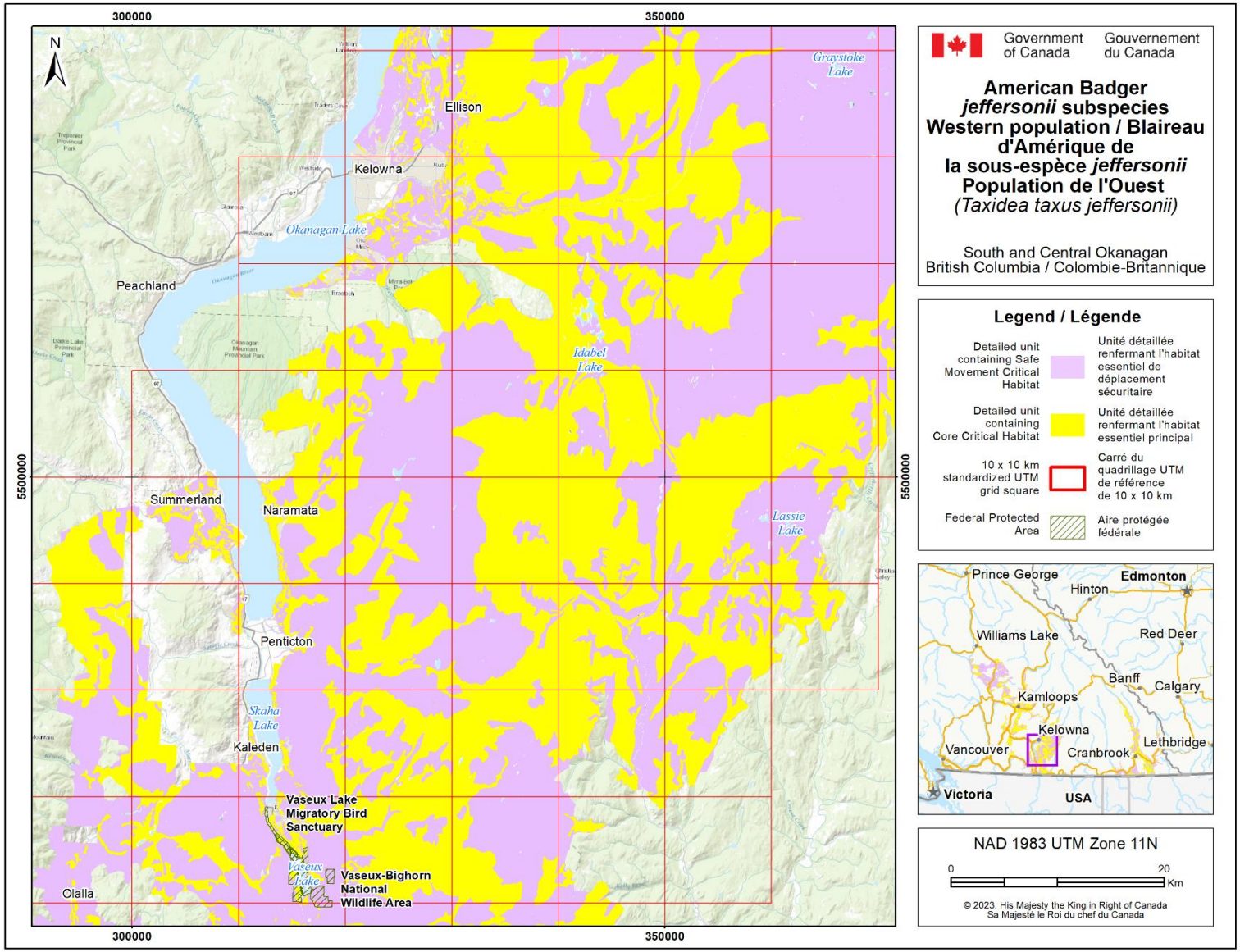

Figure 8. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the South-central Okanagan, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met. U.S.A. landbase (below dashed line) excluded.

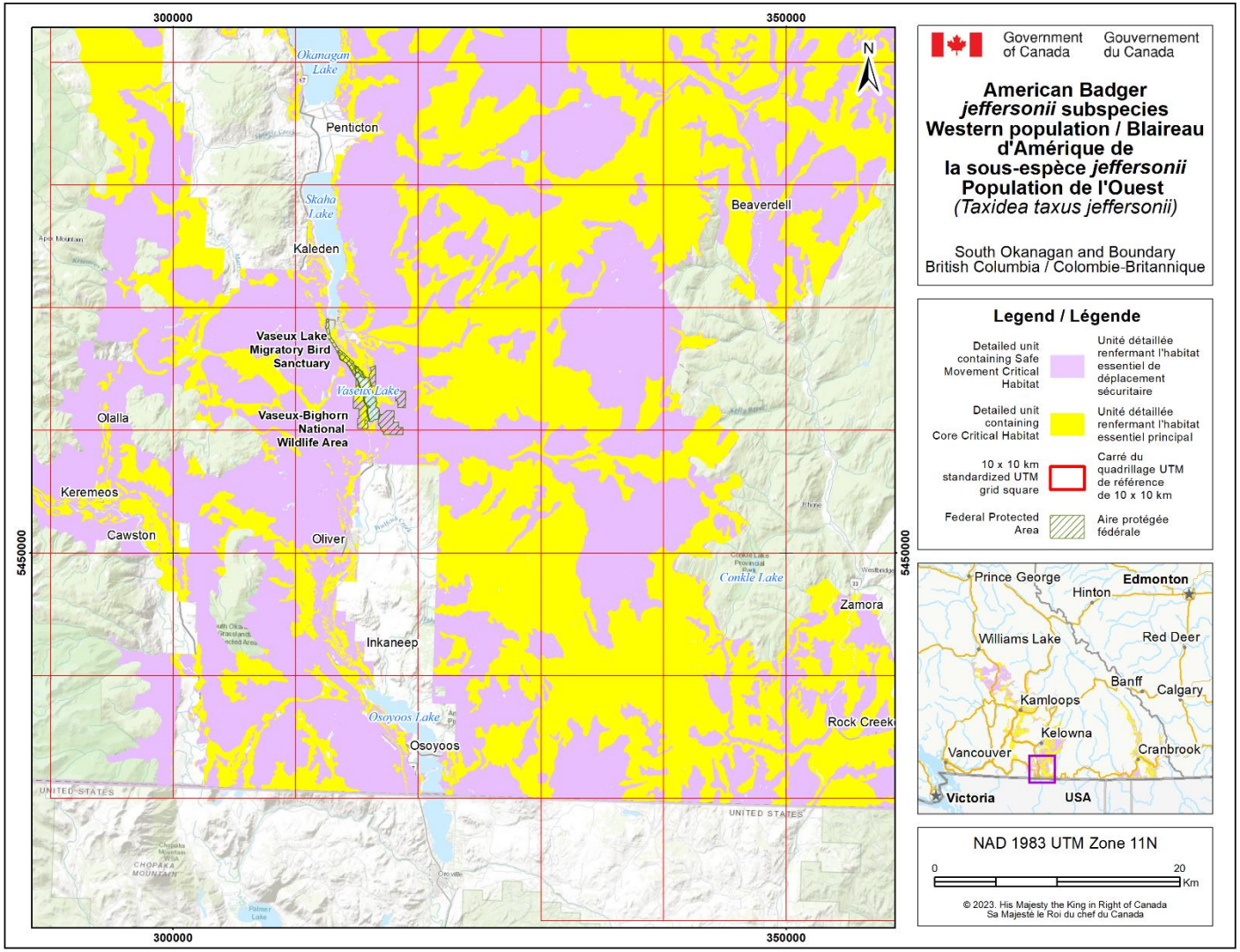

Figure 9. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the South Okanagan and Boundary, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met. U.S.A. landbase (below dashed line) excluded.

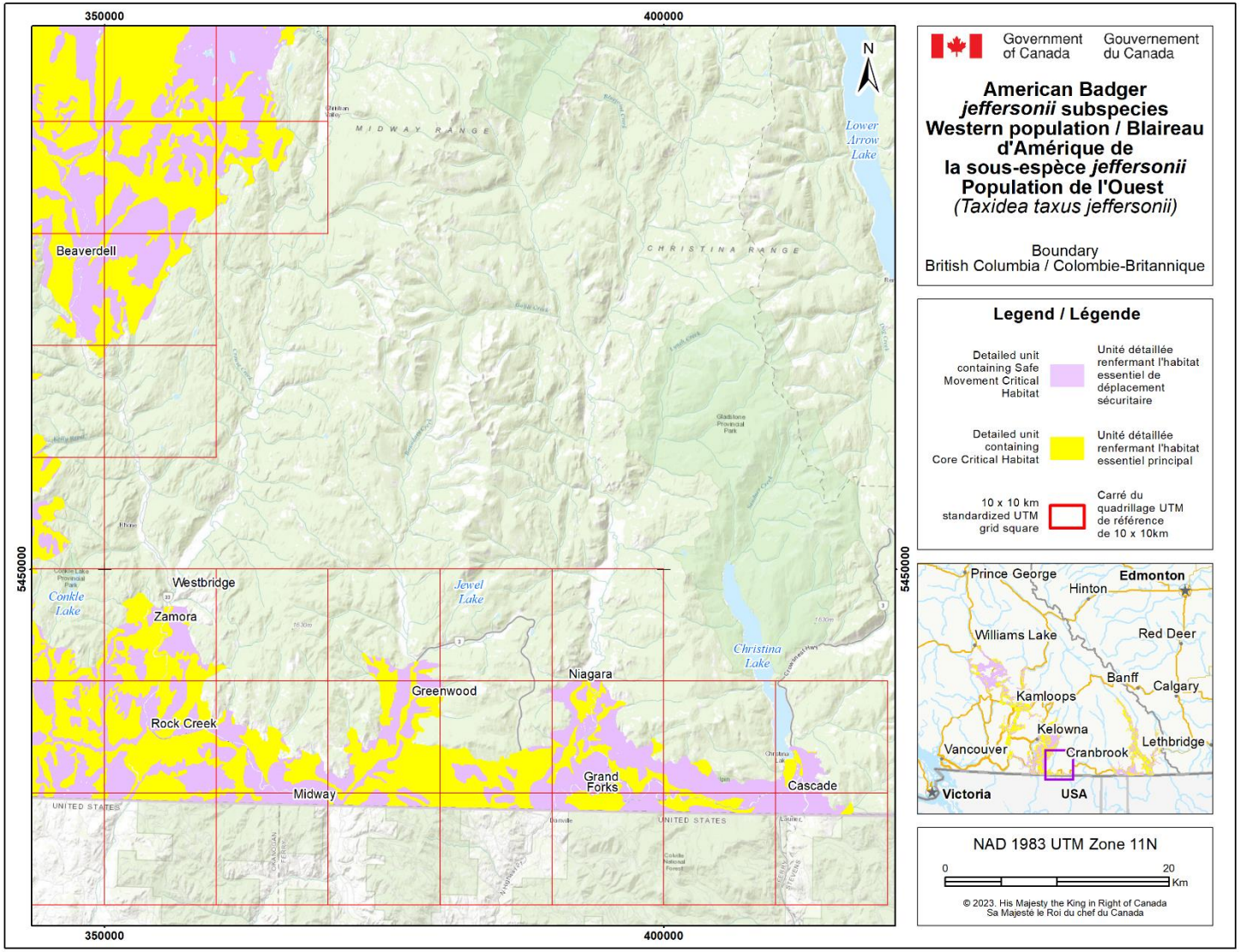

Figure 10. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Western population in the Boundary, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met. U.S.A. landbase (below dashed line) excluded.

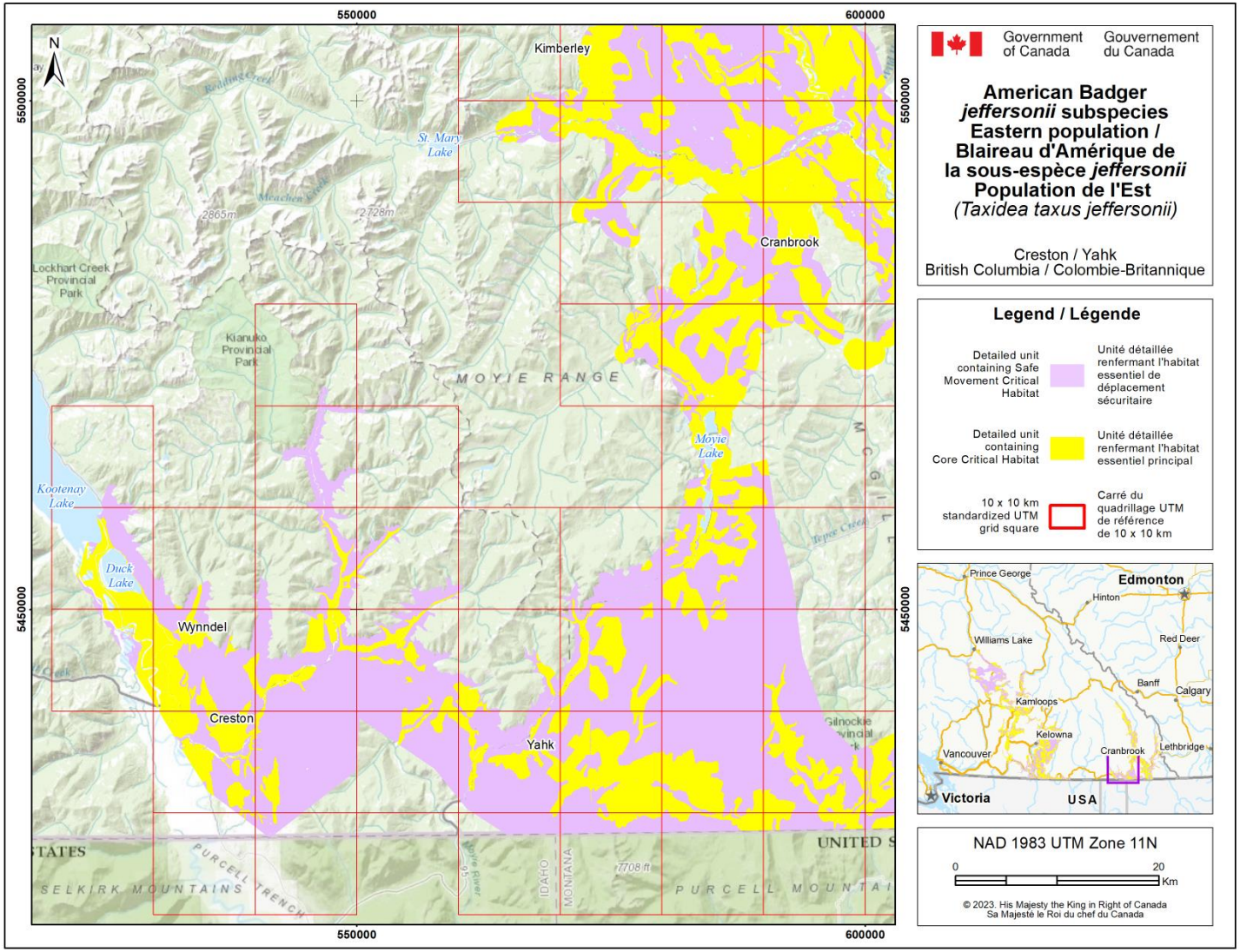

Figure 11. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Eastern population in Creston / Yahk, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met. U.S.A. landbase (below dashed line) excluded.

