PROPOSED

Species at Risk Act
Management Plan Series

Management Plan for the Western Toad (*Anaxyrus boreas*) in Canada

Western Toad

2016

Government of Canada
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Canada

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

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

Preface

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

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Western Toad and has prepared this management plan as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the provinces of British Columbia and Alberta, and Yukon and Northwest Territories as per section 66(1) of SARA.

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

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

[2] http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6B319869-1%20

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An earlier draft of this document was prepared by Kristiina Ovaska and Lennart Sopuck (Biolinx Environmental Research Ltd.), with input from representatives of federal, provincial, and territorial governments, and regional experts. The document was updated by Greg Ferguson, Holly Middleton, and Megan Harrison of Environment and Climate Change Canada, with review and input from the following people: Lucy Reiss, Syd Cannings, David Cunnington, Andy Didiuk, Mike Gill, Stephen Hureau, Donna Mulders, Mark Wayland, and Donna Bigelow (Environment and Climate Change Canada, Canadian Wildlife Service); Diane Casimir, Barb Johnston, Rhonda Kindopp, Lisa Larson, Charlie Pacas, Derek Peterson, Brenda Shepherd, Doug Tate, and Carmen Wong (Parks Canada); Tom Jung, Tess McLeod, Bruce Bennett and Todd Powell (Government of Yukon); Rob Gau and Joanna Wilson (Government of Northwest Territories); Purnima Govindarajulu, James Quayle, Leah Westereng, Doug Wilson, Connie Miller Retzer, Sarma Liepins, Dave Trotter, and Peter Fielder (Government of BC); Gavin Berg, Lisa Wilkinson, and Scott Stevens (Government of Alberta); Brian Eaton (Alberta Innovates - Technology Futures, Vegreville); Cindy Paszkowski (University of Alberta); Danna Schock (Detroit Zoological Society), Brian Slough (Whitehorse, YT); Doug Whiteside (Calgary Zoo); and Elke Wind (Nanaimo, BC).

Executive Summary

The Western Toad (*Anaxyrus boreas*) is a large, stocky toad. It ranges in colour from greenish to tan, brown or black with a light line along its mid-back and a pronounced cheek gland. The Western Toad was assessed as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2002 and listed under Schedule 1 of the *Species at Risk Act* in 2005. COSEWIC reconfirmed its status in 2012 and divided the species into two populations or designatable units: Non-calling and Calling.

The Western Toad has a wide distribution in western North America, from Baja California to Alaska, and from the Pacific Coast to Colorado and Alberta. In Canada, the Western Toad occurs throughout the majority of British Columbia, western Alberta, and southeastern Yukon and southwestern Northwest Territories. The majority of the Non-calling population in Canada occurs within British Columbia and almost the entire global range of the Calling population is within Alberta.

The Non-calling population has suffered declines and extirpations in the United States and declines appear to have occurred in Canada along the south coast of British Columbia and in other localized areas within the province over a number of decades. In Yukon and Northwest Territories, the number of known occurrences has increased (likely due to increased survey effort), but there has been no evidence of expansion outside the historical range. The Calling population remains widespread throughout much of its historical range in Alberta and may be expanding its range eastward. However, declines are suspected and projected based on known vulnerabilities and threats.

The Western Toad uses a wide variety of aquatic habitats for breeding and terrestrial habitats for foraging and hibernation. These habitats may be several kilometers apart, requiring Western Toads to move extensively, increasing their vulnerability to human developments and activities. High breeding site fidelity, communal hibernation and egg-laying, and the tendency for newly emerged Western Toads to form large post-metamorphic aggregations also increase their vulnerability. The species' reliance on high adult survival to sustain populations through periods of poor reproductive success means that threats that impact adult survival can have particularly pronounced effects.

The main threats to both populations are transportation and service corridors (habitat loss/fragmentation and road mortality), and invasive and other problematic species and genes (particularly, infection with the amphibian chytrid fungus [*Batrachochytrium dendrobatidis*]). Other threats common to both populations include logging/wood harvesting, pollution, and climate change. The Calling population is also threatened by agricultural activities and oil and gas drilling.

The management objective is to maintain stable or increasing populations distributed throughout the species' present range in Canada.

The broad strategies and conservation measures to achieve the management objective are outlined in Section 6.2 and 6.3 of this document.

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1. COSEWIC* Species Assessment Information

Date of Assessment: November 2012

Common Name (population): Western Toad - Non-calling population

Scientific Name: *Anaxyrus boreas*

COSEWIC Status: Special Concern

Reason for Designation: This species has suffered population declines and population extirpations in the southern part of its range in British Columbia, as well as in the USA. The toads are particularly sensitive to emerging skin disease caused by the amphibian chytrid fungus, which has been linked to global amphibian declines. It is relatively intolerant of urban expansion, conversion of habitat for agricultural use, and habitat fragmentation resulting from resource extraction and road networks. Life history characteristics, including infrequent breeding by females, aggregation at communal, traditionally used breeding sites, and migrations to and from breeding sites, make populations vulnerable to habitat degradation and fragmentation. The species remains widespread, but declines are suspected and projected based on known vulnerabilities and threats.

Canadian Occurrence: Yukon, Northwest Territories, British Columbia, Alberta

COSEWIC Status History: The species was considered a single unit and designated Special Concern in November 2002. Split into two populations in November 2012. The Non-calling population was designated Special Concern in November 2012.

* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

Date of Assessment: November 2012

Common Name (population): Western Toad - Calling population

Scientific Name: *Anaxyrus boreas*

COSEWIC Status: Special Concern

Reason for Designation: Almost the entire range of the calling population is within Canada. The toads are particularly sensitive to emerging skin disease caused by the amphibian chytrid fungus, which has been linked to global amphibian declines. This species is relatively intolerant of urban expansion, conversion of habitat for agricultural use, and habitat fragmentation resulting from resource extraction and road networks. Life history characteristics, including infrequent breeding by females, aggregation at communal, traditionally used breeding sites, and migrations to and from breeding sites, make populations vulnerable to habitat degradation and fragmentation. The species remains widespread throughout much of their historic range in Alberta and may be expanding their range eastwards. However, declines are suspected and projected based on known vulnerabilities and threats.

Canadian Occurrence: British Columbia**,** Alberta

COSEWIC Status History: The species was considered a single unit and designated Special Concern in November 2002. Split into two populations in November 2012. The Calling population was designated Special Concern in November 2012.

2. Species Status Information

Status ranks for the Western Toad are listed in Table 1. The International Union for Conservation of Nature (IUCN) has also designated the species as “near threatened” due to declines and extirpations over parts of its distribution in the United States (IUCN 2014). COSEWIC assessed the Western Toad as Special Concern (COSEWIC 2002). It was listed under Schedule 1 of the Canadian *Species at Risk Act* (SARA) in 2005. COSEWIC reconfirmed its status in 2012 and divided the species into two populations or designatable units: Non-calling and Calling (COSEWIC 2012). Approximately 40% of the species’ distribution is within Canada.

Table 1. List and description of various conservation status ranks for Western Toad (NatureServe 2014, British Columbia Conservation Data Centre 2014, B.C. Ministry of Environment 2010).

