

STATUS REPORT ON AMPHIBIANS IN YUKON

WESTERN TOAD (*ANAXYRUS BOREAS*),
BOREAL CHORUS FROG (*PSEUDACRIS MACULATA*),
COLUMBIA SPOTTED FROG (*RANA LUTEIVENTRIS*) AND
WOOD FROG (*LITHOBATES SYLVATICUS*)

Prepared by:
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2011

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Preface

Four species of amphibians are found in Yukon: Western Toad, Boreal Chorus Frog, Columbia Spotted Frog, and Wood Frog. The Committee on the Status of Endangered Wildlife in Canada designated the Western Toad as a species of *Special Concern* and in 2005 the Western Toad was listed on Schedule 1 of the federal Species at Risk Act. This listing legally requires the federal government to develop a management plan for the Western Toad.

Initial discussions with the federal government concluded that each jurisdiction within the Western Toad range would complete an individual management plan. Environment Yukon determined that it would be more effective to develop a management plan that addresses the needs of all four Yukon amphibians. This approach takes advantage of technical experts involved in the planning process and is a more comprehensive look at amphibians in the territory.

Environment Yukon hosted a workshop in Whitehorse in 2009 to develop objectives and proposed recommendations for the management of amphibians in Yukon. Following the workshop we contracted Brian Slough—a local amphibian expert—to draft this technical overview of the status of amphibians in Yukon.

The purpose of this document was to compile the relevant technical information on the status of Yukon amphibians to support the development of the Management Plan for Yukon Amphibians (2013). The assessment presents species description, significance, distribution, habitat, biology, population sizes and trends, threats and limiting factors, protection, status and ranks. In addition to compiling scientific and technical data, all Yukon First Nations, renewable resources councils, and the Yukon Fish and Wildlife Management Board were contacted for contributions of local and traditional knowledge. Theresa Earle edited the document.

This assessment is best used when paired with the Management Plan for Yukon Amphibians (2013).

Status Report on Amphibians in Yukon

Western Toad (*Anaxyrus boreas*), Boreal Chorus Frog (*Pseudacris maculata*), Columbia Spotted Frog (*Rana luteiventris*) and Wood Frog (*Lithobates sylvaticus*)

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Executive Summary

Amphibian Species Description and Significance

Four amphibian species are known to occur in Yukon: Wood Frog, Columbia Spotted Frog, Boreal Chorus Frog and Western Toad. The Wood Frog has a black mask behind the eye and a contrasting white stripe on the upper jaw. The Columbia Spotted Frog is large, with black spots on the back and upturned eyes. The Boreal Chorus Frog is small, with a pointed snout and short legs. The Western Toad has short legs, warty skin, and large parotoid glands. All except the Columbia Spotted Frog have different colour phases.

In Yukon, amphibians garner a great deal of public curiosity and are culturally important to many local First Nations. They play important roles in ecosystems and are good indicators of environmental health.

Distribution

The Wood Frog is widespread across Yukon, while the other three species are limited to southern Yukon. The Columbia Spotted Frog is found in the Bennett Lake and Hyland River areas, the Western Toad is in the southern Liard River basin, and the Boreal Chorus Frog is known only from the LaBiche River valley.

Habitat

All Yukon amphibians depend on water for breeding and use a variety of shallow wetlands, and adults need moist conditions on land. The Wood Frog and Boreal Chorus Frog are resistant to freezing and hibernate above ground. They may forage away from breeding ponds. The Columbia Spotted Frog is highly aquatic, foraging on the shores of breeding ponds. Because they hibernate underwater, their ponds must have some deep waters and a winter snow cover so they don't freeze to the bottom. Western Toads breed in sandy, silty waters in river and stream floodplains and deltas.

Biology

Yukon amphibians breed as soon as open water appears in spring between late April and early June. Most lay hundreds of eggs in clusters, while the Western Toad may lay thousands of eggs in long strings. Tadpoles metamorphose in late July or August. Some Columbia Spotted Frog tadpoles may overwinter. Boreal Chorus Frogs may only live 2 to 3 years, but the other species are surprisingly long-lived, until 10 years or more.