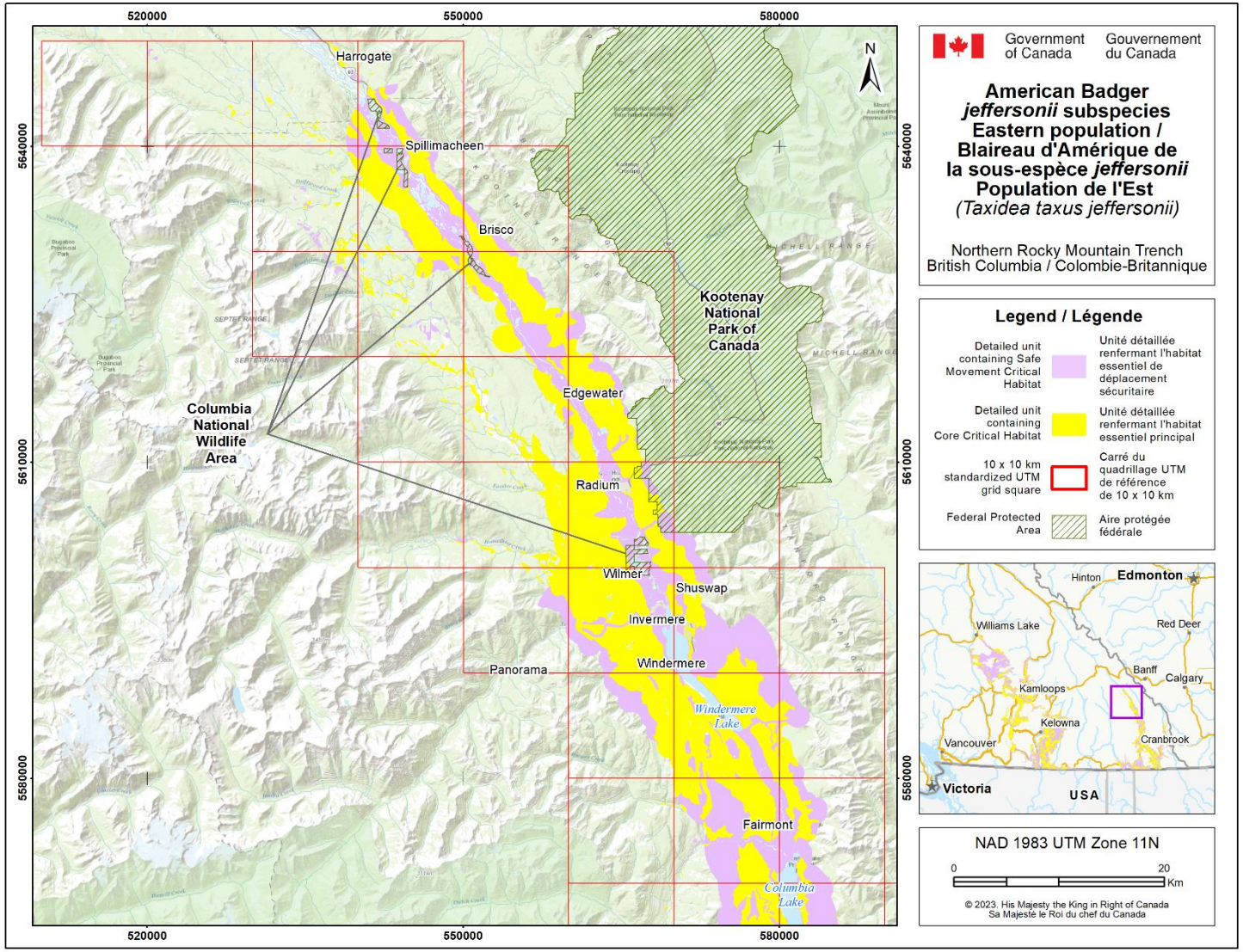

Figure 12. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Eastern population in Northern Rocky Mountain Trench, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

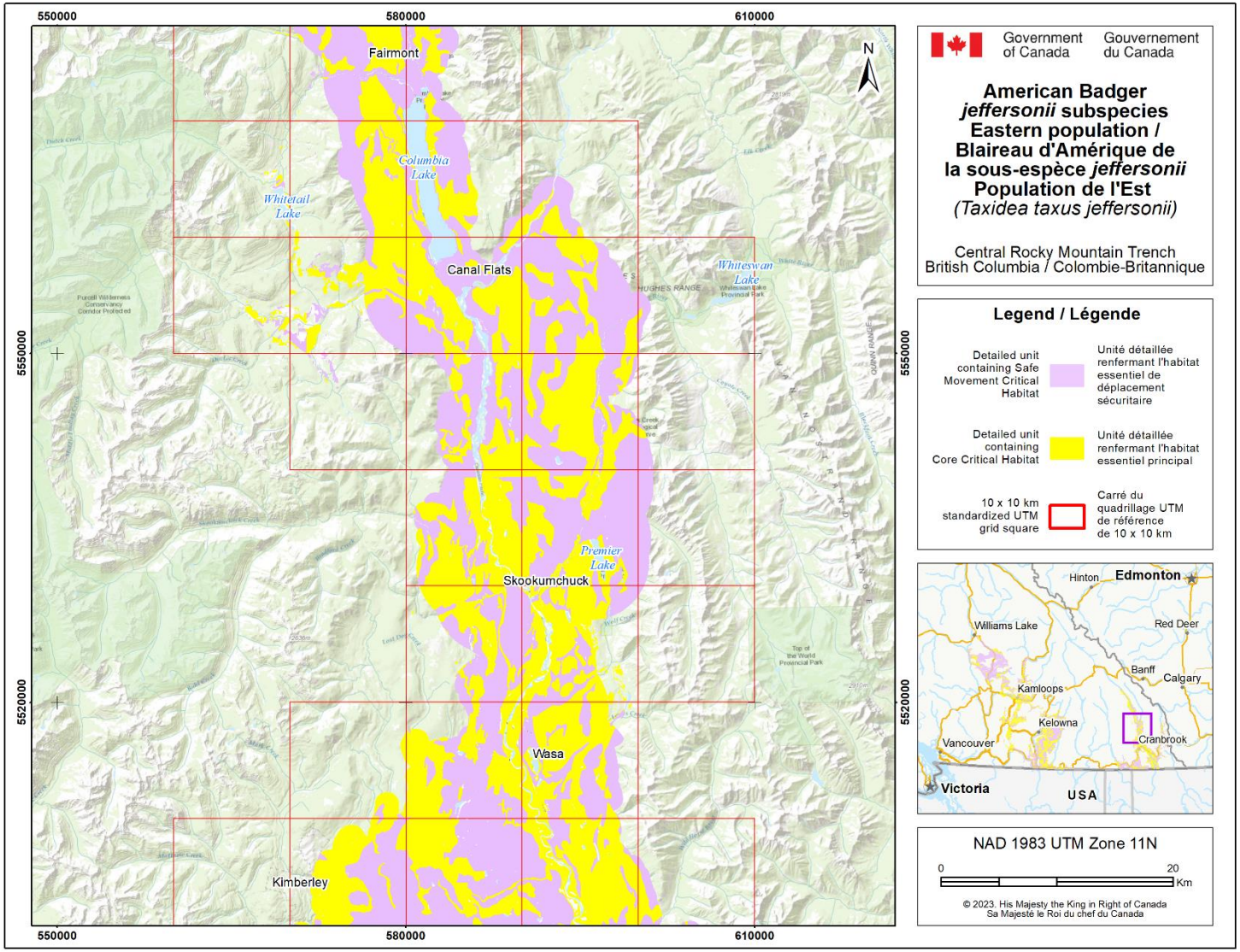

Figure 13. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Eastern population in Central Rocky Mountain Trench, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

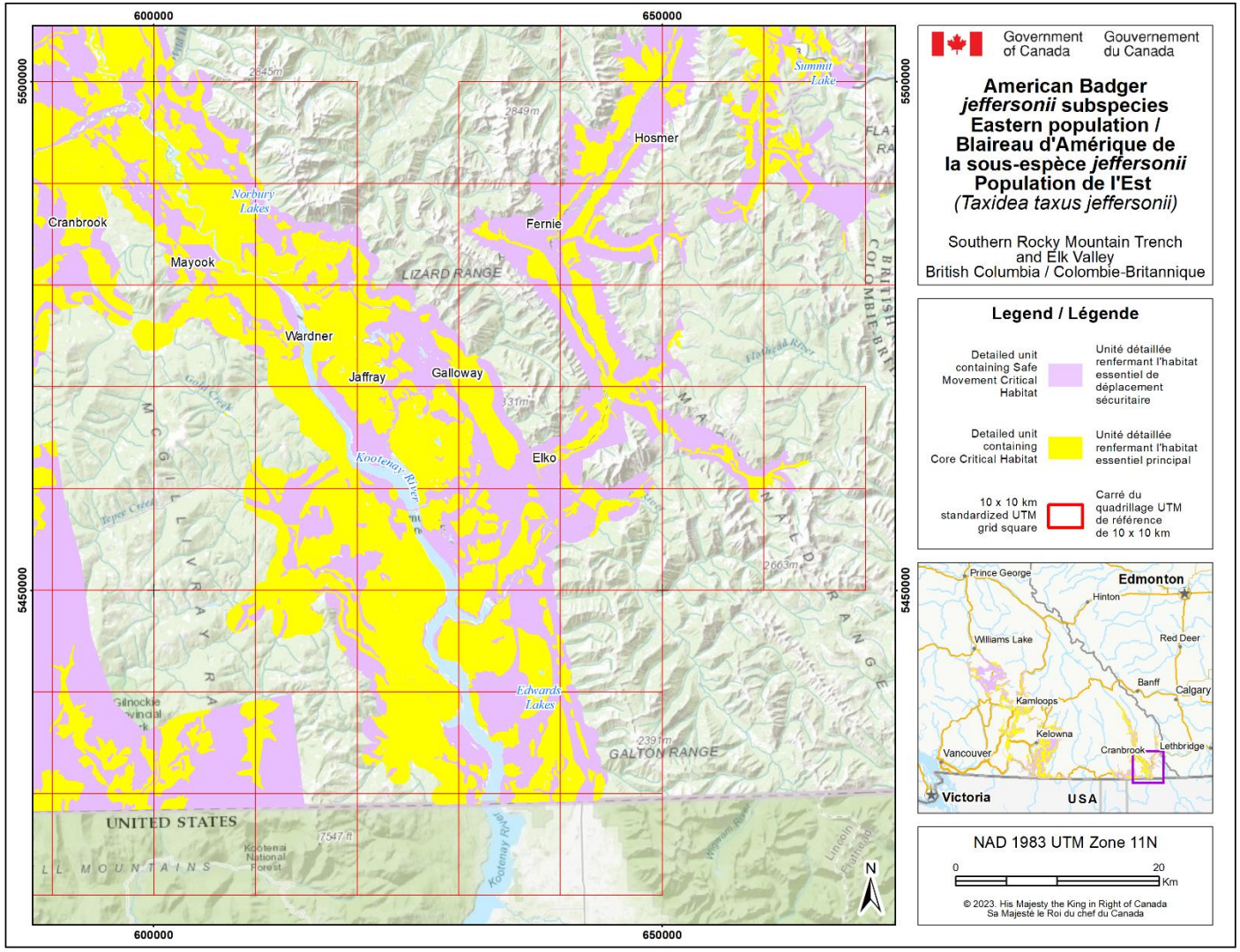

Figure 14. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Eastern population in Southern Rocky Mountain Trench and Elk Valley, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met. U.S.A. landbase (below dashed line) excluded.