Global (G) Rank*	National (N) Rank*	Sub-national (S) Rank*	COSEWIC Status	B.C. List	B. C. Conservation Framework***
G4	N4	British Columbia: S3S4 Alberta: S3 Yukon: S3 Northwest Territories: S2S3 Alaska (S3S4 California: SNR Colorado: S1 Idaho: S3 Montana: S2 Nevada: S4 New Mexico: S1 Oregon: S3 Utah: S3 Washington: S3 Wyoming: S1	SC (Special Concern)	Blue**	Priority 3 under Goal 1, Priority 2 under Goal 2, and Priority 4 under Goal 3

* Rank 1– critically imperilled; 2– imperilled; 3– vulnerable to extirpation or extinction; 4– apparently secure; 5– secure; SNR: status not reported

** Includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.

*** The three goals of the B.C. Conservation Framework are: 1. Contribute to global efforts for species and ecosystem conservation; 2. Prevent species and ecosystems from becoming at risk; 3. Maintain the diversity of native species and ecosystems

3. Species Information

3.1. Species Description

The Western Toad is a member of the large cosmopolitan family Bufonidae or true toads. Much of the literature on this species refers to it as *Bufo boreas*, but when the genus *Bufo* was split (Frost et al. 2006), the species was placed into the genus *Anaxyrus*. In Canada, COSEWIC (2012) classified the Western Toad into two populations or designatable units; Non-calling and Calling (Figure 1). These two populations are distinguished by the presence (calling) or absence (non-calling) of a vocal sac in males and production of a true advertisement call characterized by long, high-amplitude trills (Pauly 2008). Vocalizations are also made in the Non-calling population, but are not equivalent to the high-amplitude advertisement call that distinguishes the Calling population (Pauly 2008).

The Western Toad is a robust toad with an adult body length of 55 - 145 mm (Corkran and Thoms 2006). Its colour ranges from greenish to tan, brown, grey, or black, with or without mottling; a light line down the centre of the back is usually present, but may be lacking in small toadlets. There is a pronounced oval poison gland (parotoid gland) on each cheek behind the eye and raised poison glands (“warts”) on the back. The Western Toad occurs sympatrically with the superficially similar Canadian Toad (*Anaxyrus hemiophrys*) in eastern Alberta. The Canadian Toad is smaller (adult body length usually 70 mm or less) and has a hump (or boss) on the head between the eyes. Western Toad tadpoles are small and black, roughly 25 - 30 mm total length prior to metamorphosis (Green and Campbell 1984; Blaustein et al. 1995). For illustrations and detailed descriptions of different life stages see Russell and Bauer 2000; Jones et al. 2005; Corkran and Thoms 2006; and Matsuda et al. 2006.

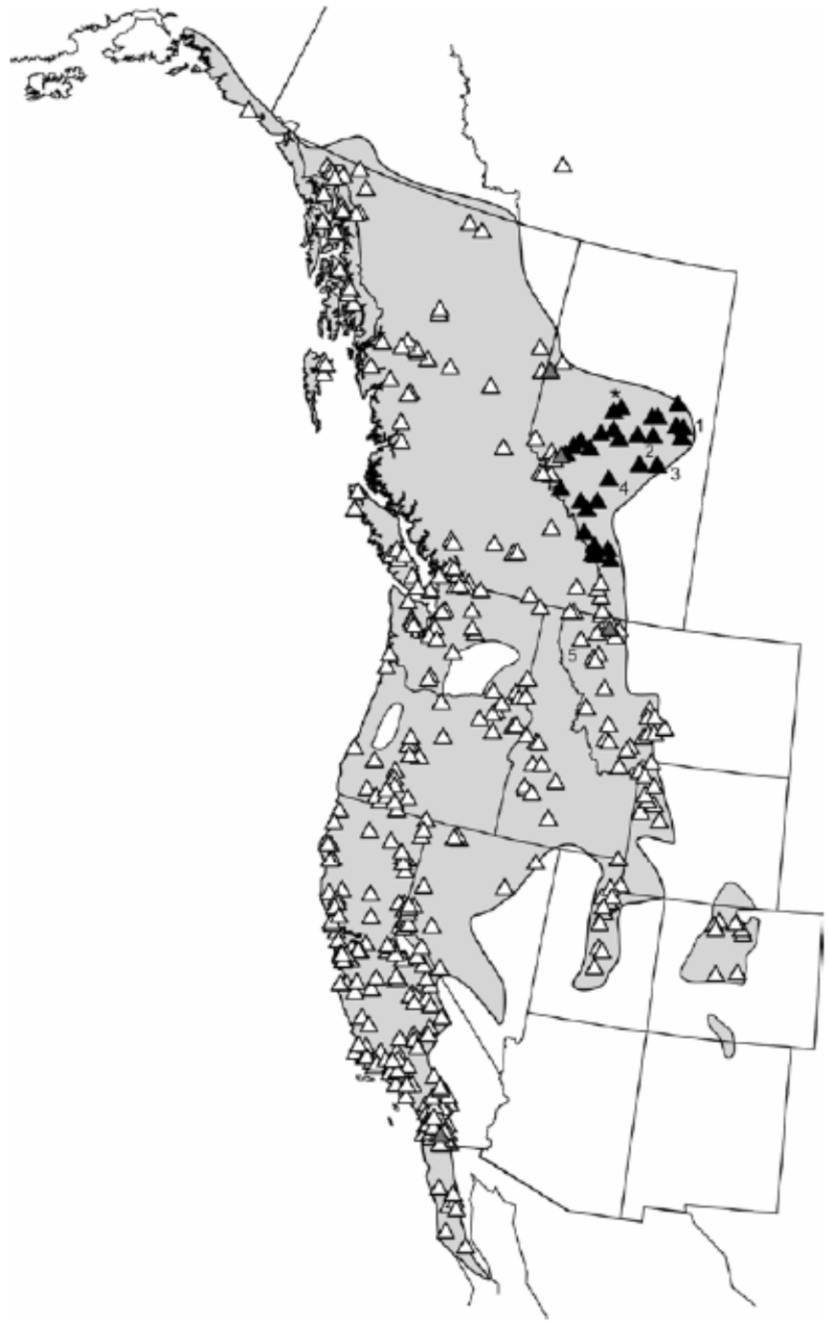

Figure 1. Sites verified to contain either non-calling or calling males of the Western Toad (Pauly 2008 in COSEWIC 2012). Triangles indicate males lacking vocal sacs (white), males with vocal sacs (black), or males with and without vocal sacs (gray). Overall sample size = 1279 individuals (museum and purpose-collected specimens). Numbered sites in Alberta are localities where males were recorded during field visits. The asterisk in northern Alberta denotes individuals observed to have vocal sacs and produce long, pulsed calls, but no specimens or recordings were taken. The grey shaded area is an outdated representation of the global range. A more accurate delineation of the species' range is shown in Figure 2.

3.2. Population and Distribution

3.2.1. Species Distribution

The Western Toad has a wide distribution in western North America, from Baja California to Alaska, and from the Pacific Coast to Colorado and Alberta (Figure 2). Across its range, it occurs from near sea level to elevations of at least 3355 m (NatureServe 2014). In Canada, the Western Toad occurs in British Columbia, Alberta, Yukon, and Northwest Territories (Figure 2). Most of the Canadian distribution is in British Columbia (~70%) and Alberta (~20%), with small portion in the Yukon and Northwest Territories (Figure 2). The Calling population occurs mainly to the east and the Non-calling Population to the west of the Rocky Mountains (Pauly 2008; Figure 3), but the boundary is not completely understood and will require additional study (COSEWIC 2012).

In British Columbia, the Western Toad ranges throughout most of the province, including Vancouver Island and the Haida Gwaii archipelago (Matsuda et al. 2006). The species appears to be absent from the Teslin River basin (Government of Yukon 2013) and is likely absent from extreme northeast British Columbia (COSEWIC 2012).

The range of the Western Toad extends slightly into Yukon and Northwest Territories (COSEWIC 2012). In southeast Yukon, it occurs in the southern Liard River basin, where it has been found in five geographically separated localities (Slough and Mennell 2006; Slough 2009a; Yukon CDC 2015). In southwest Northwest Territories, it occurs in the Liard River basin where it has been found in six different sites (Schock et al. 2009; Government of the Northwest Territories 2014).