Population Sizes and Trends

Little effort has been devoted to amphibian studies, and population sizes and trends remain unknown. Since 1993 researchers have undertaken extensive surveys to determine species present and their distribution.

Threats and Limiting Factors

Amphibians face many global threats, and they are declining faster than any other group of vertebrates. Permeable skin combined with a reliance on aquatic and terrestrial environments contributes to their vulnerability. Some factors interact resulting in stress and lower immunity to diseases. Major threats to amphibians include:

- habitat loss;
- habitat fragmentation;
- traffic mortality;
- collecting for food, bait, medicine, and education;
- acid rain;
- chemical pollutants including pesticides and toxins;
- introduction of exotic species such as competitors and predators (e.g., rainbow trout and bullfrogs);
- diseases from non-native fish;
- emerging diseases such as chytrid fungus;
- ultraviolet radiation (which may reduce hatching success); and
- global climate change (changes to water levels and temperature).

Climate change and emerging diseases like chytridiomycosis and ranavirus likely pose the greatest threats to Yukon amphibians. Introduced predators, such as game fish and their diseases, may also pose a threat. Chytridiomycosis is an infection of the chytrid fungus which is present in Wood Frogs and Western Toads in northern British Columbia and Yukon.

Among the local amphibian species, Western Toad is the most vulnerable to chytridiomycosis. Western Toads infected by this disease generally show skin lesions and sloughing and thickening of the skin. Death likely occurs because the disease interferes with skin functions including maintenance of fluid balance, respiration and preventing infections. Western Toad declines at the southern part of its range in the United States were believed to be caused by Chytrid Fungus. Researchers do not know whether chytrid is spreading around the world or if it is endemic to some areas. Co-stressors, such as increased UV-B radiation, may act to reduce immunity in some amphibian species.

Protection, Status, and Ranks

Amphibians are classified as wildlife under the Yukon *Wildlife Act* in the general category of a vertebrate animal that is wild by nature. Under this act, people must have a license or permit to harvest or study amphibians.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2002, 2009) designated Western Toad as a species of *Special Concern* because they are relatively intolerant of urban expansion, conversion of habitat for agricultural use, non-native predators and competitors, and disease. The Western Toad is legally protected under the federal *Species at Risk Act* (SARA).

The general status ranks adopted by the Yukon government offer no legal protection; however, the ranks highlight species in need for a more detailed assessment by COSEWIC. The general status ranks are:

- Wood Frog – *Secure*;
- Western Toad – *Sensitive*;
- Columbia Spotted Frog – *May be at Risk*; and
- Boreal Chorus Frog – *May be at Risk*.

Most Yukon protected areas encompass some Wood Frog habitat and range. Coal River Springs Ecological Reserve, a 16 km² territorial park, protects some key Western Toad habitat including breeding sites. Known habitats of the Columbia Spotted Frog and Boreal Chorus Frog are not protected. Most amphibian habitats are on Crown Lands or First Nations Settlement Land.

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Amphibian Species Descriptions and Significance

Names and Classification

The scientific and common names of amphibians follow Crother (2008). Four species occur in Yukon: Western Toad *Anaxyrus boreas* (formerly *Bufo boreas*), Boreal Chorus Frog *Pseudacris maculata* (formerly *Pseudacris triseriata maculata*), Columbia Spotted Frog *Rana luteiventris*, and Wood Frog *Lithobates sylvaticus* (formerly *Rana sylvatica*) (Slough and Mennell 2006).

Morphological Description

Amphibians live both in water and on land, and they depend on water or moist conditions throughout their lives. They have glandular skin that absorbs water and is used for breathing. Frogs and toads are tail-less.