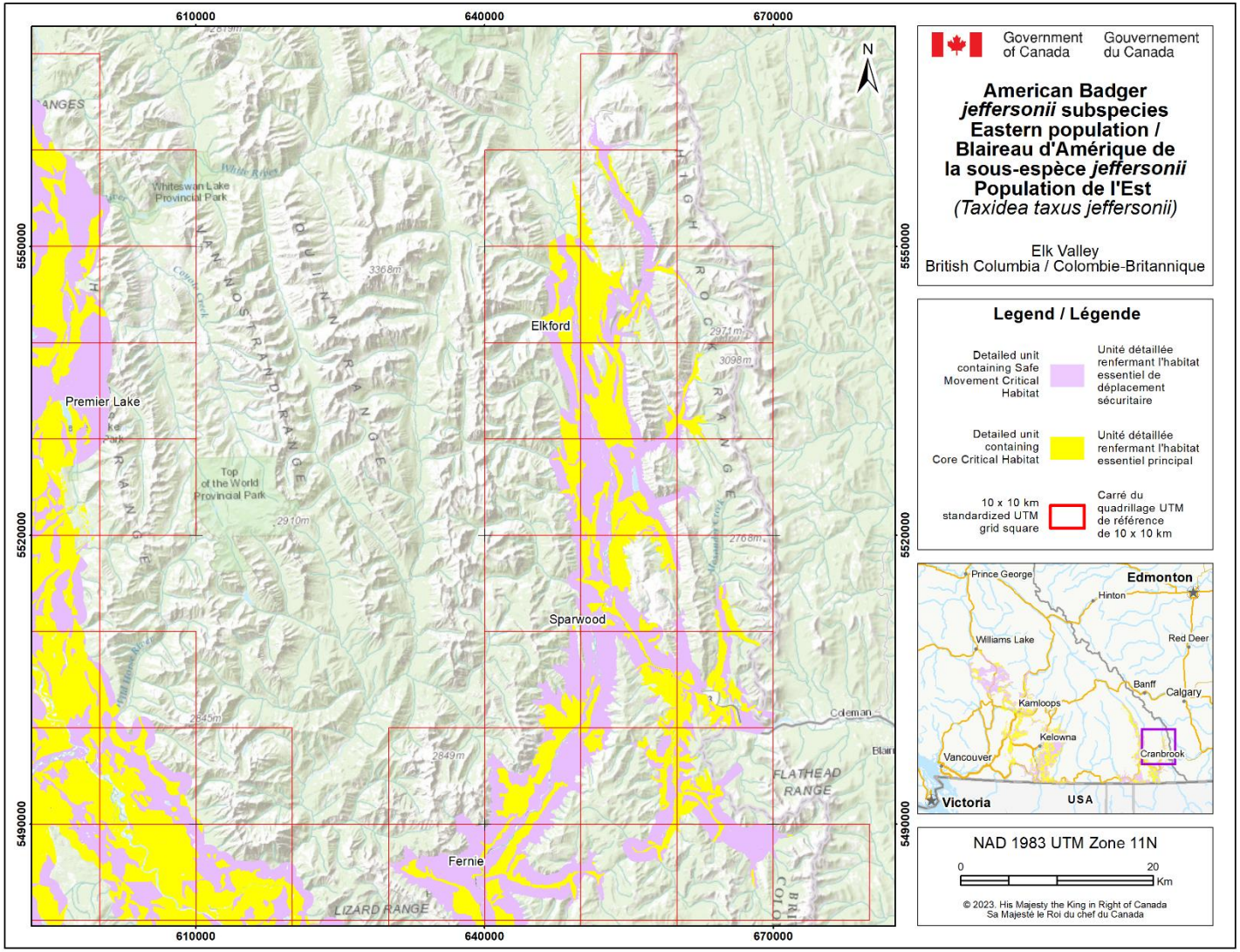

Figure 15. Detailed units containing core and safe movement critical habitat for the American Badger *jeffersonii* subspecies Eastern population in Elk Valley, B.C. are represented by the yellow (core and safe movement) and pink (safe movement) polygons, where the criteria and methodology set out in Section 3.1 are met.

3.2 Schedule of studies to identify critical habitat

The following schedule of studies (Table 3) is required to complete the identification of critical habitat for American Badger *jeffersonii* subspecies.

Table 3. Schedule of studies to complete the identification of critical habitat for American Badger *jeffersonii* subspecies Western population and Eastern population.

Description of Activity	Rationale	Timeline
Work with applicable organizations to complete identification of critical habitat in the Western population – (South) Okanagan/Boundary EO.	Critical habitat has not been identified for a portion of lands in the Okanagan / Boundary EO. This activity is required such that sufficient critical habitat is identified to meet the population and distribution objective.	2023-2033

3.3 Activities likely to result in the destruction of critical habitat

Understanding what constitutes destruction of critical habitat is necessary for the protection and management of critical habitat. Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by American Badger *jeffersonii* subspecies. Destruction may result from single or multiple activities at one point in time or from the cumulative effects of one or more activities over time. Activities described in Table 4 include those likely to cause destruction of critical habitat for American Badger *jeffersonii* subspecies, however, destructive activities are not limited to those listed.

Table 4. Activities likely to result in the destruction of critical habitat for American Badger *jeffersonii* subspecies.

Activity	Description of Effect	Additional Information
Creation of new/expansion of existing barriers that prevent safe movement within and between areas containing **core or safe movement critical habitat** (e.g., via road developments or land conversion for housing, industry, or crop plants).	Barriers result in isolation of suitable habitat, preventing badgers from moving safely within and between home range areas. This prevents the species from completing all life functions including reproduction and gene flow. It may be possible to create barriers within areas containing core or safe movement critical habitat without resulting in destruction, for example, by installing or retaining safe passage corridors such as wildlife over- or under-passes.	Related IUCN-CMP Threat #: 1.1 - housing & urban areas, 2.1 - annual & perennial non-timber crops, 3.2 - mining & quarrying, and 4.1 - roads & railways. Most likely to result in destruction when portions of habitat are completely bisected, and when the barrier increases danger associated with movement (e.g., road development). Destruction can result if the activity occurs at any time. Destruction may be temporary (if accompanied by installation of safe passage corridors).
Conversion of habitat within an area containing **core critical habitat** such that there is a net loss in the availability of biophysical attributes (e.g., residential / commercial / industrial / agricultural development, transportation corridor construction activities).	Net loss of suitable habitat for denning and foraging causes destruction of core critical habitat by reducing the ability of the habitat to support key life history functions for the species. It may be possible to convert some areas of suitable habitat for denning and foraging within the areas containing core critical habitat without resulting in destruction of core critical habitat, for example, by restoring foraging biophysical attributes elsewhere in the core critical where the denning biophysical attributes exist, and safe movement is possible.	Related IUCN-CMP Threat #: 1.1 - housing & urban areas, 2.1 - annual & perennial non-timber crops, 3.2 - mining & quarrying, and 4.1 - roads & railways. Most likely to cause destruction when conversion is at a larger scale (e.g., multi-unit developments vs single-family homes). Restoration efforts may not offset destruction if undertaken more than 20 km from the converted habitat (maximum American Badger *jeffersonii* subspecies home range distance). Destruction can result if the activity occurs at any time. Destruction may be temporary (if accompanied by adequate restoration of foraging biophysical attributes elsewhere in the core critical where the denning biophysical attributes exist, and safe movement is possible).

Activity	Description of Effect	Additional Information
Purposeful removal of a prey colony within an area containing **core critical habitat** (e.g., by targeting shooting, trapping, burrow-flooding, smoke-bombing, poisoning or similar actions).	Removal of prey sources causes destruction of core critical habitat by reducing the capacity of the area to adequately support the species' foraging functions.	Related IUCN-CMP Threat #: 5 – biological resource use Destruction can result if the activity occurs where/when a prey colony is active. Destruction may be temporary (if prey recolonize sites and/or are reintroduced).
Deliberate tree-planting in naturally non-forested or naturally open-canopied habitat within an area containing **core critical habitat**.	Tree planting in naturally open areas causes destruction of core critical habitat by reducing the availability of suitable open-forest or naturally non-forested habitat to support prey required for the species' foraging functions. Planting trees in habitat that was naturally/previously forested is not likely to result in the destruction of critical habitat.	Related IUCN-CMP Threat #: 7.1 - fires & fire suppression. Most likely to result in destruction of core critical habitat if tree planting is extensive enough to result in ≥16% canopy closure and/or ≥75-stems/ha stand density. Destruction can result if the activity occurs at any time. Destruction may be temporary (if planted trees are removed and open forest/grassland conditions restored).

4. Statement on Action Plans

One or more action plans for the American Badger *jeffersonii* subspecies will be completed within the 10 years following the publication of this Recovery Strategy.

5. 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*[5]. 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[6] (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.

The recovery measures proposed are not expected to negatively affect any other species. It is likely that efforts to conserve American Badger *jeffersonii* subspecies will indirectly benefit several other species at risk with similar habitat attributes including: Behr's Hairstreak (*Satyrium behrii*), Bobolink (*Dolichonyx oryzivorus*), Burrowing Owl (*Athene cunicularia*), Common Nighthawk (*Chordeiles minor*), Desert Nightsnake (*Hypsiglena chlorophaea*), Grand Coulee Owl-clover (*Orthocarpus barbatus*), Great Basin Gophersnake (*Pituophis catenifer deserticola*), Great Basin Spadefoot (*Spea intermontana*), Half-moon Hairstreak (*Satyrium semilunar*), Lewis's Woodpecker (*Melanerpes lewis*), Lyall's Mariposa Lily (*Calochortus lyallii*), Monarch (*Danaus plexippus*), Morman Metalmark (*Apodemia mormo*), Northern Rubber Boa (*Charina bottae*), Nuttall's Cottontail (*Sylvilagus nuttallii nuttallii*), Okanagan Efferia (*Efferia okanagana*), Sage Thrasher (*Oreoscoptes montanus*), Short-eared Owl (*Asio flammeus*), Showy Phlox (*Phlox speciosa ssp. occidentalis*), Sonora Skipper (*Polites sonora*), Western Harvest Mouse (*Reithrodontomys megalotis megalotis*), Western Rattlesnake (*Crotalus oreganus*), Western Skink (*Plestiodon skiltonianus*), Western Tiger Salamander (*Ambystoma mavortium*), Western Toad (*Anaxyrus boreas*), Western Yellow-bellied Racer (*Coluber constrictor mormon*), and Yellow-breasted Chat (*Icteria virens*).

[5] www.canada.ca/en/environmental-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html
[6] www.fsds-sfdd.ca/index.html#/en/goals/

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Personal Communications

Rich Weir, *B.C. American Badger Recovery Team Chair*. 2020.

Part 2 – *Recovery Plan for American Badger (*Taxidea taxus*) in British Columbia*, prepared by the British Columbia Badger Recovery Team for the British Columbia Ministry of Environment

Recovery Plan for American Badger (*Taxidea taxus*) in British Columbia

Prepared by British Columbia Badger Recovery Team

December 2016

About the British Columbia Recovery Strategy Series

This series presents the recovery documents that are prepared as advice to the Province of British Columbia on the general approach required to recover species at risk. The Province prepares recovery documents to ensure coordinated conservation actions and to 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 provincial recovery document?

Recovery documents summarize the best available scientific and traditional information 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. This information may be summarized in a recovery strategy followed by one or more action plans. The purpose of an action plan is to offer more detailed information to guide implementation of the recovery of a species or ecosystem. When sufficient information to guide implementation can be included from the onset, all of the information is presented together in a recovery plan.

Information in provincial recovery documents may be adopted by Environment Canada for inclusion in federal recovery documents that the federal agencies prepare to meet their commitments to recover species at risk under the *Species at Risk Act*.

What's next?

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.

Success in the recovery of a species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this document. All British Columbians are encouraged to participate in these efforts.

For more information

To learn more about species at risk recovery in British Columbia, please visit the B.C. Ministry of Environment Recovery Planning webpage at:
<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>

Recovery Plan for American Badger (*Taxidea taxus*) in British Columbia

Prepared by the British Columbia Badger Recovery Team

December 2016

Recommended citation

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Cover illustration/photograph

Additional copies

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

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

Disclaimer

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

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

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

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

ACKNOWLEDGEMENTS

The British Columbia Badger Recovery Team has provided significant contributions to this recovery plan. Ian Adams was the primary writer, and Rich Weir, Carnivore Conservation Specialist (B.C. Ministry of Environment [ENV]), coordinated the preparation of this document and made many important contributions and suggestions. Peter Fielder and Leah Westereng (both B.C. Ministry of Environment) provided expert guidance and assistance. This plan benefited greatly from the comments of numerous reviewers in the governments of British Columbia and Canada including; Jonathan Tillie (B.C. Ministry of Transportation and Infrastructure), Dave Trotter (B.C. Ministry of Agriculture), Chris Pasztor (B.C. Ministry of Natural Gas Development), Kirk Safford (B.C. Parks, ENV), Kirk Hancock (B.C. Ministry of Energy and Mines); Alan Dibb, Diane Casimir, Dwight Bourdin and Todd Keith (Parks Canada); Kella Sadler, Kim Borg and Darcy Henderson (Environment and Climate Change Canada). Robert Au, Integrated Pest Management License Officer (ENV), provided guidance on pesticide regulations in the province. Funding was provided by the provincial government with assistance from Environment and Climate Change Canada.

RECOVERY TEAM MEMBERS

Ian Adams, Vast Resource Solutions, Inc., Cranbrook
Lindsay Anderson, B.C. Ministry of Forests, Lands and Natural Resource Operations, Nelson
Helen Davis, Artemis Wildlife, Victoria
Alan Dibb, Parks Canada, Radium Hot Springs
Corinna Hoodicoff, Associated Environmental, Inc., Vernon
Shauna Jones, B.C. Ministry of Forests, Lands and Natural Resource Operations, Kamloops
Richard Klafki, Nature Conservancy of Canada, Invermere
Karl Larsen, Thompson Rivers University, Kamloops
Eric Lofroth, B.C. Ministry of Environment, Victoria
Roger Packham, Wildlife Biologist (B.C. Ministry of Forests, Lands and Natural Resource Operations; retired), 100 Mile House
Julie Steciw, B.C. Forests, Lands and Natural Resource Operations, Williams Lake
Karyn Sutherland, Evolve Extension, Kamloops
Stephen Symes, Worley Parsons, Inc., Calgary
Rich Weir, B.C. Ministry of Environment, Victoria (Chair)

EXECUTIVE SUMMARY

The American Badger (*Taxidea taxus*) is a medium-sized, mottled yellow and tan carnivore that is relatively flattened and well developed for a digging lifestyle. Three subspecies of badger occur in Canada, where it is distributed from British Columbia's Interior to southwestern Ontario. In British Columbia, all badgers are currently classified as the *jeffersonii* subspecies. This subspecies is listed federally as Endangered in Canada on Schedule 1 of the federal *Species at Risk Act* (SARA).[1] Two populations of this subspecies were recognized in 2012 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): Western Population and Eastern Population. Both populations were designated as Endangered by COSEWIC in 2012 because each had less than 250 mature individuals. The American Badger is ranked nationally (at the species level only) as N4. In British Columbia, it is ranked collectively as S2 (imperiled) by the B.C. Conservation Data Centre, and the species is on the provincial Red list. The B.C. Conservation Framework ranks the species as a priority 1 under goal 3 (maintain the diversity of native species and ecosystems). Under the British Columbia *Wildlife Act*, the American Badger is protected from capture and killing, except under defense of property. It is listed as a species that requires special management attention to address the impacts of forest and range activities under the *Forest and Range Practices Act* (FRPA) and the impacts of oil and gas activities under the *Oil and Gas Activities Act* (OGAA) on Crown land (as described in the Identified Wildlife Management Strategy).