In Alberta, the Western Toad ranges from the forested regions of the southwest to central and northern Alberta, and to a lesser extent into the short-grass prairie and aspen parkland (COSEWIC 2012). The distribution in northern Alberta may be more extensive than illustrated in Figure 3, which reflects limited survey effort, and few historical occurrence records (Russell and Bauer 2000; COSEWIC 2012). Surveys associated with oil and gas development and forestry activities in northern Alberta recently detected Western Toad in new areas, which could be indicative of an eastward range expansion, or simply a reflection of increased survey effort (COSEWIC 2012). If this indicates a true range expansion, the Western Toad may be replacing the Canadian Toad (*Anaxyrus hemiophrys*), which has declined throughout its range in Alberta (COSEWIC 2012).

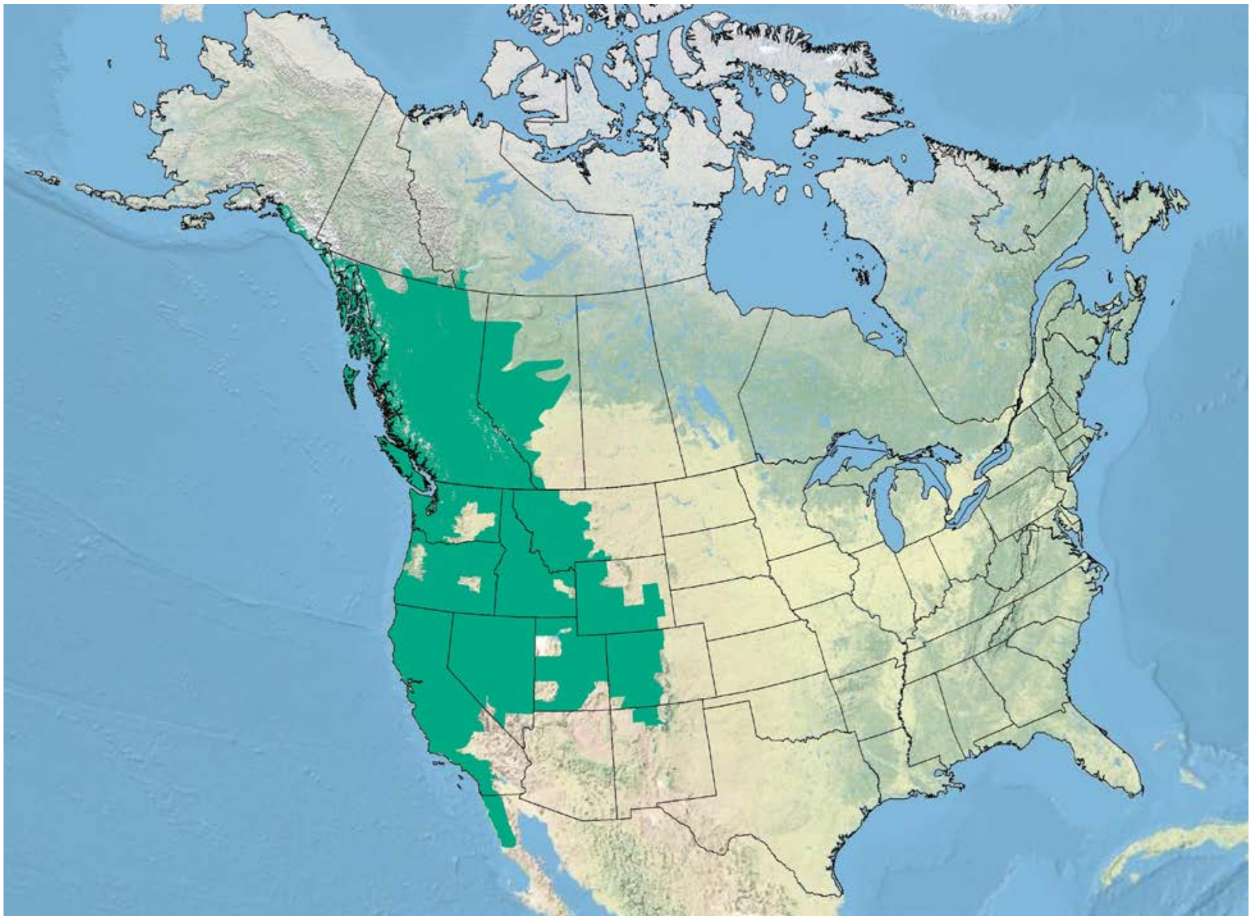

Figure 2. Global distribution of the Western Toad (dark green shading). Map prepared by Joanna Wilson, Northwest Territories Department of Environment and Natural Resources, 2014; United States and Mexican range based on a map compiled by IUCN, Conservation International, NatureServe, and collaborators, in 2004 (NatureServe 2014).

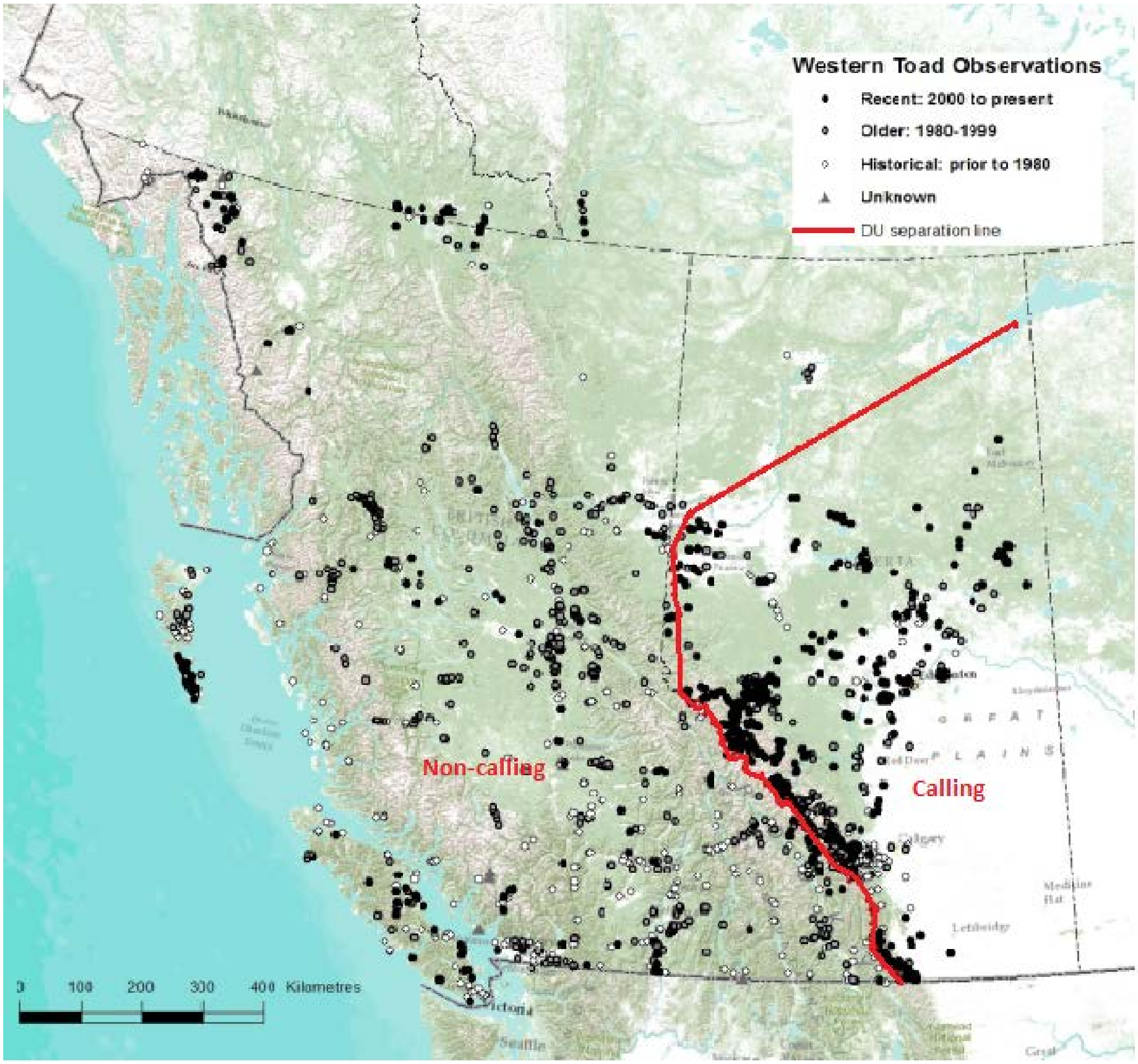

Figure 3. Canadian distribution of the Western Toad (after COSEWIC 2012). The current estimated boundary between the two populations/designatable units (DUs) is indicated by the red line. The Non-calling population is mainly to the west and north of the line and the Calling population is primarily to the east and south.