The Western Toad has short legs, warty skin, and large parotoid glands (skin glands behind the eyes which secrete a noxious substance to deter predators). The Boreal Chorus Frog is small, with a pointed snout and short legs. The Columbia Spotted Frog is large, with black spots on the back and upturned eyes. The Wood Frog is intermediate in size and has several colour variations, always with a black mask behind the eye and a contrasting white stripe on the upper jaw. The species are described in the brochure “*Yukon Amphibians*” (Environment Yukon 2005) and in regional field guides (Russell and Bauer 2000, Jones et al. 2005, Corkran and Thoms 2006, Matsuda et al. 2006).

Special Significance

Frogs are crest emblems for the inland Tlingit First Nations of Teslin and Carcross. They are regarded as animal shamans and guardian spirits. Tlingit, Southern Tutchone, and Tagish people traditionally feared frogs, believing they may bring bad luck and must not be hunted (McClellan 1975: 178-179).

Amphibians are highly valued for wildlife viewing by naturalists and outdoor enthusiasts, and by generations of children. Yukon residents are generally very interested in the health of amphibian populations. Scientific researchers and natural historians are attracted to amphibians by their unique characteristics, such as interesting life histories.

Amphibians have little direct economic value, but they are important ecologically. Frog and toad tadpoles mainly eat plants, and the adults eat insects, worms, and other invertebrates. In turn, these amphibians are preyed on by fish, birds, and carnivorous mammals.

Amphibians are especially important as indicators of environmental health. Because they have both aquatic and terrestrial life stages, they can provide early warnings to changes in both types of environments. Because they breathe through their skin, they are more susceptible to pollution than other species. Their eggs are permeable to water and are exposed to light, making them vulnerable to pollution, diseases, and ultraviolet radiation. Amphibians' dependence on the weather, including precipitation and temperature, makes them especially vulnerable and a good indicator of global climate change.

Distribution

Global Range

Field guides provided information on the global range of amphibians for this report (Stebbins 2003, Jones et al. 2005, Corkran and Thoms 2006, Matsuda et al. 2006). In fact, author Brian Slough provided input on the northern range of these species for publications by Stebbins (2003) and Jones et al. (2005), and he contributed some northern observations published in Matsuda et al. (2006).

The Western Toad inhabits western North America from the Rocky Mountains west to the Pacific Coast and north to southern Yukon and coastal Alaska. The Boreal Chorus Frog is found east of the Continental Divide from Yukon to Hudson's Bay in the north and east and south to Arizona and New Mexico. The Columbia Spotted Frog is another western species, ranging from the Rocky Mountains to the Pacific Coast in Alaska, and south to the western United States. The Wood Frog's extensive range in North America includes all of Alaska, most of Canada below treeline, east to the Atlantic, and many northern and eastern states.

Yukon Range

Figure 1 shows the distribution of Yukon amphibians based on information derived from museum specimens, published and unpublished reports and unpublished data.

The Western Toad, found throughout northern British Columbia (Matsuda et al. 2006), is absent only from the region around Teslin Lake (B. Slough and L. Mennell, unpublished data). The toad enters Yukon only in the southern Liard River Basin from the Meister River in the west to the Beaver River in the east (Slough and Mennell 2006).

The Boreal Chorus Frog has been found only in the lower La Biche River valley of the extreme southeast Yukon (La Biche/Beaver Ecosystem Technical Working Group 1999, Slough and Mennell 2006). The frog is also found in the southern Northwest Territories, but its distribution in northern British Columbia is poorly understood.

The Columbia Spotted Frog is found across northern British Columbia east of the Rocky Mountains (Matsuda et al. 2006) and enters Yukon in the west on the West Arm of Bennett Lake, and in the southeast in the Hyland River area, including Irons Creek Lake (Slough and Mennell 2006).

The Wood Frog has extensive Yukon distribution north to the Peel and Porcupine rivers, reaching its northern limit on the Old Crow Flats (Slough and Mennell 2006). Some factors affecting the distribution of the amphibian species are discussed under habitat requirements.