The primary habitat requirements for badgers are soil conditions suitable for digging and available prey populations. In British Columbia, the American Badger is typically associated with grassland and open forest ecosystems, which are most common at valley bottom elevations; however, badgers can be found at any elevation up to, and including, alpine areas, and in various types of forested and unforested ecosystems. American Badgers tend to prefer coherent soils comprised of coarse silts to fine sand with low coarse material content, usually in areas with glaciolacustrine, lacustrine, and fluvial parent materials. American Badgers are opportunistic hunters, preying on a wide variety of animals. Columbian Ground Squirrel (*Urocitellus columbianus*), Yellow-bellied Marmot (*Marmota flaviventris*), and microtine rodents are preferred prey.

Limiting factors include low lifetime reproductive capacity, reduced gene flow owing to isolation of populations within the province, low juvenile survivorship, and large home range size that increases exposure to threats (especially males and dispersing juveniles).

The main threat facing American Badgers in British Columbia is road mortality, which is the main cause of death within all studied populations. Other threats include habitat loss related to urban and commercial housing; cultivation agriculture, viniculture and orchards; mining and large-scale solar energy production; forest ingrowth and encroachment, resulting from fire suppression; and off-road vehicle use. American Badgers are reliant on prey populations that

[1] Species that were designated at risk by COSEWIC before October 1999 must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may, on the recommendation of the Minister, decide on whether they should be added to the List of Wildlife Species at Risk. The protection and/or conservation measures afforded by SARA apply only to species once they are on Schedule 1.

often face poisoning and are susceptible to secondary poisoning if contaminated prey are consumed.

The recovery (population and distribution) goal is to maintain or increase the Western and Eastern Populations to levels sufficient to ensure persistence over time, and to maintain the distribution of the species across the known range in British Columbia.

The following are the recovery objectives:

1. to protect American Badgers and their habitat;
2. to more accurately estimate American Badger abundance;
3. to better understand prey ecology, history, and distribution;
4. to better understand distribution of preferred soil associations;
5. to improve understanding of genetic structure of American Badgers in the province;
6. to improve knowledge of American Badger distribution and abundance in poorly documented regions; and
7. to increase public awareness and appreciation of American Badgers in British Columbia.

RECOVERY FEASIBILITY SUMMARY

The recovery of the American Badger in British Columbia is considered technically and biologically feasible. However, there are unknowns regarding the feasibility of recovery based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility. In keeping with the precautionary principle, a recovery plan that addresses these unknowns has been prepared.

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

   YES. There is clear evidence of continuous and ongoing reproduction by American Badgers throughout their range in British Columbia. American Badgers have low reproductive output compared to many other species and this may, in part, slow the pace of recovery; however, the ability to reproduce is not an impediment to recovery. Sufficient demographic data has likely been collected for American Badgers to complete a population viability analysis, which should indicate whether current estimated populations in British Columbia are able to withstand observed mortality rates.

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

   YES. American Badgers are largely habitat generalists. Their main habitat requirement is suitable soil in which to dig burrows. Land use can affect American Badger occurrence by reducing availability of suitable soil types. Urban areas, industrial activities, and cultivation agriculture are the most significant sources of habitat loss to American Badgers in British Columbia. American Badgers are also reliant on prey populations. Habitat requirements of these species (mainly Columbian Ground Squirrels and Yellow-bellied Marmots) are less well known and may be more susceptible to land use decisions and

habitat loss. In some areas, fire suppression has led to forest ingrowth and encroachment on grassland and open forest habitats, which are preferred by American Badgers. Restoration activities are ongoing to relieve this ingrowth and encroachment. Though slow and expensive work, this is helping to increase habitat available to both American Badgers and their prey. Ephemeral American Badger habitat is also created by mid-elevation logging activity and the species has likely benefited from the Mountain Pine Beetle infestation and subsequent logging throughout its range, particularly in the Cariboo region. These areas provide ephemerally suitable conditions to prey, especially Columbian Ground Squirrels, and are usually at a safer distance from main highways in valley bottoms where most American Badger mortality occurs.

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

   UNKNOWN. The main threat facing American Badgers in British Columbia is road mortality. This threat cannot be avoided or removed. Some aspects making the animals particularly susceptible to road mortality can be lessened or mitigated. These include installing underpasses in areas of high road mortality incidence and reducing habitat attractants for American Badgers and their prey close to roadways. Ultimately, roads in the province will always be a population sink for American Badgers; the best way to overcome the threat is to ensure that robust source populations are located in areas removed from the main road threats.

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

   YES. Habitat conservation and private land stewardship are the keys to successful American Badger recovery in British Columbia, as this will ensure that populations are able to withstand road mortality and occasional extermination on private land. Mechanisms include Wildlife Habitat Areas, private land covenants, and fee-simple land purchases by land conservation organizations. Provincial and national parks within areas of American Badger occurrence (primarily valley bottoms) are likely too small to be effective tools relative to the species' home ranges and population densities.

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1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Assessment Summary – November 2012
Common Name:* American Badger – *jeffersonii* subspecies – Western population
Scientific Name:** *Taxidea taxus jeffersonii*
Status: Endangered
Reason for Designation: Fewer than 250 mature badgers live in the Okanagan Valley–Cariboo region where they are vulnerable to increasing threats of mortality from roadkill and habitat loss associated with the change of open areas to urban or forest environments.
Occurrence: British Columbia
Status History: The species was considered a single unit and designated Not at Risk in 1979. Each subspecies was given a separate designation in May 2000; the *jeffersonii* subspecies was designated Endangered. In November 2012, the *jeffersonii* subspecies was further split into two populations (Western and Eastern populations), and the Western population was designated Endangered.

Assessment Summary – November 2012
Common Name:* American Badger – *jeffersonii* subspecies – Eastern population
Scientific name:** *Taxidea taxus jeffersonii*
Status: Endangered
Reason for Designation: As few as 100 mature badgers live in the East Kootenay region where they are vulnerable to increasing threats from roadkill. The loss of open areas to forest succession and urban development is resulting in ongoing habitat decline.
Occurrence: British Columbia
Status History: The species was considered a single unit and designated Not at Risk in 1979. Each subspecies was given a separate designation in May 2000; the *jeffersonii* subspecies was designated Endangered. In November 2012, the *jeffersonii* subspecies was further split into two populations (Western and Eastern populations), and the Eastern population was designated Endangered.

* Committee on the Status of Endangered Wildlife in Canada.
** Common and scientific names reported in this recovery 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

American Badger[a]		
Legal Designation:		
FRPA:[b] Species at Risk OGAA:[b] Species at Risk	*Wildlife Act*:[c] Schedule A	SARA:[d] Schedule 1 Endangered (2003)
Conservation Status[e]		
B.C. List: Red B.C. Rank: S2 (2015) National Rank: N4[f] (2012) Global Rank: G5 (2012)		
Other Subnational Ranks:[g] Alberta: S4; Saskatchewan: S3S4; Manitoba: S4; Ontario: S2.		
B.C. Conservation Framework (CF)[h]		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority:[j] 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: 1 (2009)
CF Action Groups:[i]	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 (2015) unless otherwise noted. Where the text discusses American Badger in British Columbia, these are assumed to be *Taxidea taxus, jeffersonii* subspecies unless otherwise noted.
[b] Species at Risk = a listed species that requires special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the impacts of oil and gas activities on Crown land under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008) as described in the Identified Wildlife Management Strategy (Province of British Columbia 2004).
[c] Schedule A = designated as wildlife under the *Wildlife Act* (Province of British Columbia 1982), which offers it protection from direct persecution and mortality.
[d] Schedule 1 = found on the List of Wildlife Species at Risk under the *Species at Risk Act* (SARA; Government of Canada 2002).
[e] Red: Includes any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia. S = subnational; N = national; G = global; 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.
[f] All badger subspecies are collectively ranked nationally at the species level, *Taxidea taxus*.
[g] Data source: NatureServe (2015).
[h] Data source: B.C. Ministry of Environment (2009).
[i] Data source: B.C. Ministry of Environment (2016).
[j] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

The American Badger[2] (*Taxidea taxus*) is a medium-sized carnivore in the mammalian family Mustelidae, which includes (among other species) weasels, otters, martens, and wolverine. Adult males are 60–76 cm long, including the tail, and weigh up to 12 kg. Adult females are slightly smaller (Long 1973). Badgers are relatively flattened animals with a well-developed pectoral girdle and forelimbs well adapted for digging. The hind limbs are much smaller. Their fur is mottled yellow and tan over most of the body. Distinct black and white stripes on the head and characteristic black "badges" on each cheek give the animal its name.

[2]Hereafter, all references to American Badger in British Columbia are assumed to be *Taxidea taxus, jeffersonii* subspecies unless otherwise noted. Other common names include North American Badger and Yellow Badger. Any other badger species referred to in this document will be clearly noted.

3.2 Populations and Distribution

American Badgers occur throughout much of western and central North America (Long 1973; Messick 1987; COSEWIC 2012; Figure 1). Three subspecies of badgers occur in Canada, where it is distributed from British Columbia's Interior to southwestern Ontario. Within British Columbia (B.C.), all American Badgers are considered to be the *jeffersonii* subspecies, within which two distinct populations are recognized: Western Population and Eastern Population (COSEWIC 2012). This distinction is supported both by biogeography and genetics (Ethier *et al.* 2012). Within each population, discrete Element Occurrences (EOs) are recognized. These are areas of core occurrences (based on reported sightings) and preferred habitat types.

Figure 1. American Badger global distribution showing ranges of four subspecies (from COSEWIC 2012; B.C. portion of distribution based on Weir and Almuedo 2010).

Ethier *et al.* (2012) demonstrated that, in Canada, the *jeffersonii* subspecies is divided into two distinct genetic groups separated by the Selkirk and Monashee Mountains. The Western

Population differed significantly from the Eastern Population. While American Badgers from the Eastern Population did not differ significantly from those in Montana, they did differ from American Badgers in Alberta despite sharing haplotypes with *T.t. taxus* populations (Ethier *et al.* 2012). American Badgers in the Western Population were found to be highly isolated from all other American Badger populations sampled by Ethier *et al.* (2012), although these researchers did not sample American Badgers from adjacent Washington State.

Although no historical population data exist for American Badgers in British Columbia, a long-term decline has almost certainly occurred; historical trapping records show the number of American Badgers trapped annually in the mid-1920s was greater than current population estimates (*jeffersonii* Badger Recovery Team 2008). Trap returns remained very low after the 1940s, although no data on trapping effort for American Badgers exist over these time periods. Legal trapping of American Badgers in the province was discontinued in 1968.

The Western Population occurs within Okanagan, Boundary, Thompson, Cariboo, and Nicola/Similkameen regions of south-central British Columbia (Figure 2). Their range is from the east slopes of the Coast Mountains and Fraser River, west into the Monashee Mountains and Kettle River valley, and as far north as Williams Lake, B.C. Between 150 and 245 mature individuals are estimated to occur in the Western Population (Table 1).

Table 1. Status and description of American Badger populations in British Columbia (COSEWIC 2012).

Population	Element occurrence	Status and description	Land tenure[a]
Western Population (Population 1)	Cariboo	70–90 mature individuals	Private land, Crown land
	Thompson	30–50 mature individuals	Private land, Crown land
	Okanagan/Boundary	35–65 mature individuals	Private land, Crown land
	Nicola/Similkameen	15–40 mature individuals	Private land, Crown land
	Total Western Population:	150–245 mature individuals	
Eastern Population (Population 2)	Rocky Mountain Trench	100–160 mature individuals, combined	Private land, Crown land
	Elk Valley		Private land, Crown land
	Creston/Yahk		Private land, Crown land
	Provincial Total	**250–405 mature individuals**	

[a] Private land includes some Conservation Land holdings and fee-simple land holdings with conservation-based covenants. Crown land is predominantly provincial, but also includes some federal land.

The majority of the Eastern Population occurs in the Rocky Mountain Trench EO in the East Kootenay region of southeastern British Columbia (Figure 2). Their range here extends from the United States border at Grasmere, B.C., north to Golden, B.C. (Kinley *et al.* 2013). The Elk Valley between the Rocky Mountain Trench and the Alberta border also supports American Badgers (Figure 2), as does the Creston/Yahk area of the Central Kootenay region. Between 100 and 160 mature individuals are estimated to occur in the Eastern Population (Table 1).