3.2.2. Population Abundance and Trends

Precise global population and trend data are unavailable, but NatureServe (2014) estimates that the population is at least 100,000 adults (possibly up to 1,000,000) and has declined by up to 50% in the last 200 years (with 10-30% in the past ~18 years [i.e., 3 generations]). In the United States, the Western Toad has suffered widespread declines and disappearances (COSEWIC 2002; NatureServe 2014), partially linked to epidemic chytridiomycosis, which is caused by the pathogenic chytrid fungus *Batrachochytrium dendrobatidis* (Carey 1993; Muths et al. 2003). Populations in the southern Rocky Mountains and Sierra Nevada have experienced the most severe declines (NatureServe 2014).

Opportunistic observations and localized studies suggest that Western Toad is widespread, abundant, and persistent across a large portion of its Canadian range. However, scant information exists on population sizes or densities, and few populations have been systematically monitored to evaluate trends (COSEWIC 2012). Congregation at breeding sites and mass migrations of toadlets may give an appearance of abundance; however, tadpole and metamorph abundance is often a poor indicator of adult population size because breeding success can fluctuate dramatically and juvenile mortality is high (COSEWIC 2012). The Western Toad appears to be less abundant north of 58°N where aggregations of tadpoles and metamorphs have been reported only in the hundreds or thousands (Slough 2004; 2005; 2009a; Schock 2009) compared to elsewhere where aggregations of tens to hundreds of thousands have been reported (COSEWIC 2012).

In British Columbia, numbers appear to be declining along the south mainland coast, Vancouver Island, and in other localized areas (COSEWIC 2012) but rates of decline have not been quantified (Provincial Western Toad Working Group 2014). COSEWIC (2002) reported population declines in the Lower Fraser Valley associated with local anthropogenic habitat loss and Davis and Gregory (2003) documented the disappearance from a large wetland complex on Vancouver Island. Ohanjanian and colleagues (2006) visited 87 wetlands in the East Kootenays known historically to support Western Toads and found breeding evidence at less than a third of sites. In 2011, extant breeding populations were reported in the south coast of the mainland and Vancouver Island (Beasley unpubl. data 2011; Tayless 2011; and Wind unpubl. data 2011 in COSEWIC 2012), although the number of breeding sites is thought to have declined in the past 20 years. Wetland loss has been significant in parts of British Columbia, particularly in the Fraser and Columbia River drainages; in the South Okanagan region (part of the Columbia River drainage), ~85% of the original wetland area has been lost (Austin et al. 2008).

In Alberta, a declining trend has been observed since the 1980s by local residents (J. Russell, pers. comm. 2013) and biologists (Wallis et al. 2002) in the region of Waterton Lakes National Park. Occupancy surveys of breeding sites in Waterton Lakes National Park between 1998 and 2015 showed yearly fluctuations, with an increasing trend being observed in foothills parkland and montane ecoregions since 2014

(Johnston and Price 2015). Western Toads were known to breed in Banff National Park from 1992-2008. Data collected during pitfall trapping at six monitoring sites in Alberta from 1997 to 2008 indicated that Western Toads experienced wide fluctuations in relative abundance (Eaton and Hiltz 2012). Adults showed increasing trends in abundance at two sites, a decreasing trend at one site, and no significant findings at three sites. Other reports cited by COSEWIC (2012) (i.e., Eaves 2004; Schank 2008) indicated that Western Toad populations are either stable or increasing in parts of Alberta. It should be noted that declines or disappearances could have gone unnoticed in parts of the province with limited survey efforts (Government of Alberta, Sustainable Resource Development unpubl. 2010). Recent detections in central Alberta and the lower Athabasca Region bring the known range further east and north than previously thought, but it is unclear whether those new records represent range expansion or are simply a reflection of increased survey effort associated with resource development (C. Paszkowski, pers. comm. 2012 in COSEWIC 2012).

The population trends of Western Toads at the northern limits of their distribution in Yukon, Northwest Territories, and extreme northern British Columbia are unknown. The population appears to have declined at a monitoring site in northwestern British Columbia, where no breeding was observed for three consecutive years (from 2007-09; Slough 2009b).

3.3. Needs of the Western Toad

3.3.1. Biological Needs

The Western Toad occurs in a wide range of habitats (COSEWIC 2002) and has a biphasic life cycle consisting of aquatic eggs and tadpoles and terrestrial juveniles and adults. It requires suitable water bodies for breeding, and terrestrial habitats for foraging and hibernation, as well as connectivity among seasonally used habitats (COSEWIC 2012).

Spring/breeding:

In spring, the Western Toad breeds in a variety of temporary and permanent ponds and shallow littoral zones of lakes, often with a sandy or silty bottom substrate (COSEWIC 2002, 2012). Permanent waterbodies with higher daytime temperatures (but still high dissolved oxygen concentrations) are required to promote tadpole growth (Ultsch et al. 1999; COSEWIC 2012). In the northern portion of their Canadian range, the Western Toad breeds in beaver ponds (Slough and Mennell 2006; Stevens et al. 2006), shallow stream deltas on lakes, geothermal springs, and small water bodies in gravel quarry sites (Schock 2009; Slough 2009a).

The Western Toad gathers at breeding sites to complete mating and egg-laying during a 1-2 week period in spring. In south-central British Columbia, this is typically in late April to May and coincides with the daily minimum and maximum temperatures reaching 0 ˚C and 10˚C, respectively (Gyug 1996). The Western Toad shows some fidelity to traditional breeding sites (Bull and Carey 2008) resulting in the selection of only one or a few of the potential breeding sites in a relatively large area (Slough 2004). The female lays a clutch of thousands of eggs, often laid communally with other females. Tadpoles often form large, dense aggregations in shallow, warm water. They develop rapidly and metamorphose in the summer within three months of egg-laying (Stebbins 1951).

Foraging/hibernation:

In the summer, adults and juveniles forage in forests and forest openings, shrubby areas, marshes, and other open and wooded habitats, and may be found several kilometers away from water bodies (COSEWIC 2002). Browne and Paszkowski (2014) found Western Toads more often in open habitat (especially wet shrubland) than predicted by habitat availability, and this was most evident during the foraging season.

Characteristics of hibernation habitats are not well known. In Alberta, hibernation sites were located in natural habitats, especially in coniferous forest stands, as opposed to human-modified or open habitats (Browne 2010). Other recent research found Western Toads hibernating in pre-existing cavities, such as rodent burrows, squirrel middens, or other subterranean crevices (Browne and Paszkowski 2010a). Sites must be below the frost line, as the Western Toad is intolerant of freezing, and must contain sufficient moisture to prevent desiccation (COSEWIC 2012). Most northern records come from valleys that receive consistently early, high snowfall accumulations (Cook 1977; Mennell 1997). In one Alberta study, 68% of Western Toads hibernated communally (Browne and Paszkowski 2010b).