The Wood Frog ranges across all Yukon First Nation traditional territories. The Carcross/Tagish traditional territory includes Columbia Spotted Frog range, the Teslin Tlingit territory includes Western Toad range, and the Kaska traditional territory includes ranges of all four species.

Habitat

Habitat Requirements

All four Yukon species are known as “pond-breeding” amphibians since they depend on water for breeding and tadpole development. However, each species has different preferences for wetland types, foraging habitats, and hibernating habitats. The range of each species is profoundly affected by its habitat requirements and physiological adaptations.

Slough (2004, 2005a) and Slough and Mennell (2006) have described Western Toad habitat in Yukon and northwestern British Columbia. The Western Toad breeds in a wide variety of aquatic habitats throughout much of its range (Wind and Dupuis 2002), but breeding habitats appear to be more limited in the North.

Here, toads are frequently associated with sandy or silty shallows on ponds, lakes, streams, and rivers. In northwestern British Columbia, most breeding sites are near shallow stream deltas on lakes (Slough 2004). Breeding sites on the Coal River in the southeast Yukon are in floodplain backwater channels and ponds (Slough 2005a). A silty beaver pond on a creek 8 km southwest of the Coal River Springs is a suspected breeding site (juvenile toads present). Toads also breed at the Coal River Springs outflow and at geothermal springs in northern British Columbia, including the Atlin Warm Springs.

No Western Toad breeding sites have been found in Yukon outside of the Coal River area, though they clearly must exist to explain the wide distribution of adult toads. Tadpoles are often observed aggregating in warm shallow water where their black bodies absorb heat from the sun, accelerating their growth and development. Toads will breed where fish are present, but they are vulnerable to predation by fish and birds.

The toads' affinity for sandy breeding areas in the North may also be a consequence of hibernation requirements. To prevent desiccation, hibernation sites must be below the frost line and near water. They typically use existing rodent burrows (such as arctic ground squirrel dens), or they dig their own burrows in the soil. Sandy and silty areas likely provide habitats for digging hibernation burrows. Geothermal springs and areas with deep snow contribute to a shallow frost line, and a scarcity of areas with these conditions helps limit toad distribution in the North.

Western Toads may forage in marshes near breeding sites, but they are also capable of moving long distances (more than 7 km) to summer ranges in a variety of aquatic and upland habitats. They are often found further from water and in drier habitats than Yukon frogs. Their warty skin is moderately resistant to desiccation, and a thin-skinned pelvic patch under the belly absorbs moisture from the ground. Due to habitat preferences, Columbia Spotted Frog and Wood Frog have not been observed breeding at toad breeding sites, but adult toads have been observed foraging near frog breeding ponds (Slough 2004).

Boreal Chorus Frogs have been observed breeding in natural and manmade ponds and ditches in the La Biche River valley along a 10 km section of a road and at the airstrip. The ponds are shallow and fishless and may be seasonal and shared with Wood Frogs. Nothing else is known of Boreal Chorus Frog habitat in Yukon. They are expected to forage in damp grassy or wooded areas, spending drier periods underground or under leaf litter or decaying wood. They hibernate above ground.

Like the Wood Frog, the Boreal Chorus Frog uses a high concentration of glucose as a cryoprotectant, allowing it to withstand freezing temperatures during hibernation.

It ranges as far north as Norman Wells in the Northwest Territories and may be expanding its Yukon range following the last period of continental glaciation.

Columbia Spotted Frogs breed in small ponds and beaver ponds on streams around the West Arm of Bennett Lake, south of Carcross. They have also been observed breeding on Irons Creek Lake, east of Watson Lake. Most of these sites are fishless. The most aquatic of Yukon amphibian species, they are often seen perched at the water's edge.

Adults are capable of foraging for invertebrates underwater. Their breeding and foraging ponds usually have steep banks and relatively deep water, which provides escape habitat from predators. They use traditional, shallow, flooded basins around pond margins for communal breeding. Because Columbia Spotted Frogs hibernate under water, their requirements include deep water that doesn't freeze to the bottom, and early, deep snow accumulation which prevents ice formation and permits safe hibernation. Tadpoles and hibernating frogs are vulnerable to predation by fish.