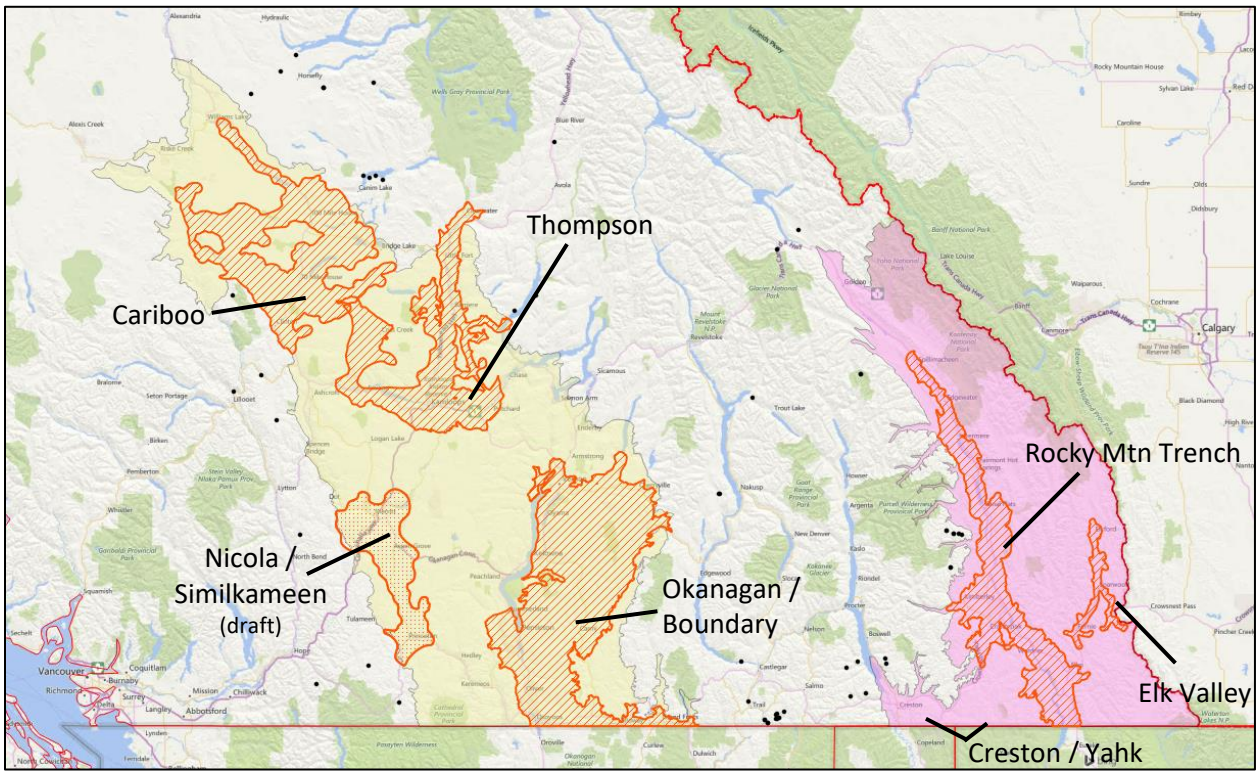

Figure 2. American Badger distribution in British Columbia (after Weir and Almuedo 2010) showing Western Population (shaded yellow) and Eastern Population (shaded pink).
Finalized Element Occurrences are shown with hatching. The Nicola/Similkameen EO, in draft at time of publication, is shown with orange stippling (source: B.C. Ministry of Environment unpubl. data). The Creston Yahk EO has not been mapped. Black dots represent extralimital records of American Badgers and/or burrows.

American Badgers in the Elk Valley may be more closely related to the *T.t. taxus* subspecies than *T.t. jeffersonii*. Both Kyle *et al.* (2004) and Ethier *et al.* (2012) stated that the subspecies boundary coincides with the Continental Divide along the British Columbia/Alberta border, but neither study sampled American Badgers from the Elk Valley. Several mountain passes across this border are at relatively low elevations and well within the movement capabilities of American Badgers.

The landscape conditions between the Western and Eastern populations are generally unfavourable to American Badgers. The Interior Cedar–Hemlock biogeoclimatic zone, which predominates in the mountains between the two populations, generally does not support American Badgers or their preferred prey. The long distance of unsuitable habitat in the Selkirk and Monashee Mountain ranges (which run north-to-south) is considered a barrier between the two populations in the province (COSEWIC 2012). Early seral forests, resulting from forestry and fire, and an extensive forestry road network are thought to facilitate occupation by American Badgers and their prey within some areas between the populations (e.g., the Darkwoods property south of Nelson, B.C.; T. Kinley, pers. comm., [2012]). Several historic records of American Badger exist from the Pend d'Oreille valley south of Trail, B.C., but no American Badgers are thought to occur there now (T. Kinley, pers. comm., [2012]). American Badgers in adjacent

jurisdictions are generally considered secure, though the *taxus* subspecies in the Canadian prairie provinces was assessed as a Species of Special Concern in Canada (COSEWIC 2012), and the Ontario *jacksonii* subspecies is federally listed on SARA Schedule 1 as Endangered.

3.3 Habitat and Biological Needs of the American Badger

The primary requirements for American Badgers are soil conditions suitable for digging and available prey populations (Rahme *et al.* 1995; Table 2). American Badger habitat associations may otherwise be very plastic. American Badgers have been found in many environments—from hot, dry grassland, valley-bottom habitat to alpine tundra; however, they most commonly occur in grasslands, fields, or open-canopied forests (Apps *et al.* 2002; Hoodicoff 2003; Weir *et al.* 2003; Kinley and Newhouse 2008; Klafki 2014).

American Badgers are unusual carnivores in that they excavate burrows in pursuit and capture of food and to create their own security cover for resting and reproduction. American Badgers dig and re-use many burrows throughout their territory, but as solitary carnivores, they do not share burrows with other individuals, except for reproductive females with kits. American Badgers tend to prefer burrowing into soils with textures ranging from coarse silts to fine sand with low coarse material content (Messick and Hornocker 1981; Messick 1987; Apps *et al.* 2002; Hoodicoff 2003; Weir *et al.* 2003; Hoodicoff and Packham 2007; Duquette 2008; Ethier *et al.* 2010; Kinley *et al.* 2013). Well-developed soils on unconsolidated sediments >1 m deep are important for American Badgers because these soils retain structure when burrowed into, are also required by prey, and provide energy-efficient burrowing and thermoregulatory advantages (Symes 2013). Glaciolacustrine, lacustrine, fluvial, and aeolian parent materials tend to be preferred. Brunisol and chernozems are the soil types (see Soil Classification Working Group 1998 for definitions) usually selected for burrowing (Apps *et al.* 2002; Hoodicoff and Packham 2007; Kinley *et al.* 2013; Klafki 2014).

American Badger habitat traditionally has been considered grassland, steppe, and open forest (Messick and Hornocker 1981; Messick 1987). They also use open or cleared areas within forested environments (Apps *et al.* 2002; Hoodicoff 2003; Jannett *et al.* 2007; Weir and Almuedo 2010).

American Badgers often occur close to linear corridors, including roads, fencerows, field edges, and hedgerows (Warner and Ver Steeg 1995; Apps *et al.* 2002; Duquette 2008). This tendency is particularly true in forested areas, where American Badgers likely follow roads to access prey populations that have colonized forest openings created by forestry or wildfire. The attraction of suitable soil conditions typically found alongside roads can lead to increased road mortality. American Badgers do not typically inhabit cultivated fields (Messick and Hornocker 1981) but use the uncultivated areas around the fields (Warner and Ver Steeg 1995; Duquette 2008) and are often associated with agricultural habitat types (Kierepka and Latch 2015).

Within forested landscapes, American Badgers use early seral, non-forested or open-forest patches created by forestry activities (i.e., recent cutblocks), wildfire, insect outbreaks (e.g., mountain pine beetle) and ski developments (Weir *et al.* 2003; Kinley and Newhouse 2008). Predictive habitat modelling in the East Kootenay region identified a broad range of habitat

features, including low elevation, shallow slope, low crown closure, brunisol soils with low amounts of colluvial material, and high solar radiation (Kinley *et al.* 2013). In the Cariboo region, American Badgers may be associated with wetland habitats (Hoodicoff and Packham 2007; Klafki 2014).

Table 2. Summary of essential functions, features, and attributes of American Badger habitat in British Columbia.

Life stage	Function[a]	Feature(s)[b]	Attribute(s)[c]
Adults	Feeding/foraging	Suitable prey	Colonial fossorial rodents; primarily Columbian Ground Squirrels (where present). Non-forested to open forest sites with well-developed grass or forb community. Typically in valley bottom locations but also in mid-elevation forest clearings (resulting from forestry) and alpine environments.
	Denning (security, thermal, reproductive cover)	Unconsolidated sediments >1 m deep and suitable for denning	Preferred soil types include: Brunisols and Chernozems on Aeolian, Glacio-lacustrine, Lacustrine and Fluvial parent materials, with low coarse fragments. Often adjacent to large rodent burrow complexes, and often (but not always) well-removed from human disturbance.
Juveniles	Dispersal	Continuous habitat and/or corridors that are not unduly impeded by anthropogenic barriers, such as major roadways and large developed areas.	Typically lower relief valley bottom grasslands and open forests in the Bunchgrass, Ponderosa Pine, and Interior Douglas Fir biogeoclimatic zones, but also mid-elevation forest clearings up to and including the Alpine biogeoclimatic zone.
Adult female	Reproduction	Male Badgers	Female Badgers are induced ovulators (multiple breedings required to induce ovulation), so access to multiple males may be necessary. This may be a challenge in low-density populations.
Adult male	Reproduction	Female Badgers	Male Badger occurrence during breeding season (June–July) is a function of search for females. Especially in low-density populations, this can lead to large home ranges and Badger occurrences in atypical habitats

[a] Function: a life-cycle process of the species (e.g., include either animal or plant examples: spawning, breeding, denning, nursery, rearing, feeding/foraging and migration; flowering, fruiting, seed dispersing, germinating, seedling development).
[b] Feature: the essential structural components of the habitat required by the species.
[c] Attribute: the building blocks or *measurable* characteristics of a feature.

American Badgers are opportunistic hunters, preying on a wide variety of animals. Gut and scat analyses from the East Kootenay, Thompson, and Cariboo regions revealed that American Badgers consume Columbian Ground Squirrel (*Urocitellus columbianus)*, Yellow-bellied Marmot (*Marmota flaviventris*), Northern Pocket Gopher (*Thomomys talpoides*), Muskrat (*Ondatra zibethicus*), leporids (rabbits and hares), various microtine rodents (e.g., voles), insects, birds, reptiles, and amphibians (Newhouse 2006; Hoodicoff 2003; Hoodicoff and Packham 2007; Kinley and Newhouse 2008). Small mammals, particularly Columbian Ground Squirrels, form

the majority of the American Badger diet. Where they occur, Yellow-bellied Marmots are also an important prey species. The Northern Pocket Gopher is found throughout much of the American Badger's range, but its role as a prey species appears relatively minor (Hoodicoff 2003). Birds are likely rare prey items, although American Badgers could be regular nest predators of ground-nesting birds.

American Badgers have much larger home ranges in British Columbia than elsewhere (Table 3). Factors contributing to this difference may include low prey densities (food searching) and low American Badger densities (mate searching). Males typically have much larger home ranges than females and most movement occurs in the summer months during breeding season. Of the 16 American Badgers radio-tagged by Klafki (2014) in the Cariboo, 12 had a major highway bisecting the home range, 3 had at least one paved secondary road, and 1 had gravel roads.

Lifetime movements by individuals can be very high. An adult male American Badger killed on the Trans-Canada Highway west of Kamloops was found to be in otherwise excellent condition. This American Badger was originally captured as an orphaned juvenile in the Cariboo region and released near 100 Mile House. This represents a straight-line distance of at least 100 km from point of release to point of death (R. Weir, R. Klafki, and R. Packham, unpublished data).

Table 3. Mean annual home range sizes[a] (km^2) of male (M) and female (F) American Badgers in North America.

	Minimum Convex Polygon		95% Fixed Kernel		Sample size (*N*)		
Location	**M**	**F**	**M**	**F**	**M**	**F**	**Source**
British Columbia							
East Kootenay	315	34.2	67.1	17.4	9	7	Newhouse (2006)
Thompson	87.9	10.5	32.7	15.6	8	1	Weir et al. (2003); Hoodicoff et al. (2009)
Cariboo: summer only			163.4 (87.7*)	23.2 (14.9*)	5	10	Klafki (2014)
Cariboo: winter only			3.93 (3.65ł)	3.4 (2.9ł)	8	12	Symes (2013)
Cariboo: winter only			26.6 (12.2*)	2.2 (1.6*)	2	7	Klafki (2014)
Range-wide							
Illinois	35.6 (18.1*)	17.7 (9.8*)	49.4 (25.8*)	16.4 (8.4*)	5	9	Duquette (2008); Warner and Ver Steeg (1995)[b]
Ohio	3.2 (2.9*)	4.9 (1.2*)	3.6 (4.9*)	7.1 (2.2*)	3	2	Duquette (2008)
Northwest Utah	5.8	2.4			2	5	Lindzey (1978)
Wyoming	8	3			18	15	Minta (1993)
Wyoming			12	3.4	8	6	Goodrich and Buskirk (1998)
Southwest Idaho	2.4	1.6			2	3	Messick and Hornocker (1981)
Eastern Washington	6.4	3.1	9.2	5.7	10	4	Paulson (2007)

[a] Calculated as either Minimum Convex Polygon or 95% Fixed Kernel. Sample size is the number of individuals contributing to the mean estimate; number of locations per individual varies.
[b] Duquette (2008) re-analyzed data from Illinois Badgers, originally collected by Warner and Ver Steeg (1995).
ł Standard Error; * Standard Deviation

3.4 Ecological Role

Mesocarnivores[3], including American Badgers, play important ecological roles, influencing prey populations and often driving community structure (Roemer *et al.* 2009). American Badgers play a key role in the functioning of grassland and open forest ecosystems throughout their range in British Columbia. They have the ability to influence prey population numbers as a top-level predator (Proulx 2010; Proulx and MacKenzie 2012). American Badger diggings are considered highly beneficial to a wide range of soil functions, including water infiltration and aeration (Eldridge 2004, 2009). American Badger mounds alter soil chemistry and composition, creating patchy soils that help maintain shrub-steppe communities (Eldridge and Whitford 2009).

Burrows dug by American Badgers are used by other species, including Burrowing Owl (*Athene cunicularia*; Poulin *et al.* 2005) and Great Basin Spadefoot (*Spea intermontana*) as well as insects and spiders, reptiles, small mammals, and leporids (Messick and Hornocker 1981).