Movement:

Newly-transformed Western Toads form large, dense, post-metamorphic aggregations along shorelines and migrate *en masse* towards terrestrial foraging areas. Terrestrial movements of the Western Toad vary with the configuration and quality of seasonal habitats. On Vancouver Island (Davis 2000) and in east-central Alberta (Browne 2010), most Western Toads used terrestrial habitats within 2 km of breeding sites, although much longer movements have occasionally been reported suggesting that hibernation sites may be limiting. In Alberta, movements to reach upland hibernation sites were greater than those associated with foraging areas (Browne 2010). Hibernation sites have been found 146-1936 m (Browne and Paszkowski 2010b) and 180-6230 m (Bull 2006) from breeding sites in Alberta and Oregon, respectively.

The Western Toad is thought to exist as a series of relatively independent subpopulations within a region (Davis 2002), but few data are available on dispersal, movements among breeding sites, and population dynamics.

3.3.2. Limiting Factors

Extensive movements in terrestrial habitats and long distances between breeding, hibernation, and foraging areas (Davis 2002) increase the vulnerability of Western Toads in fragmented habitats (COSEWIC 2002). Other biological factors that increase their vulnerability include communal hibernation and egg-laying (Provincial Western Toad Working Group 2014), high breeding site fidelity (Davis 2000), and the formation of large post-metamorphic aggregations (Livo 1998). Wide fluctuations between years in breeding success also increase the vulnerability of populations to local extirpation (Marsh and Trenham 2001). The species' reliance on high adult survival to sustain populations through periods of poor reproductive success means that threats that impact adult survival can have particularly pronounced effects (COSEWIC 2002).

4. Threats

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (adapted from Salafsky et al. 2008). For purposes of threat assessment, only present and future threats are considered[3]. Threats presented here do not include limiting factors[4], which are presented in Section 3.3.2.

[3] 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).

[4] 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).

4.1. Threat Assessment

The Western Toad threat assessment is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. 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). Limiting factors are not considered during this assessment process. Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats are presented in the Description of Threats section. Threats for the Western Toad were assessed for the entire Canadian range (Non-calling population: Table 2, and Calling population: Table 3).

Table 2. Threat assessment table for the Western Toad Non-calling population.

Threat		**Impact**[a]	**Scope**[b]	**Severity**[c]	**Timing**[d]
1	Residential & commercial development	Negligible	Negligible	Extreme	High
1.1	Housing & urban areas	Negligible	Negligible	Extreme	High
1.2	Commercial & industrial areas	Negligible	Negligible	Extreme	High
1.3	Tourism & recreation areas	Negligible	Negligible	Moderate	High
2	Agriculture & aquaculture	Negligible	Large	Negligible	High
2.1	Annual & perennial non-timber crops	Negligible	Negligible	Serious	High
3	Energy production & mining	Negligible	Negligible	Serious	High
3.1	Oil & gas drilling	Negligible	Negligible	Serious	High
3.2	Mining & quarrying	Negligible	Negligible	Serious	High
3.3	Renewable energy	Negligible	Negligible	Slight	High
4	Transportation & service corridors	Medium - Low	Restricted	Extreme-Moderate	High
4.1	Roads & railroads	Medium - Low	Restricted	Extreme-Moderate	High
4.2	Utility & service lines	Negligible	Negligible	Slight	High
5	Biological resource use	Low	Small	Moderate	High
5.3	Logging & wood harvesting	Low	Small	Moderate	High
6	Human intrusions & disturbance	Negligible	Negligible	Slight	High
6.1	Recreational activities	Negligible	Negligible	Slight	High
7	Natural system modifications	Negligible	Negligible	Moderate	High
7.1	Fire & fire suppression	Negligible	Negligible	Moderate	High
7.2	Dams & water management/use	Negligible	Negligible	Slight	High
7.3	Other ecosystem modifications	Negligible	Negligible	Slight	High

8	Invasive & other problematic species & genes	Medium - Low	Pervasive	Moderate - Slight	High
8.1	Invasive non-native/alien species	Medium - Low	Pervasive	Moderate - Slight	High
9	Pollution	Low	Small	Slight	High
9.1	Household sewage & urban water waste	Negligible	Negligible	Slight	High
9.2	Industrial & military effluents	Negligible	Negligible	Slight	High
9.3	Agricultural & forestry effluents	Negligible	Negligible	Slight	High
9.4	Garbage & solid waste	Negligible	Negligible	Slight	High
9.5	Air-borne pollutants	Low	Small	Slight	High
11	Climate change & severe weather	Low	Small	Moderate	High
11.2	Droughts	Low	Small	Moderate	High

Table 3. Threat assessment table for the Western Toad Calling population.

Threat		Impact[a]	Scope[b]	Severity[c]	Timing[d]
1	Residential & commercial development	Negligible	Negligible	Extreme	High
1.1	Housing & urban areas	Negligible	Negligible	Extreme	High
1.2	Commercial & industrial areas	Negligible	Negligible	Extreme	High
1.3	Tourism & recreation areas	Negligible	Negligible	Moderate	High
2	Agriculture & aquaculture	Low	Restricted	Serious - Moderate	High
2.1	Annual & perennial non-timber crops	Low	Restricted	Serious - Moderate	High
3	Energy production & mining	Low	Restricted	Serious	High
3.1	Oil & gas drilling	Low	Restricted	Serious	High
3.2	Mining & quarrying	Negligible	Negligible - Restricted	Serious	High
3.3	Renewable energy	Negligible	Negligible	Slight	High
4	Transportation & service corridors	Medium - Low	Restricted - Small	Extreme - Moderate	High
4.1	Roads & railroads	Medium - Low	Restricted - Small	Extreme - Moderate	High
4.2	Utility & service lines	Low	Small	Slight	High
5	Biological resource use	Low	Small	Moderate	High
5.3	Logging & wood harvesting	Low	Small	Moderate	High
6	Human intrusions & disturbance	Negligible	Negligible	Slight	High
6.1	Recreational activities	Negligible	Negligible	Slight	High
7	Natural system modifications	Negligible	Negligible	Moderate	High
7.1	Fire & fire suppression	Negligible	Negligible	Moderate	High
7.2	Dams & water management/use	Negligible	Negligible	Slight	High
7.3	Other ecosystem modifications	Negligible	Negligible	Slight	High

8	Invasive & other problematic species & genes	Medium - Low	Pervasive	Moderate -Slight	High
8.1	Invasive non-native/alien species	Medium - Low	Pervasive	Moderate -Slight	High
9	Pollution	Low	Restricted - Small	Moderate - Slight	High
9.1	Household sewage & urban water waste	Negligible	Negligible	Slight	High
9.2	Industrial & military effluents	Low	Small	Slight	High
9.3	Agricultural & forestry effluents	Low	Small	Slight	High
9.4	Garbage & solid waste	Negligible	Negligible	Slight	High
9.5	Air-borne pollutants	Low	Small	Slight	High
11	Climate change & severe weather	Low	Small	Moderate	High
11.2	Droughts	Low	Small	Moderate	High

[a] **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 timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

[b] **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%).

[c] **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 an 18-year or three-generation timeframe. For this species a generation time of 6 years (COSEWIC 2012) was used resulting in severity being scored over an 18-year timeframe. 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 $\geq$ 0%).

[d] **Timing** - High = continuing; Moderate = only in the future (could happen in the short term [< 18 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 threat impact for this species is Medium-High and High for the Non-calling and Calling populations, respectively. This overall impact considers the cumulative impacts of all threats identified for each population (IUCN-CMP 2006). Transportation and service corridors and invasive and other problematic species and genes are the most significant threats for both populations. Energy production and mining and agriculture and aquaculture are additional threats for the Calling population. Details are discussed below for threats that are Low impact or greater.