Like the Western Toad, the lack of deep snow is believed to limit Columbia Spotted Frog distribution in the North, which helps explain why the species enters Yukon only in the Liard Basin and Coast Mountains, as toads are found in the Coast Mountains of northern British Columbia, but not Yukon.

Wood Frogs breed in shallow water, usually in small ponds, the shallow margins of lakes and in stream backwaters and beaver ponds. Wood Frogs do not necessarily use traditional or communal breeding sites, but if shallow breeding habitats are in short supply, breeding may appear communal. They also prefer fishless ponds to avoid predation. Summer foraging habitats may be far from breeding sites, but moisture must always be present.

Wood Frogs hibernate on land, under leaf litter, often in the meadows surrounding their breeding ponds. In Yukon, the Wood Frog has been found only below treeline, but the species has been observed in arctic and alpine tundra in Alaska in riparian areas with shrubby vegetation (Hokit and Brown 2006, Tessler 2008).

Habitat Trends

Yukon amphibian habitats are believed to be stable within the normal range of environmental conditions. Breeding sites for all species are exposed to fluctuating water levels, which typically peak in the spring and fall throughout the summer. The upper Yukon River Basin, where water levels on the large lakes and rivers rise through the summer, is the exception.

In drought years, shallow ponds near Whitehorse where Wood Frogs breed have dried out by mid-summer before tadpoles had metamorphosed, resulting in mass mortality (B. Slough, unpublished data).

Forestry, oil and gas developments, and agriculture may have locally impacted amphibian habitats in Yukon (Slough 2008). However, the Boreal Chorus Frog co-occurs with humans in a variety of land use situations and is relatively tolerant of habitat modifications. Natural disturbances in Yukon are limited mainly to fires, insect outbreaks, annual flooding, and active stream channelling.

Biology

Information on the biology of Yukon amphibians is from Slough and Mennell (2006), Slough (2004, 2005a, 2005b) and from observations (B. Slough, unpublished data). General information on life span and age at maturity is summarized from amphibian field guides (Russell and Bauer 2000, Jones et al. 2005, Corkran and Thoms 2006, Matsuda et al. 2006).

Life Cycle and Reproduction

All Yukon amphibian species breed as soon as they are able to leave hibernation (depending on snow and ice conditions) and move to ice-free breeding sites.

Western Toad breeding has not been observed in Yukon, but breeding takes place in late May in northwestern British Columbia. Females are known to lay 5,000 to 15,000 eggs in southern areas (Jones et al. 2005); however, local observations suggest that smaller clutches of about 1,000 to 3,000 are laid in the North. Northern tadpole aggregations in breeding sites are typically in the 500 to 5,000 range, as compared to the hundreds of thousands or millions reported elsewhere. Toadlets move onto land in July in northwestern British Columbia, but in the Coal River area they have not been observed before early August. Toads mature in 2 to 4 years, and they live as long as 11 years.

Tadpoles and the calls of Boreal Chorus Frogs have been observed in the La Biche valley throughout June. Metamorphs have not been observed. They mature in one year, and live 2 to 3 years.

Columbia Spotted Frogs in northwestern British Columbia breed explosively, often on a single warm day between May 18 and 22. Metamorphs emerge throughout August, but the presence of a few tadpoles in mid-September suggests that some may overwinter at higher elevations or in cool summers. Little is known of breeding phenology in Yukon, though an egg mass was observed on Irons Creek Lake on 22 May. They reach maturity in two to three years and may live for 9 to 12 years.

In the interior of Yukon, Wood Frogs have been observed breeding as early as late April and this period extends throughout May in most areas. The breeding period in any given wetland is generally short, lasting about 2 weeks. Metamorphs move onto land throughout July. They reach maturity in 3 to 5 years, and may live to 10 years of age.