3.5 Limiting Factors

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

3.5.1 Low reproductive capacity

Similar to other large mustelids, American Badgers exhibit low reproductive capacity and net reproductive output can be low across an adult female's lifetime (Messick and Hornocker 1981; Ruggiero *et al.* 1994; Rahme *et al.* 1995; Weaver *et al.* 1996). Females can breed in their first season but only 30–50% do so (Messick and Hornocker 1981). American Badgers exhibit delayed implantation, which offsets active gestation until the spring following breeding so that litters are born the following year. This factor further exacerbates low productivity by increasing the length of time that adults need to be alive to produce replacement offspring relative to species that breed and produce offspring in the same year. In the Rocky Mountain Trench, two of four females over 1 year of age had litters (Newhouse 2006). Males do not mature sexually until over 1 year of age (Messick 1987) but are not thought to contribute significantly to reproduction until more than 4 years old. The maximum age of badgers in the wild is believed to be 14 years, but most badgers live to age 3 or 4 (Messick and Hornocker 1981).

Badger litter sizes across North America vary from one to five kits (Lindzey 1982), with most litters in British Columbia averaging two or fewer kits (Table 4). Females are capable of producing one litter each year, but data suggest this is rare. In the East Kootenay, 16 adult females fitted with radio-transmitters were monitored for 1–4 years, representing 33 possible litters; however, only 17 litters were observed and contribution to breeding was unequal among females (Kinley and Newhouse 2008).

[3] Mammalian carnivores that typically consume prey <10 kg in size.

Table 4. Summary of American Badger litter sizes in British Columbia. For sightings data, all American Badger groups observed are assumed to be one female with kits (litter size = group size – 1).

Region	Litters	Mean	Range	Source
Rocky Mountain	17	1.7	1–3	Radio-telemetry: 1996–2006; Kinley and Newhouse 2008
Trench	129	2	1–4	Sightings: 1996–2008; Kinley (unpublished data)
Thompson-Okanagan	57	1.6	1–4	Sightings: 1996–2008
	2	1.5	1-2	Radio-telemetry: 1999–2002; R. Weir (unpublished data)
Cariboo	11	2.0	1–4	R. Klafki and R. Packham (radio-telemetry and unpublished sightings data)

Reproductive output may also be limited by other means. American Badgers are believed to be induced ovulators and ovulation may require multiple copulations (Messick and Hornocker 1981; Minta 1993). In addition, rates of fertilization may be increased by the number of copulations and male fitness (Messick and Hornocker 1981). Consequently, repeated copulations with experienced males may be necessary for fertilization to occur. American Badgers also exhibit delayed implantation that may be triggered by environmental conditions and prey availability (Messick 1987). If breeding opportunities are limited by low densities of mates (and therefore reduced encounters) and food sources are unreliable, overall reproductive output at the population level could be limited.

3.5.2 Genetic isolation

The genetic isolation of American Badger populations in the province (Ethier *et al.* 2012) has conservation implications for the species. Gene flow is an important aspect of conservation biology as part of maintaining connected populations over broad areas (Hanski 1999). Maintaining gene flow is a conservation action for many species, particularly wide-ranging carnivores (e.g., Cegelski *et al.* 2003; Tomasik and Cook 2005; Ernest *et al.* 2014) and is a concern for American Badgers (see Kierepka and Latch 2015). Despite American Badgers' ability to move through a wide variety of landscapes, they are thought to be limited by the large distances across their provincial range. The two populations are separated by extensive unsuitable habitat in the Selkirk and Monashee mountain ranges and wet-belt/Interior Cedar–Hemlock zone forests (see Section 3.2). Reduced gene flow is exacerbated by anthropogenic disturbances, resulting in isolation from more contiguous populations in the United States, particularly the Okanogan Valley in Washington (Washington Wildlife Habitat Connectivity Working Group 2010) and limited rescue effect elsewhere in the province (COSEWIC 2012).

3.5.3 Low juvenile survivorship

Recruitment of juveniles into the adult population can be compromised by low juvenile survivorship. Potential predators include Coyote (*Canis latrans*), Grey Wolf (*Canis lupus*), domestic dog (*Canis familiaris*), Bobcat (*Lynx rufus*), Cougar (*Puma concolor*), Raven (*Corvus corax*), and large raptors (Messick 1987; Rahme *et al.* 1995; Newhouse 2006). In the East Kootenay region, annual survival rate for radio-tagged American Badgers to 1 year of age was

51% (n = 11 juveniles; 4 males, 7 females). In contrast, annual survival rate for adults over the same period was 81% (n = 19 adults; 10 males, 9 females; Kinley and Newhouse 2008). Both rates are comparable to other studies (Warner and Ver Steeg 1995; Hoff 1998) and are likely similar elsewhere in the province. Whether low recruitment of juveniles into the adult population limits the ability of American Badgers to repopulate areas following a decline is unknown.

3.5.4 Large home range size

As outlined in Section 3.3, badgers in British Columbia have very large home ranges, which expose them to considerable mortality risk and affects recovery of populations. Minta (1993) showed that the density of females dictates male home range size. Where female numbers are high, males need not range far for breeding opportunities. It is believed that food availability limits female home range size (Minta 1993; Goodrich and Buskirk 1998). Home range is included as a limiting factor because movements associated with large home ranges expose many individuals to increased mortality risk from highways. This biological factor (large home range) increases the human-caused threat (highway mortality). Large home range size can also artificially increase the public perception that American Badgers are more abundant than they actually are as a result of repeated sightings of the same individual American Badger in multiple locations.

4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (Salafsky *et al.* 2008). For purposes of threat assessment, only present and future threats are considered.[4] Threats do not include limiting factors, which are presented in Section 3.5.[5]

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 2015). 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

[4] Past threats may be recorded but are not used in the calculation of threat impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master *et al*. 2012).
[5] It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts (e.g., inbreeding depression, small population size, and genetic isolation, or likelihood of regeneration or recolonization for ecosystems).

details. Threats for the American Badger were assessed for Western Population (Table 5) and Eastern Population (Table 6) within British Columbia.

Table 3. Threat classification table for the American Badger, Western Population, in British Columbia (i.e., the Okanagan, Thompson, Cariboo, Boundary, and Nicola regions). For footnotes, see Table 6.

Threat #[a]	Threat description	Impact[b]	Scope[c]	Severity[d]	Timing[e]
1	Residential & commercial development	Low	Small	Moderate	High
1.1	Housing & urban areas	Low	Small	Moderate	High
1.2	Commercial & industrial areas	Negligible	Negligible	Moderate	High
2	Agriculture & aquaculture	Low	Small	Slight	High
2.1	Annual & perennial non-timber crops	Low	Small	Slight	High
3	Energy production & mining	Negligible	Negligible	Moderate	High
3.2	Mining & quarrying	Negligible	Negligible	Moderate	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	Restricted	Slight	High
5.1	Hunting & collecting terrestrial animals	Low	Restricted	Slight	High
6	Human intrusions & disturbance	Negligible	Restricted	Negligible	High
6.1	Recreational activities	Negligible	Restricted	Negligible	High
7	Natural system modifications	Low	Large	Slight	High
7.1	Fire & fire suppression	Negligible	Negligible	Slight	High
7.3	Other ecosystem modifications	Low	Large	Slight	High

Table 4. Threat classification table for the American Badger, Eastern Population, in British Columbia (i.e., the East Kootenay, Elk Valley, and Creston regions).

Threat #[a]	Threat description	Impact[b]	Scope[c]	Severity[d]	Timing[e]
1	Residential & commercial development	Low	Small	Moderate–Slight	High
1.1	Housing & urban areas	Low	Small	Moderate–Slight	High
1.2	Commercial & industrial areas	Negligible	Negligible	Moderate–Slight	High
2	Agriculture & aquaculture	Negligible	Negligible	Slight	High
2.1	Annual & perennial non-timber crops	Negligible	Negligible	Slight	High
3	Energy production & mining	Low	Small	Moderate	High
3.2	Mining & quarrying	Low	Small	Moderate	High
3.3	Renewable energy	Low	Small	Moderate–Slight	Moderate
4	Transportation & service corridors	Low	Pervasive	Slight	High
4.1	Roads & railroads	Low	Pervasive	Slight	High
5	Biological resource use	Low	Restricted	Slight	High
5.1	Hunting & collecting terrestrial animals	Low	Restricted	Slight	High
6	Human intrusions & disturbance	Negligible	Restricted	Negligible	High
6.1	Recreational activities	Negligible	Restricted	Negligible	High
7	Natural system modifications	Low	Large	Slight	High
7.1	Fire & fire suppression	Low	Large	Slight	High
7.2	Dams & water management/use	Negligible	Negligible	Extreme	Low
7.3	Other ecosystem modifications	Low	Large–Restricted	Slight	High

[a] Threat numbers are provided for Level 1 threats (i.e., whole numbers) and Level 2 threats (i.e., numbers with decimals).
[b] **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on severity and scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment time (e.g., timing is insignificant/negligible [past threat] or low [possible threat in long term]); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.
[c] **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).
[d] **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation time frame. For this species, a generation time of 4 years was used, resulting in severity being scored over a 12-year time frame. This varies slightly from the time frame used by COSEWIC (2012). 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 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2 Description of Threats

The overall province-wide Threat Impact for this species is High for the Western Population and Medium for the Eastern Population.[6] This overall threat considers the cumulative impacts of multiple threats. The greatest threat for both Western (Table 5) and Eastern (Table 6) populations is Threat 4.1 (Transportation & service corridors: Roads and railroads). Threats differ slightly between the two populations. For example, two threats face the Eastern Population but not the Western Population—that is, Threat 3.3 (Renewable energy) and Threat 7.2 (Dams and water management/use). In addition, threat scope and severity differs between the two populations for some threats; in particular, the scope of threats varies in relation to the size difference between the two populations. For example, a 10 km^2 mine development would represent a much higher percentage of total occupancy area for the smaller Eastern Population than for the larger Western Population, and thus a greater impact.

Threat severity was scored over a 12-year time frame, based on an updated generation time of 4 years. This estimate, which was the result of expert opinion during discussion at the B.C. Badger Recovery Team meeting held in June 2015, varies slightly from the previous 10-year time frame used by COSEWIC (2012).

Threat details are discussed below under the Threat Level 1 headings.

4.2.1 Medium and Medium–Low Threats

Threat 4. Transportation & service corridors

4.1 Roads & railroads

This threat scored Medium–Low in the Western Population and Low in the Eastern Population.

Road mortality is the single greatest threat to American Badgers in British Columbia, and likely elsewhere. American Badgers are particularly susceptible to road mortality. Some reasons for this include:

- American Badgers primarily occur in valley-bottom areas throughout their range, coinciding with the same location as human development, including most major highways and roads.
- Large home ranges increase the likelihood that individuals (particularly males) will cross a major road.
- High-risk roadside areas are often highly attractive to American Badger because soil conditions and frequently mowed grasses are ideal habitat for both American Badgers and their main prey species—Columbian Ground Squirrel.
- American Badgers are most active at night which, combined with their short stature, makes it difficult for drivers to observe and avoid them.

[6] The overall threat impact was calculated following Master *et al.* (2012) using the number of Level 1 Threats assigned to this species, where timing = High or Moderate (Tables 5 and 6). The overall threat impact considers the cumulative impacts of multiple threats.

- American Badgers will cross highways several times during a single night, repeatedly exposing themselves to road mortality (Klafki 2014).

Most studies of American Badgers in British Columbia have documented high road mortality rates, although it appears lower in the East Kootenay region, possibly because of lower traffic volumes (Table 7). In 2015 alone, 26 road mortalities were collected by the Ministry of Environment (R. Weir, unpublished data); several more road mortalities likely went unreported. This represents 8.7% of the conservatively estimated population of 250 mature American Badgers, and given the high probability of under-detection, the actual proportion of the population lost to roads each year is likely higher. Road mortality is also the main source of non-hunting or trapping mortality for American Badgers elsewhere in the distribution (Messick 1987; Duquette 2008; Ontario Badger Recovery Team 2010; Kierepka and Latch 2015). Conversely, Paulson (2007) reported no road mortalities among 12 radio-tagged American Badgers over 2 years in eastern Washington but attributed this to very low road density in the study area. Railways are also a source of mortality for American Badgers (Kinley and Newhouse 2008) but at a much lower rate.

Table 5. Rates of road mortality from radio-telemetry studies of American Badgers in British Columbia.

Percentage	Region	Source
85% (11 of 13 radio-tagged)	Thompson/Okanagan	Weir *et al.* 2005, R.D. Weir unpubl. data
50% (8 of 16 radio-tagged)	Cariboo	Klafki 2014
33% (4 of 12 radio-tagged adults, translocated from northwestern Montana, 2004–2006)	East Kootenay	Kinley and Newhouse 2008
19.0% (4 of 21 adults resident in East Kootenay, 1996–2002)	East Kootenay	Kinley and Newhouse 2008

4.2.2 Low Threats

Threat 1. Residential & commercial development

1.1 Housing & urban areas/1.2 Commercial & industrial areas

American Badgers have lost significant amounts of habitat to both residential and commercial/industrial development throughout their range in British Columbia. This loss includes suitable burrowing and foraging habitat as well as disruptions to connectivity. Large urban centres included within the American Badger's range are Kelowna and Kamloops; smaller areas include Vernon, Penticton, and Cranbrook. Loss and degradation of habitat (particularly in the Okanagan) is likely in areas that continue to experience increases in human population (COSEWIC 2012). American Badgers occur occasionally within urban areas, but are usually viewed as problem wildlife by some members of the public in these situations (see Threat 5.1.3). Municipalities can partially address this relatively low threat by incorporating badger habitat (particularly movement corridors) into official community plans as a Development Permit Area under the provincial *Land Act* (e.g., Regional District of East Kootenay 2008).

Threat 2. Agriculture & aquaculture

2.1 Annual & perennial non-timber crops

American Badgers are known to avoid cultivated fields within agricultural areas (Duquette *et al*. 2014). In Saskatchewan, American Badgers are thought to use less than 2% of cultivation agricultural areas (COSEWIC 2012), and instead use the unplanted areas between fields and along roadways. Although American Badgers may at times travel through fields, the extent of these movements has not been quantified; however, prey species are unlikely to occur within the field or crop. Viniculture and orchards are likely less disruptive to American Badgers but still largely exclude prey populations. No estimates are available on the amount of new conversions to annual and perennial non-timber crops, but these activities are thought to have a Low impact to American Badgers.