IUCN-CMP Threat 2. Agriculture & Aquaculture (Low Impact: Calling Population)

Threat 2.1- Annual & perennial non-timber crops

Conversion of wetlands to agricultural land or intensification of agricultural practices can have serious effects on the Western Toad through loss or temporary destruction of wetland and upland foraging/dispersal/hibernation habitat (COSEWIC 2002) and mortality of dispersing/foraging toads by machinery. Irrigation may also reduce the suitability of aquatic breeding habitats through reducing water levels in wetlands (due to ground water diversions/water table draw down) or through increasing their salinity (Eaves 2004; Podmore 2007). Agricultural lands are expanding in the Aspen Parklands in central Alberta (World Wildlife Fund 2014). Although the Western Toad may use some types of cultivated areas for foraging, these uniform habitats are unlikely to provide for seasonal needs of the Western Toad, including hibernation sites (Browne 2010).

IUCN-CMP Threat 3. Energy Production & Mining (Low Impact: Calling Population)

Threat 3.1 – Oil & gas drilling

Oil and gas exploration and development disturbs habitat of the Western Toad via ecosystem conversion, fragmentation, and environmental contamination (for impacts of associated roads and transportation infrastructure see IUCN-CMP threat #4). The oil and gas industry is most active in northeast British Columbia and north central to northern Alberta, overlapping portions of the Western Toad's range, particularly the Calling population (Austin et al. 2008). Light and noise pollution from natural gas production negatively impacts the Calling population (COSEWIC 2012).

However, the footprint is relatively small relative to the range of the species, so the overall impact is predicted to be low.

IUCN-CMP Threat 4. Transportation & Service Corridors (Medium - Low Impact: Non-calling and Calling Population)

Threat 4.1 – Roads & railroads

Roads and other transportation corridors are a threat, particularly those close to breeding sites in developed areas of British Columbia and Alberta. Not only do vehicles kill Western Toads crossing roads, but road construction results in a loss of woodland habitat and creates barriers to dispersal. Roads alter wetland hydrology causing hydroperiods to be out of sync with the needs of amphibians. A negative association between abundance of aquatic-breeding amphibians and traffic volumes can be attributed primarily to road kill (Fahrig et al. 1995; Eigenbrod et al. 2008). The Western Toad often moves relatively long distances between foraging, hibernating, and breeding sites, and hence is more susceptible to road mortality than more sedentary amphibians (Carr and Fahrig 2001). Although many juvenile Western Toads may be vulnerable to road mortality during mass migration from natal sites (Carr and Fahrig 2001), mortality of mature females can have a larger impact on the population (P. Govindarajulu pers. comm. 2015). Adverse effects are most severe on well-used highways, but problem areas may exist on networks of logging, oil and gas development, and mining roads that are expanding with increased resource extraction in northern parts of the species' range in British Columbia, Alberta and Northwest Territories. Mortality from vehicles is not restricted to roads; in Northwest Territories all-terrain-vehicle tracks intersect breeding ponds (R. Gau, pers. comm. 2011).

Beaver control is used to prevent road flooding and can result in loss and deterioration of beaver ponds, which are used by Western Toad as breeding habitat (Stevens et al. 2007). Irrigation ponds and borrow pits created during road construction act as population sinks for Western Toad because they provide poor larval habitat (Stevens et al. 2006).

Threat 4.2 Utility & service lines

Seismic lines and pipelines associated with the oil and gas industry are prevalent in parts of the Western Toad range, particularly in northeastern British Columbia and north central and northern Alberta (primarily affecting the Calling population). Electrical transmission lines also intersect suitable habitat throughout the species' range. New construction of utility/service lines/corridors will impact Western Toad through habitat loss, and ongoing operation/maintenance of existing infrastructure (e.g., routine vegetation maintenance along rights-of-way) can disturb or harm dispersing/foraging individuals. However, the footprint is relatively small relative to the range of the species (e.g., pipeline footprints represent only 1.1% of the area of Alberta; Alberta Biodiversity Monitoring Institute 2012), so the overall impact is predicted to be low.

IUCN-CMP Threat 5. Biological Resource Use (Low Impact: Non-calling and Calling Population)

Threat 5.3 – Logging & wood harvesting

The Western Toad is relatively tolerant of logging, but it is unclear what the long-term effects of forest harvesting might be on population dynamics. The increased proportion of closed canopy, young second-growth stands could decrease suitable toad habitat over the long term, although toads preferentially used recent clearcuts on Vancouver Island (Davis 2000). The major impact of forest harvesting on pond breeding amphibians might be the creation of breeding ponds in clearcuts that act as population sinks due to short hydroperiods (Gyug 1996).

IUCN-CMP Threat 8. Invasive & Other Problematic Species & Genes (Medium - Low Impact: Non-calling and Calling Population)

Threat 8.1- Invasive non-native/alien species

Epidemic diseases, particularly chytridiomycosis caused by the fungus *Batrachochytrium dendrobatidis*, threaten the Western Toad throughout its Canadian range (COSEWIC 2012). Globally, precipitous declines and extirpations of amphibians and the decline of the Western Toad in the United States have been linked to chytridiomycosis (Carey 1993; Daszak et al. 1999; Muths et al. 2003). The fungus is widely distributed within the Western Toad's Canadian range (Richardson et al. 2014): in Alberta at 7 of 15 sites surveyed (D. Prescott, pers. comm. in COSEWIC 2012); in the Northwest Territories in the Fort Liard area (Schock et al. 2010); and throughout British Columbia (Adams et al. 2007; Deguise and Richardson 2009a; Slough 2009b). There are a few reports of population declines in Canada associated with the presence of the fungus (COSEWIC 2012), but even mass mortalities can easily escape detection if populations are not specifically monitored. In Atlin (northwestern British Columbia), chytridiomycosis was present in a monitored population, and might have led to the extirpation of that population (Slough 2009b). In other studies, however, Western Toads that tested positive for *B. dendrobatidis* showed no signs of disease (Deguise and Richardson 2009a; Schock et al. 2010). It is possible that unknown cofactors need to be present for the fungi to become pathogenic (Carey 1993), or that populations stressed by habitat degradation and/or increased UV-B light exposure may be more susceptible to infection (COSEWIC 2002). As humans continue to encroach on Western Toad habitats and open up new areas for development and resource extraction, the potential for introducing chytrid fungi and other pathogens increases. Disease transmission by sport fishers, researchers, and others who enter water at breeding sites and travel from site to site is of concern, if equipment is not properly cleaned (British Columbia Ministry of Environment 2008; Mendez et al. 2008; Vredenburg et al. 2010).

Ranavirus (Family: Iridoviridae) is a potential threat to the Western Toad, having caused infection and mortality in captivity and the wild (Miller et al. 2011). The distribution of ranavirus overlaps the southwest NWT where it was detected in Wood Frogs but not in

Western Toads or Boreal Chorus Frogs (Schock 2009; Schock et al. 2010). No mass mortality events directly attributed to ranavirus have been documented in British Columbia nor is there any information on the prevalence of ranavirus in Western Toads in British Columbia (Govindarajulu 2007). There is less evidence for mass mortalities via ranavirus than via *Batrachochytrium dendrobatidis* (Green et al. 2002; Daszak et al. 2003 in Govindarajulu 2007.)

COSEWIC (2002; 2012) identified the introduction of sport fish to previously fishless lakes as an important threat to the Western Toad. This practice is widespread through most of the species' Canadian range. Introduced fish threaten the Western Toad primarily through potential disease transmission rather than through predation, as adult and tadpole Western Toads are largely unpalatable to fish. Fish transmit pathogens, such as the water mould (*Saprolegnia* sp.), to amphibians (Kiesecker et al. 2001), but their role in chytrid transmission is unknown.