Threat 3. Energy production & mining

3.2 Mining & quarrying

Mines and quarries have the potential to affect American Badger habitat and prey through habitat loss, loss of prey, and disruption of movement corridors. Large mines, especially those at the preferred valley-bottom locations, can pose a threat to local American Badger populations. Smaller quarries and gravel pits will likely have a lesser impact but can still alter movements and affect local habitat quality.

3.3 Renewable Energy

Solar farms are being proposed and established in the East Kootenay region of British Columbia. Proposed sites include native grassland and open forest areas, which are the preferred habitat type of American Badgers. The potential effects of these installations are not clear and poorly studied for wildlife (Lovich and Ennen 2011; Hernandez *et al*. 2013; Northrup and Wittemyer 2013). Some potential impacts include altered behaviour and movement and loss of prey species, although whether fossorial prey are likely to persist below utility-scale solar farms is uncertain. Habitat alienation rates may be similar to cultivation agriculture or orchard/viniculture situations. This threat is likely only to occur in the East Kootenay region where photovoltaic potential and mean solar insolation are high enough to warrant installations (Natural Resources Canada 2015). No solar installations are known from the Western Population, so this is not considered a threat to these American Badgers at this time.

Threat 5. Biological resource use

5.1 Hunting & collecting terrestrial animals

5.1.2 Unintentional effects:

American Badgers are at risk of mortality if they consume prey that contains rodenticides used for pest control of various fossorial rodent species (e.g., chlorophacinone, bromadiolone, strychnine) (Proulx 2011; Proulx and MacKenzie 2012). In southwestern Saskatchewan, American Badgers died within 9 days of feeding on Richardson's Ground Squirrels (*Urocittelus richardsonii*) treated with chlorophacinone (Proulx *et al.* 2009, in Proulx and MacKenzie 2012).

The number of American Badgers per kilometre of road (based on spotlighting surveys), where 20% of areas were treated with rodenticide, were significantly higher (2.2 times) than in areas with a 90% application (Proulx and MacKenzie 2012). Anticoagulant rodenticides are known to cause lethal secondary poisoning to birds of prey (Albert *et al*. 2009; Thomas *et al.* 2011; Rattner *et al.* 2012) and a wide range of other predators (Sanchez-Barbudo *et al.* 2012; Rattner *et al.* 2014; Sereiys *et al.* 2015).

Chlorophacinone, a "first-generation" anticoagulant, is typically less toxic to both target rodents and non-target predators than "second-generation" anticoagulants such as bromadiolone (Elliott *et al.* 2013), which kill target rodents more quickly and also persist longer, leaving predators and scavengers at greater risk of secondary poisoning. Sub-lethal effects, such as reduced reproductive output (B.C. Ministry of Environment 2014), are also of concern.

The extent and use of anticoagulant rodenticides that would expose American Badgers in British Columbia to potential threat is not known. Health Canada (2012) restricts the use of second-generation anticoagulants to indoor locations or against the outside walls of buildings. American Badgers are most likely to encounter prey killed with first-generation anticoagulant in fields; nevertheless, even these less toxic pesticides are lethal to secondary consumers (Proulx and MacKenzie 2012) and the regulations governing their use receive little to no enforcement.

The availability and use of strychnine in British Columbia is uncertain. Although legal to use, amounts sold and applied are not tracked. Strychnine is a toxic alkaloid that causes death through unimpeded muscle stimulation. Its use in any application has been described as inhumane and contravenes animal welfare guidelines (Proulx and Rodtka 2015; Proulx *et al.* 2015). It is highly persistent in carcasses and frequently kills non-target animals (Eason and Wickstrom 2001 *in* Proulx *et al.* 2015). Strychnine is readily available in Alberta and Saskatchewan, where it is commonly used for Grey Wolf and Coyote control, primarily by bounty hunters (Proulx and Rodtka 2015). British Columbia residents can purchase strychnine in Alberta to deploy on their property. While this likely can occur, the extent and frequency is unknown. This threat is mostly relevant to American Badgers in the Eastern Population.

5.1.3 Persecution/control:
Hunting and trapping of American Badgers is not permitted in British Columbia; however, American Badgers can be legally killed on private property in defense of that property. No data are available on how many are killed in defense of property or because land owners simply do not want them. Public outreach is thought to have increased appreciation of American Badgers in British Columbia and reduced extermination killing, but it is assumed to still occur at low levels.

Threat 7. Natural system modifications

7.1 Fire & fire suppression

Fire has been a key disturbance that maintains grassland and open forest ecosystems within most of the province's Southern Interior (e.g., Daniels *et al.* 2011; Heyerdahl *et al.* 2011). This has led to the growth of young forests that were historically burned by frequent, low-intensity fires (Gayton 2001). Ingrown areas tend to be dense stands of small-diameter Douglas-fir

(*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*) that support much-reduced biodiversity (Gayton 2001), including reduced prey populations. The resulting increase in forest canopy closure may reduce habitat quality for prey species.

7.3 Other ecosystem modifications

The effects of invasive plants on American Badger conservation are poorly understood. Direct impacts to American Badgers are unlikely, although certain situations may impede American Badger movements to some extent. A more probable effect is that invasive plants influence prey populations, especially Columbian Ground Squirrels and small mammals, by outcompeting preferred forage species and/or reducing the open habitat conditions preferred by Columbian Ground Squirrels or the more structured native grasslands preferred by small mammals (Hoodicoff 2006).

Off-road vehicles affect grassland and open forest ecosystems preferred by American Badgers through the erosion and rutting of trails, which can contribute to an increase in invasive plants. This may indirectly affect American Badgers by reducing prey populations, especially in areas where Columbian Ground Squirrels are absent and American Badgers rely on microtine rodents, which are more sensitive to range condition than ground squirrels.

5 RECOVERY GOAL AND OBJECTIVES

5.1 Recovery (Population and Distribution) Goal

The recovery (population and distribution) goal is to maintain or increase the Western and Eastern Populations to levels sufficient to ensure persistence over time, and to maintain the distribution of the species across the known range in British Columbia.

5.2 Rationale for the Recovery (Population and Distribution) Goal

The criterion for listing both populations of American Badgers in British Columbia as Endangered is low population size (Criterion D – Very small or restricted population size; COSEWIC 2012). The quantitative criteria threshold between Threatened and Endangered is more than 250 mature individuals. Approximately 150–245 mature adults are estimated to occur in the Western Population and 100–160 mature adults in the Eastern Population (Table 1). American American Badger, *jeffersonii* subspecies Western and Eastern Populations were likely always small enough to be considered ‘naturally rare’; therefore, an objective to down-list the species to a status of Threatened or Special Concern is not appropriate.

Quantitative population goals cannot be set for either population units for a number of reasons. Estimated population sizes are based on sightings data and expert opinion and population inventory have not been conducted to verify those estimates. Furthermore, a population viability analysis not been completed to determine the population size sufficient to reduce extinction risk to acceptable levels. Population viability studies are needed to determine biologically appropriate population targets, and these studies are deemed feasible (E. Lofroth pers comm.).

In future, the population component of the objective should be reassessed as new quantitative information comes available. Where targets fall below what is deemed viable for populations and/or the metapopulations that comprise them, deliberate attempts to increase them are warranted.

The distribution of American Badger, *jeffersonii* subspecies is represented by both a range of all known records divided into two populations (Western and Eastern), and core areas described by seven element occurrences (see Section 3.2 Population and Distribution). The goal of maintaining distribution applies to the whole range of the two populations, as additions and modifications to the element occurrences could occur in future. Those changes may result from consideration of new records, and re-consideration of transient, vagrant, and/or historical records.

American Badger habitat within the range is also dynamic. Wherever appropriate soil types occur, habitat suitability is mainly driven by prey (predominantly ground squirrel) availability and is often ephemeral or based on human disturbance (e.g., horse pastures, pipeline rights of way, logging landings, burns). American Badger habitat may expand or shift significantly in response to climate change and the conversion of unmanaged to managed forest landscapes; areas considered to have ephemeral or vagrant American Badger populations may become important supporting habitat over the next few decades (T. Kinley, pers. comm. 2013). Further, it is suspected that American Badger populations may be expanding north, potentially in response to climate change, deforestation trends and/or prey resources (C. Hoodicoff pers. comm. 2013). For these reasons, the potential range, i.e., as determined by records peripheral to, and/or outside of the best available understanding of current range, is included in the distribution component of the objective. In addition to accommodating the dynamic nature of American Badger habitat, preventing barriers to movement both within and between element occurrences in each of the two populations is an important component of this objective.

5.3 Recovery Objectives

The suggested time frame for this recovery plan is 12 years (approximate time of 3 generations). The following recovery objectives should be revisited and updated when achieved and as new information becomes available.

1. To protect American Badgers and their habitat[7];
2. To more accurately estimate American Badger abundance;
3. To better understand prey ecology, history, and distribution;
4. To better understand distribution of preferred soil associations;
5. To improve understanding of genetic structure of American Badgers;
6. To improve knowledge of American Badger distribution and abundance in poorly documented regions; and
7. To increase public awareness and appreciation of American Badgers in British Columbia.

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

6 APPROACHES TO MEET RECOVERY OBJECTIVES

6.1 Actions Already Completed or Underway

The following actions are categorized according to the action groups outlined in the B.C. Conservation Framework (B.C. Ministry of Environment 2016). Status of the action group for this species is given in parentheses.

Compile Status Report (complete); Send to COSEWIC (complete)

- American Badger assessed as Endangered in two designated units: Western Population and Eastern Population (COSEWIC 2012). Re-assessment and update report due in 2022.

Planning (in progress)

- British Columbia Recovery Plan completed (this document, 2016).

Habitat Protection and Private Land Stewardship (in progress)

- American Badger habitat currently protected via formal protected areas (national and provincial parks, Wildlife Management Areas), provisions under the Identified Wildlife Management Strategy (Province of British Columbia 2004), and purchase of fee-simple land by Land Conservation organizations (Table 8).
- Private land stewardship efforts essential to American Badger conservation in the province.
- Maintain provincial American Badger website (www.badgers.bc.ca) to increase public awareness and knowledge of American Badgers, their habitat, and ecology, as well as to solicit public sightings.

Habitat Restoration (in progress)

- Support ecosystem restoration activities that benefit American Badger habitat (e.g., Rocky Mountain Trench Ecosystem Restoration Program; Redstreak Restoration Area in Kootenay National Park).

Table 6. Existing mechanisms that afford habitat protection for American Badger in British Columbia.

Existing mechanisms that afford habitat protection	Threat[a] or concern addressed	Site
National parks	1.1, 1.2, 2.1, 3.2, 3.3, 5.1, 6.1, 7.1	Kootenay National Park
National Wildlife Areas (NWA) and migratory bird sanctuaries	1.1, 1.2, 2.1, 3.2, 3.3, 5.1	Vaseux–Bighorn NWA Vaseux Migratory Bird Sanctuary Columbia NWA
Provincial parks	1.1, 1.2, 2.1, 3.2,	Numerous provincial parks

Existing mechanisms that afford habitat protection	Threat[a] or concern addressed	Site
	3.3, 5.1, 6.1	
Wildlife Management Areas (WMA)	1.1, 1.2, 2.1, 3.2, 3.3, 5.1	Columbia Wetlands WMA East Side Columbia Lake WMA South Okanagan WMA McTaggart-Cowan/nsək'łniw't WMA Tranquille WMA Dewdrop-Rosseau Creek WMA
Wildlife Habitat Areas (WHA)	2.1, 7.1	40 approved WHAs throughout distribution; see Table 10 for a breakdown of approved Badger WHAs as of 2016
Private land purchase by land conservation organizations	1.1, 1.2, 3.2, 5.1	Numerous locations throughout distribution
Private land stewardship	2.1, 5.1	Numerous locations throughout distribution
Development permit areas under municipal official community plans (OCP)	1.1, 1.2,	Lake Windermere OCP (Regional District of East Kootenay 2008)

[a] Threat numbers according to the IUCN–CMP classification (see Table 6 for details).

6.2 Recovery Planning Table

Table 7. Recovery actions for American Badger in both populations in British Columbia.

Objective	Conservation Framework action group	Actions to meet objectives	Threat[a] or concern addressed	Priority[b]
1	Habitat Protection	Encourage installment of suitable underpasses during road construction in areas of high American Badger occurrence.	4.1	Essential
1	Habitat Restoration	Identify key highway crossing locations, either from movement data or high number of road mortality incidents, to target priority locations for underpasses.	4.1	Essential
1	Species and Population Management	Reduce attractants for American Badgers and their prey near roads.	4.1	Essential
1	Private Land Stewardship	Promote private land stewardship for American Badgers, their habitat, and prey, particularly in areas well away from major roads and highways.	1.1, 1.2, 2.1, 5.1, 6.1	Essential
1	Habitat Restoration	Provide scientific support for grassland and open forest restoration in accordance with strategic range management objectives and values.	6.1, 7.1, 7.3	Essential

Objective	Conservation Framework action group	Actions to meet objectives	Threat[a] or concern addressed	Priority[b]
1	Habitat Protection	Establish and approve Wildlife Habitat Areas for American Badgers, especially in forest districts with low areas of current approved habitat.	4.1, 6.1, ,7.1	Essential
1, 7	Planning; Habitat Protection	Work with municipal and regional governments within American Badger distribution to include American Badger habitat as part of official community planning.	1.1, 1.2, 3.2, 3.3, 4.1, 6.1, 7.3	Essential
1	Species and Population Management	Work with road maintenance contractors to identify all badger road mortalities and map to highlight key problem locations and identify high-risk areas where mitigation would be most useful.	4.1	Necessary
1	Species and Population Management	Collaborate with Barn Owl Recovery Team to write a document outlining secondary poisoning concerns for predators. Target audience to include Integrated Pest Management Program and land owners applying rodenticides.	5.1	Necessary
1	Species and Population Management	Regularly test American Badger tissues (as available) for rodenticide exposure.	5.1	Necessary
2	Monitor Trends	Develop a reliable, cost-effective, and repeatable method for estimating American Badger abundance at a regional level.	Knowledge Gap	Essential
2	Monitor Trends	Continue to solicit and collect American Badger sightings, including road mortalities and fresh burrow diggings.	Knowledge Gap	Essential
2, 6	Monitor Trends	Maintain a single, province-wide database of American Badger sightings and occurrence records.	Knowledge Gap	Essential
2	Monitor Trends	Investigate methods to record and analyze American Badger sightings database (e.g., square map grid).	Knowledge Gap	Necessary
3	Monitor Trends	Better understand current and historic prey distribution, especially for Columbian Ground Squirrels.	Knowledge Gap	Necessary
3	Habitat Protection; Private Land Stewardship	Better understand impacts of invasive plants on prey abundance and distribution.	Knowledge Gap	Beneficial
4	Habitat Protection	Support work to update and complete soils mapping.	Knowledge Gap	Necessary
5	Species and Population Management	Encourage and cooperate with neighbouring jurisdictions to undertake American Badger conservation work, including genetics, movement, and survival.	Knowledge Gap	Necessary
5	Species and	Complete population viability analysis for	Knowledge	Necessary

Objective	Conservation Framework action group	Actions to meet objectives	Threat[a] or concern addressed	Priority[b]
	Population Management	American Badgers.	Gap	
5	Species and Population Management	Cooperate with researchers to improve conservation genetics knowledge of American Badgers throughout their provincial distribution, making available samples wherever possible (priority regions: Nicola, Elk Valley, and Boundary).	Knowledge Gap	Essential
6	Habitat Protection	Conduct inventories in regions where American Badger abundance and distribution are poorly documented (priority: Nicola Region; also Elk Valley, Boundary).	Knowledge Gap	Essential
7	Habitat Protection; Private Land Stewardship, Monitor Trends	Work with private landowners, land managers, and other government officials to create awareness of American Badgers, their habitat, and threats.	1.1, 1.2, 3.2, 3.3, 4.1, 6.1, 7.3	Essential
7	Habitat Protection; Private Land Stewardship, Monitor Trends	Maintain and regularly update American Badger website.	All	Essential

[a] Threat numbers according to the IUCN–CMP classification (see Table 5 and Table 6 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).

6.3 Narrative to Support Recovery Planning Table

Recommended actions have been categorized by B.C. Conservation Framework action groups.

6.3.1 Planning

Most planning efforts for American Badger are complete. The COSEWIC status report was updated in 2012 (COSEWIC 2012); the current recovery plan (this document) is the second version of the provincial plan.

Some of the most effective conservation actions may be realized at the municipal and regional levels, through official community plans. Because habitat loss and new roads are two of the most consistent threats facing American Badgers, development decisions and local planning can have a substantial effect on American Badger conservation. Inclusion of development permit areas that are specific to American Badgers can be very beneficial in maintaining suitable habitat or facilitating movement corridors through or adjacent to urban areas. For example, the Lake Windermere Official Community Plan (Regional District of East Kootenay 2008) includes a American Badger habitat and connectivity development permit area where any new development or upgrading requires the landowner to demonstrate the maintenance of American Badger habitat and connectivity through the area. More generalized, environmentally sensitive development permit areas are less effective but still potentially beneficial. The B.C. Badger Recovery Team

should work with municipal and regional governments to ensure American Badgers are recognized and accounted for in all official community plans where American Badgers occur.

6.3.2 Monitor Trends

The goal of maintaining or increasing American Badger numbers in both provincial populations requires a reliable means to estimate American Badger population size to measure success. To date, American Badger population estimates were primarily based on expert opinion. Only the Cariboo region has a bounded population estimate (i.e., population estimate with 95% confidence interval; Klafki 2014). Some trends may be discerned from opportunistic sightings reported by the public; however, the utility of these sightings to track population size or monitor trends is questionable without consistent solicitation of sightings. Therefore, the design a cost-effective means to track American Badger populations in British Columbia is a priority. Development of a population viability analysis is rated as "Essential" because this would advise the Recovery Team on whether road mortality rates are sustainable by the current populations or whether more immediate measures are required to offset this primary threat to American Badgers.

The population genetics work completed by Ethier *et al*. (2012) is important because it led to splitting of the *T.t. jeffersonii* subspecies into two populations (COSEWIC 2012); however, this work was based on fairly small sample sizes from a few selected areas within the American Badger's provincial distribution. Very few or no samples were obtained in key areas such as Elk Valley, Nicola/Princeton, or the Cariboo. This work requires an update to include more samples from across the entire distribution. In particular, reasonable doubt exists over whether Elk Valley American Badgers are most closely allied to the *jeffersonii* or *taxus* subspecies.

6.3.3 Habitat Protection and Private Land Stewardship

Protecting American Badger habitat remains a priority for the species' conservation in British Columbia. Private land stewardship plays a key role in maintaining provincial American Badger habitat because considerable amounts of American Badger habitat is privately owned. Significant advances in public attitudes toward American Badgers have been realized over the past 15 years. This work requires continually reinforcement and revision to ensure that persecution of American Badgers (Threat 5.1) does not increase and that high value is placed on native grasslands and open forests.

Ensuring the availability of quality, secure American Badger habitat well removed from highways is also important. The possibility of achieving this may vary across the American Badger's provincial range, with most opportunities existing in the Cariboo and (to a lesser extent) the East Kootenay. Focusing land protection, stewardship, and habitat restoration activities away from highways serves to protect American Badgers from the main threat facing the population in British Columbia (road mortality; Threat 4.1). It will also create source population areas that will help offset the high level of mortality experienced by American Badgers with major roads in their home ranges.

General prohibitions of the federal *Species at Risk Act* (SARA; Section 32 and 33) apply to American Badger occurring on federal lands (Table 8). Critical habitat that is identified in a final

federal recovery strategy requires protection under *SARA* on federal and non-federal lands (per Sections 58 and 61). The "development permit area" designation available to municipal and regional planners may provide some level of habitat protection but should not be considered as permanent protection because official community plans are easily and frequently updated with rezoning applications. For this reason, it is necessary to complete a tally of current plans that acknowledge American Badger habitat and provide for its conservation.

Wildlife Habitat Areas (WHAs) under the *Forest and Range Practices Act* afford the only degree of habitat protection to American Badgers outside of national and provincial parks. Some forest districts have approved several WHAs, representing a significant amount of total habitat (Table 10); however, some forest districts in which American Badgers face high levels of conservation concern (e.g., Okanagan Shuswap and Kamloops) also have few designated WHAs. Although suitable habitat in large, contiguous areas may not be available in some districts, approving the largest possible WHAs will provide the greatest benefit to American Badgers, given their large provincial home ranges.

The General Wildlife Measures (GWMs) within the IWMS account (Adams and Kinley 2004) note that maternal dens should receive protection priority over other burrows. However differentiating maternal dens from other dens can be difficult. Symes (2012:104) also concluded that maternal, as well as winter dens, have the highest conservation value. Features of these dens in the Cariboo region study area that differentiated them from other burrows are: "larger soil fans (plumes), higher horizontal cover, and were more often found with additional infrastructure (such as under roots, stumps, coarse woody debris, *etc*.) in wooded habitats." Natal burrows also had numerous entrances. By comparison, Symes found summer (non-maternal) burrows "often had single entrances, smaller soil fans, low horizontal cover and were typically located without additional infrastructure in open habitats (such as grasslands and pastures)."

Table 8. Approved Wildlife Habitat Areas for American Badger in British Columbia (B.C. Ministry of Environment 2015).

Forest district	American Badger population	# of WHAs	Size[a] (ha)		
			Total	Max	Min
100 Mile House	Western Population	21	1943	245	7
Arrow Boundary	Western Population	2	30	29	1
Kamloops	Western Population	6	42	17	2
Okanagan Shuswap	Western Population	2	4	2	2
Kootenay Lake	Eastern Population	1	4	4	4
Rocky Mountain	Eastern Population	8	850	236	9
Total		**40**	**2873**	**245**	**1**

[a] Rounded to nearest hectare.

6.3.4 Habitat Restoration

All opportunities to facilitate road crossings should be explored. American Badgers are known to repeatedly cross major highways. Whenever highways are constructed, upgraded, or repaved within American Badger range, dry culvert underpasses should be part of this work. Larger regional initiatives to facilitate highway crossings for wildlife and connectivity across major transportation corridors should also include American Badgers as a species of concern. An example is the Elk Flathead Wildlife Enhancement Initiative under way in southeast British Columbia.

Forest ingrowth and encroachment, primarily related to exclusion of wildfire has led to the loss of habitat for American Badgers and their prey. Efforts to restore open forests and grasslands will benefit American Badgers, primarily through increased prey availability, especially Columbian Ground Squirrels. Habitat restoration has occurred mostly in the East Kootenay region through the Rocky Mountain Trench Ecosystem Restoration Program. To expand range values compatible with American Badger habitat requirements, it is necessary to encourage range management policies and ecological restoration initiatives on Crown tenures.

Habitat restoration activities can sometimes create apparent conflicts with the protection of other American Badger habitat features such as burrows. One previous example near Kimberley, B.C., resulted in abandoning a habitat restoration activity because of the likelihood that logging machinery would drive over numerous American Badger burrows (Hogg 2011). Although

protection of burrows should be considered, especially known or suspected maternal dens, removing forest cover in known ingrown stands may take precedence because greater long-term habitat restoration benefits are achieved with only the potential loss of some burrows.

7 SPECIES SURVIVAL AND RECOVERY HABITAT

Survival/recovery habitat is defined as the habitat that is necessary for the survival or recovery of the species. This is the area that the species naturally occurs or depends on directly or indirectly to carry out its life-cycle processes or formerly occurred on and has the potential to be reintroduced.

7.1 Biophysical Description of the Species' Survival/Recovery Habitat

A description of the known biophysical features and their attributes of the species' habitat that are required to support these life-cycle processes (functions) are provided in Section 3.3. Additional work required to fulfill habitat knowledge gaps are included in the Recovery Action Table.

7.2 Spatial Description of the Species' Survival/Recovery Habitat

Although no maps specific to species' survival/recovery habitat are included with this document, it is recommended to spatially describe these locations to mitigate habitat threats and to facilitate the actions for meeting the recovery (population and distribution) goals.

8 MEASURING PROGRESS

The following performance measures provide a way to define and measure progress toward achieving the recovery (population and distribution) goal (Section 5.1):

- Indicators of population size in the Western and Eastern population reflect no change or an increase in population over the next 12 years (by 2029).
- Range-wide distribution did not change, and no element occurrence was lost over the next 12 years (by 2029).

The following additional performance measures provide a way to define and measure progress toward achieving each of the recovery objectives (Section 5.3).

Measurable(s) for Objective 1

- Database of road mortalities, including date and location, is created and updated. Time frame: immediate and ongoing
- All highway construction and repaving projects in American Badger range include installation of dry half-culvert underpasses in areas where high instances of badger sightings

and/or mortalities are known. Underpasses should routinely be installed throughout known badger range. Time frame: immediate and ongoing
- All installed underpasses are mapped and a database is maintained that includes date of installation, geographical location, and dates of maintenance. Time frame: 2017
- Additional Wildlife Habitat Areas are approved for American Badgers, especially in currently underrepresented regions. Time frame: 2020
- All new or updated official community plans within American Badger range include some form of recognition of American Badger habitat requirements. Time frame: ongoing
- Document published and distributed that outlines secondary poisoning concerns to predators exposed to rodenticides; Integrated Pest Management Branch is fully aware of secondary poisoning concerns. Time frame: 2018

Measurable(s) for Objective 2
- A reliable, repeatable method for estimating American Badger abundance is developed and implemented. Time frame: 2020
- American Badger sightings and road mortality database is collated provincially. Time frame: 2017, with annual reports thereafter

Measurable(s) for Objective 3
- Work on Columbian Ground Squirrel distribution (present and historical). Time frame: 2020

Measurable(s) for Objective 4
- Detailed soil mapping is complete and available for application with American Badger critical habitat mapping or species survival habitat requirements. Time frame: 2020

Measurable(s) for Objective 5
- Elk Valley American Badger population is confirmed as *jeffersonii* subspecies (i.e., allied with other East Kootenay American Badgers) or moved to *T.t. taxus* subspecies. Time frame: 2019
- Conservation genetics completed by Ethier *et al*. (2012) is updated with larger sample size. Time frame: 2022.

Measurable(s) for Objective 6
- American Badger occurrence and distribution in Nicola/Princeton region is known at least as well as other areas of the province. Time frame: 2018
- American Badger occurrence and distribution in Boundary region is known at least as well as other areas of the province. Time frame: 2020

Measurable(s) for Objective 7
- The provincial American Badger website is updated at least four times annually. Time frame: ongoing

At least one presentation is given annually to a public organization (e.g., naturalist clubs, livestock associations). Time frame: ongoing

9 EFFECTS ON OTHER SPECIES

American Badger effects on other species and their environment are generally positive (see also Section 3.4). As a top-level predator, American Badger have the ability influence prey populations, at least at the local level (Messick and Hornocker 1981; Crooks and Soulé 1999). Digging activity is considered beneficial for various soil attributes and functions (Eldridge 2004), such as water infiltration and soil aeration. This is especially beneficial in arid to semi-arid grassland ecosystems in which American Badgers are most common. Vacant burrows are used by several other species, many of which are also considered at risk. These include Burrowing Owl, Great Basin Gophersnake, and Great Basin Spadefoot, as well as arthropods, lizards, small mammals, and lagomorphs (Messick and Hornocker 1981). A large number of other species at risk also inhabit the arid and semi-arid grassland and open forest ecosystems that are important to American Badger survival/recovery; habitat protection efforts aimed at maintaining American Badger habitat will also benefit other species that occupy similar habitat types. Nevertheless, any strategies implemented to manage or create open ecosystems (e.g., removal of trees or encroaching vegetation) must consider co-occurring species at risk (i.e., Western Screech-Owl *macfarlanei* subspecies [*Megascops kennicottii macfarlanei*], and Yellow-breasted Chat [*Icteria virens auricollis*]) that may occupy forest and/or shrub habitats within respective regions.

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Personal Communications

Kinley, T. Wildlife Biologist, Kootenay National Park, Radium, BC.