The spread of introduced species, such as Bullfrogs (*Lithobates catesbeianus*) in southwestern British Columbia, and increased abundance of predators such as raccoons (*Procyon lotor*), black and Norway rats (*Rattus* spp.), and common ravens (*Corvus corax*) in human modified landscapes are a threat to the Western Toad in localized areas (COSEWIC 2002; 2012). Predators such as raccoons and rats have been introduced to Haida Gwaii (COSEWIC 2002) and have been documented to be preying on Western Toads (Burles et al. 2004; C. Bergman, pers. comm.)

IUCN-CMP Threat 9. Pollution (Low Impact: Non-calling and Calling Population)

Threats 9.2 – Industrial & military effluents, 9.3 – Agriculture & forestry effluents, and 9.5 – Airborne pollutants

Scant research has been undertaken on the effects of specific contaminants on the Western Toad. Amphibians are vulnerable to environmental contaminants including pesticides, herbicides, fertilizers, and road salt that can impose a variety of effects including loss of prey base (Relyea and Diecks 2008), immunosuppression (Fontenot et al. 1994), developmental abnormalities (Kiesecker 2002; Hayes 2004; Sanzo and Hecnar 2005), and mortality (Harfenist et al. 1989; Rouse et al. 1999; Hatch et al. 2001). Contaminants from agricultural and urban sources impact Western Toad breeding sites in the South coast region and southern interior of British Columbia (Provincial Western Toad Working Group 2014). Glyphosate herbicides used for conifer release in British Columbia produce lethal and sublethal effects on amphibians (Govindarajulu 2008). Western Toads are exposed to heavy metals in tailings ponds (Brinkman 1998) and through aerial deposition (COSEWIC 2012). Exposure to heavy metals including zinc, cadmium, and copper increases mortality and alters growth rates of amphibians, indirectly reducing survival (Bridges 2000; Brinkman 1998; Glooschenko et al. 1992). Acidification of wetlands from airborne sulphur associated with oil and gas extraction in northeast British Columbia and Alberta can disrupt development (Austin et al. 2008). Heavy metals and UV-B radiation may act synergistically with other environmental stressors and depress the immune system of the Western Toad, making them vulnerable to pathogens (Carey 1993) and deformities (Worrest and Kimeldorf 1975).

Impacts of various pollutants can be locally significant, but over the entire range of the two populations, the overall impact is predicted to be low.

IUCN-CMP 11. Climate Change & Severe Weather (Low Impact: Non-calling and Calling Population)

Threat 11.2 – Droughts

Increased frequency and duration of droughts predicted under climate change scenarios (IPCC 2014) can decrease the persistence of smaller wetlands used for breeding, connectivity and micro-sites used for rehydration (Provincial Western Toad Working Group 2011). Forest habitats may be lost as wildfires become more frequent (Guscio et al. 2008).

Climate change impacts may become more significant in the future, but over the next 18 years (3 generations), the impact is predicted to remain low.

5. Management Objective

The management objective for the Western Toad is to maintain stable or increasing populations distributed throughout the species' present range in Canada.

Rationale for management objective

The Western Toad is widespread throughout much of western Canada and the numbers of localities and individuals are sufficiently large to maintain viability of the species in Canada, provided that threats are addressed and further declines are prevented. Quantifying population and habitat targets is not feasible at this time due to lack of adequate baseline information.

6. Broad Strategies and Conservation Measures

6.1 Actions Already Completed or Currently Underway

Management planning:

- A British Columbia management plan is complete (Provincial Western Toad Working Group 2014).
- Best Management Practices for amphibians and reptiles in urban and rural areas have been prepared (Ovaska et al. 2004).
- Research priorities for the Western Toad in British Columbia have been identified (Davis 2002).

- A Yukon amphibian management plan, including the Western Toad, is complete (Government of Yukon 2013).
- A Northwest Territories management plan for amphibians, including the Western Toad, is currently being developed (J. Wilson, pers. comm. 2015).

Surveys and monitoring:

Alberta:

- The Alberta Volunteer Amphibian Monitoring Program (AVAMP) was initiated in 1992 and is run by the Alberta Conservation Association (K. Kendell, pers. comm. 2014). In partnership with a local naturalist group, Alberta Conservation Association runs a boreal toad monitoring project in Crowsnest Pass, southwestern Alberta (K. Kendall, pers. comm. 2014). All AVAMP data is compiled and submitted to Alberta Environment and Sustainable Resource Development and entered into the Fish and Wildlife Management Information System database (K. Kendall, pers. comm. 2014). AVAMP is developing web-based mapping products to display and disseminate volunteer-collected data from Alberta (K. Kendall, pers. comm. 2014).
- The Researching Amphibian Numbers in Alberta (RANA project) was operational 1997-2008 and included intensive monitoring of at least four sites within the Western Toad's range (Government of Alberta, Environment and Sustainable Resource Development 2009; L. Wilkinson, pers. comm. 2010). Two of these sites still receive limited monitoring by volunteers and Government of Alberta staff (L. Wilkinson, pers. comm. 2014). Western Toads were sampled for chytrid fungus infection at 15 sites throughout their Alberta range in 2008 (D. Prescott, pers. comm. 2011).
- Banff National Park has extensive survey data on all herptiles, including Western Toad, from 1992 to 2006 (e.g., McIvor and McIvor 2006), and plans are underway to initiate an amphibian monitoring program for the park in 2016 (C. Carli pers. comm. 2015). An amphibian monitoring program in Jasper National Park, initiated in 2004, provides data on Western Toad populations in poorly known, high-elevation habitats (Brenda Shepherd, pers. comm. 2010). In Wood Buffalo National Park, inventories using automated recorders and opportunistic visits have not yielded any Western Toad records (R. Kindopp, pers. comm. 2011). In Waterton Lakes National Park, monitoring of sub-alpine, montane and foothills parkland has been ongoing since 1993 (Johnson 2014). Limited sampling occurred in Banff National Park beginning in 2006 but a large scale condition monitoring program will be launched in 2016 to assess the health of montane amphibian habitats.

British Columbia:

- Inventories were undertaken in Mount Revelstoke and Glacier National Parks in 2003 and 2004, and an amphibian monitoring program begun in 2009 along the Trans-Canada Highway in those parks provides data from valley bottom to subalpine ponds and lakes (L. Larson, pers. comm. 2011). Similar monitoring programs were initiated in Kootenay National Park in 2009 and Yoho National

Park in 2010 (D. Peterson, pers. comm. 2011). Testing for presence of chytrid fungus also occurred at a sample of Kootenay National Park sites in 2010. Since 2005, Gwaii Haanas National Park Reserve has been annually monitoring Western Toad populations at five known breeding sites (H. Stewart, pers. comm. 2015). During the same surveys, presence of non-native amphibians is recorded and water samples are taken for water quality.
- A draft monitoring program for Western Toads in British Columbia has been designed (Wind 2007) and is being tested (E. Wind, pers. comm. 2010).
- Distribution records for the province have been collated and mapped (P. Govindarajulu, pers. comm. 2010).
- The British Columbia Frogwatch program (British Columbia Ministry of Environment) includes a database and website for reporting occurrence records of amphibians (Surveillance for Amphibian Mass Mortalities; SAMM).
- Amphibian inventories have been conducted in many parts of the province within the past 15 years (COSEWIC 2002), and a study of the distribution of chytrid fungus in British Columbia amphibians has been completed (Govindarajulu et al. 2013).
- A long term pond-breeding amphibian monitoring program is in development for Mount Revelstoke and Glacier National Parks. Repeat surveys at core monitoring sites were completed in 2009 and 2010 (Provincial Western Toad Working Group 2014).
- Wind and Wilmott (2012) identified known breeding sites on Vancouver Island and documented road mortality sites and mitigation efforts in BC.
- A multi-year project investigating winter movement patterns and habitat requirements including characterization and spatial location of Western Toad hibernacula is underway on south Vancouver Island (E. Wind in prep).

Yukon:
- Amphibian surveys have been conducted from 1973 - 2010 (Slough and Mennell 2006; Slough 2009b; S. Cannings, pers. comm. 2010).
- Chytrid fungus surveys have been conducted in northern British Columbia and southeast Yukon (Slough 2009b). Limited monitoring of known sites is taking place in northwestern British Columbia and southeastern Yukon, including the use of eDNA (S. Cannings pers. comm. 2014). These data are housed by the Yukon Conservation Data Centre, which actively comments on development proposals that may affect Western Toad habitat.

Northwest Territories:
- Amphibian population and pathogen surveys were conducted in the Sahtu and Dehcho regions in 2007 and 2008 (Schock 2009; Schock et al. 2010).
- In Nahanni National Park, inventories using automated recorders and opportunistic visits have not yielded any Western Toad records (D. Tate, pers. comm. 2011).
- The Department of Environment and Natural Resources, Government of the Northwest Territories, maintains a database of all recorded occurrences of Western Toad from the Northwest Territories.

Research:

- University of Alberta studies include projects on amphibian habitat associations (Eaves 2004; Macdonald et al. 2006; Stevens et al. 2007; Browne 2010), terrestrial movements of the Western Toad (Browne 2010) and use of Automated Recording Units (ARUs) for amphibian monitoring (C. Paszkowski, pers. comm. 2014).
- Habitat use and movements have been studied in relation to resource extraction by Innovates - Technology Futures (B. Eaton, pers. comm. 2010).
- The ecology and movements of Western Toads have been studied on Vancouver Island (Davis 2000) and in the lower Fraser Valley/*8/ (Deguise and Richardson 2009b).
- Larval growth and development in relation to sedimentation have been studied (Wood and Richardson 2009).
- The effects of mechanical forest thinning and fire on amphibians were studied at wetlands in Banff National Park, 2004-2008 (Lepitzki and Lepitzki 2003; Lepitzki and Lepitzki 2007; Maxcy and Symes 2009).
- Alberta Conservation Association and Government of Yukon are piloting the use of eDNA sampling to detect amphibian presence in freshwater wetlands (C. Paszkowski, pers. comm. 2014, B. Bennett, pers. comm. 2015).

Species and population management:

Bullfrog management activities are ongoing in the Okanagan and Vancouver Island (B.C.) (P. Govindarajulu, pers. comm., 2010 in Provincial Western Toad Working Group 2014).

6.2 Broad Strategies

The following broad strategies will be used to achieve the management objective for the Western Toad:

1. Identify and secure regionally important breeding sites and terrestrial habitats.
2. Mitigate threats to important breeding sites and surrounding terrestrial habitats.
3. Undertake research to fill key knowledge gaps.
4. Establish regionally based monitoring programs to assess population status and trends.
5. Conduct outreach and stewardship.

6.3 Conservation Measures

Table 4. Conservation measures and implementation schedule for the Western Toad.

Conservation Measure	Priority[a]	Threats or concerns addressed	Timeline[b]
1. Identify and secure regionally important breeding sites and terrestrial habitats			
Using existing data and new surveys, identify and prioritize regionally important breeding sites and terrestrial habitats.	High	All	2017-2019
Secure regionally important breeding sites and terrestrial habitats, according to priority, by protecting[c] areas from the impacts of development, resource extraction and intensive human uses, and from the introduction of alien invasive species.	High	All	ongoing
2. Mitigate threats to important breeding sites and surrounding terrestrial habitats			
Control spread of disease and invasive species among breeding sites; establish hygiene protocols and outreach for all those who work and recreate in and around breeding sites.	High	8.1 – invasive non-native/alien species 11 – climate change	ongoing
Avoid drainage of wetlands in areas occupied by the species.	High	2.1 – annual & perennial non-timber crops 3.1 – oil & gas drilling 4.1 – roads & railroads 5.3 – logging & wood harvesting	ongoing
Develop and implement mitigation measures and Best Management Practices associated with agriculture, oil and gas/mining, logging, and sport-fishing.	Medium	2.1 – annual & perennial non-timber crops 3.1 – oil & gas drilling 4.1 – roads & railroads 5.3 – logging & wood harvesting 8.1 – invasive non-native/alien species	2016-2019
Mitigate road mortality and barriers to movements along transportation corridors.	Medium	4.1 – roads & railroads	2016-2020
3. Undertake research to fill key knowledge gaps			
Investigate factors that trigger epidemics due to chytrid fungus and other amphibian pathogens. Define current range/extent of the fungus and predicted effects of climate change.	High	8.1 – invasive non-native/alien species	2016-2024
Investigate mechanisms of spread of pathogens, including the role of sport fish introductions.	Medium	8.1 – invasive non-native/alien species	2016-2019
Study metapopulation dynamics, movements, and dispersal patterns in fragmented landscapes.	Medium	Knowledge gaps	2016-2019
Study terrestrial habitat use and identify features of hibernation sites in various landscapes; develop habitat models for mapping.	Low	Knowledge gaps	ongoing
Clarify threats in relation to land uses, including impacts of agriculture, forestry, and energy production.	Low	Knowledge gaps	2016-2024
Clarify the distribution of Calling and Non-calling Populations in Canada and extent of species diversity	Low	Knowledge gaps	ongoing
4. Establish regionally based monitoring programs to assess population status and trends			
Develop monitoring methods including analysis of existing amphibian monitoring programs.	High	Knowledge gaps	2016
Initiate population monitoring in strategic locations across the species' Canadian range.	High	Knowledge gaps	2016-2017

Conservation Measure	Priority[a]	Threats or concerns addressed	Timeline[b]
5. Conduct outreach and stewardship			
Conduct targeted outreach (meetings, workshops, site visits and assessments) where important habitats occur on private lands or are under resource use leases on Crown lands.	Medium	2.1 – annual & perennial non-timber crops 4.1 – roads & railroads 5.3 – logging & wood harvesting 8.1 – invasive non-native/alien species 9 - pollution	2016-2018
Effectively share information on inventory and management actions; this may include brochure(s), an interactive website, etc.	Medium	2.1 – annual & perennial non-timber crops 4.1 – roads & railroads 5.3 – logging & wood harvesting 8.1 – invasive non-native/alien species 9 - pollution	2016-2018

[a] "Priority" reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the conservation of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the management objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the management objective, but are still important for the management of the population. Low priority conservation measures will likely have an indirect or gradual influence on reaching the management objective, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

[b] The time-line is approximate—implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

[c] "Protection" in this document should not be confused with the legal protection afforded to the critical habitat of threatened and endangered species under SARA. Potential mechanisms could include land zoning, securement of private lands, conservation covenants, or voluntary stewardship agreements.

7. Measuring Progress

The performance indicator presented below provides a way to define and measure progress toward achieving the management objective:

Stable or increasing Western Toad populations have been maintained throughout the species' present range in Canada.

The following targets will be used to gauge progress until there is sufficient baseline information to ensure the management objective is reached:

1. The highest priority breeding sites have been secured.
2. Best Management Practices have been developed and are actively used (e.g., appropriate hygiene measures have been developed and are in place to avoid spreading amphibian diseases among water bodies).

3. Research has been undertaken on factors that trigger epidemics of chytrid fungus (and other important amphibian pathogens) and their mechanisms of spread; and has been initiated on other threats, metapopulation dynamics, and habitat use.
4. Population monitoring programs have been initiated in strategic locations across the species' range.
5. Outreach has been implemented to target owners/managers of important habitats on private and leased lands.

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Appendix A: 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.

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

Conservation and management of wetland breeding habitat across the range of the Western Toad will benefit a number of other species of conservation concern that also depend on wetland habitat for all or part of their lifecycle. Similarly, conservation and management of upland hibernation, foraging, and dispersal habitats is expected to have positive effects on co-occurring species. The potential for the plan to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects.

[5] http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1
[6] www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1