Population Sizes and Trends

Sampling Effort and Methods

Prior to 1993, most amphibian observations and specimens were collected opportunistically by researchers surveying other fauna, such as mammals and birds. Due to Yukon's remoteness and the lack of dedicated amphibian surveys, knowledge of Yukon amphibians was limited to only a few Western Toad and Wood Frog records (Slough and Mennell 2006).

Recently, dedicated amphibian surveys (by B. Slough and L. Mennell) and additional expert observations (primarily Yukon Environment and Canadian Wildlife Service staff) throughout much of the territory have greatly increased our knowledge of ranges of these and the two species first recorded in the 1990s (Boreal Chorus Frog and Columbia Spotted Frog). Much of Yukon remains poorly surveyed for amphibians, especially outside of major road and river access corridors. Knowledge of breeding habitats within known ranges, for the Western Toad in particular, remains deficient.

Dedicated amphibian surveys in the past used visual encounter surveys and dipnetting of terrestrial, semi-terrestrial (wetland), and aquatic habitats (Thoms et al. 1997). Audible calls were identified to species. The various life-stages (i.e. egg masses, tadpoles, juveniles, adults) were identified using field identification keys (Russell and Bauer 2000, Jones et al. 2005, Corkran and Thoms 2006, Matsuda et al. 2006).

Surveys are typically conducted during the breeding seasons, generally late-April through early-June, and during the warm months, June through August, when amphibians are most active.

Tadpoles are observed throughout the summer, with metamorphs appearing on land in late July and August. Late observations may be made on warm days in September.

Abundance, Extent of Occurrence and Area of Occupancy

The following population threshold numbers are based on the IUCN (2009) and COSEWIC (2009) criteria for assessing species at risk. Extent of occurrence and area of occupancy are also criteria for species assessment. These areas were estimated by summing the areas of ecoregions within each species range (from Smith et al. 2004) and subtracting areas of tundra and rocklands.

Wood Frogs are widespread and abundant in suitable wetlands below arctic and alpine treeline. Though no population estimates are available, we know there are more than 10,000 mature individuals. The extent of occurrence is approximately 420,000 km² (87% of Yukon), and the area of occupancy is approximately 295,000 km² (61% of Yukon).

The Boreal Chorus Frog occurs in only one metapopulation using 5 or more breeding ponds in the La Biche River valley. There are probably fewer than 1,000 adults, and the extent of occurrence and area of occupancy are likely less than 1000 km².

The Columbia Spotted Frog is locally abundant in 4 known and one suspected breeding populations, forming 2 metapopulations in the Bennett Lake and Hyland River areas. There may be fewer than 1,000 adults. This species remains close to breeding ponds at all times; therefore, the extent of occurrence and area of occupancy are both likely less than 1,000 km².

The Western Toad is known from only 5 geographically separated sites in the Liard Basin (metapopulations: Meister River, Upper Liard-Watson Lake, Coal River, Toobally Lakes and Beaver River), including 6 breeding populations on the Coal River. Surveys have been sparse, and more populations probably exist. The number of mature individuals is difficult to estimate, but is likely between 1,000 and 10,000. The extent of occurrence in the Liard Basin between the Meister River in the west and Beaver River in the east is approximately 10,000 km², and the area of occupancy may be less than 500 km².

Fluctuations and Trends

No Yukon information is available about amphibian population fluctuations or trends. Parks Canada initiated a Wood Frog monitoring program in the Kluane National Park area in 2008 (C. Wong, personal communication).

Attempts at initiating a FrogWatch program in Yukon have been unsuccessful, although some baseline Wood Frog calling data was collected for the Whitehorse area (B. Slough, unpublished data, Website: <http://www.frogwatch.ca/english/frogwatch/yt/>). The chytrid fungus (discussed under Threats and Limiting Factors, below) may be associated with Western Toad population declines in the Atlin, British Columbia area (Slough 2009a).

Rescue Effect

Amphibian populations rely on immigrants from other populations to support them when local reproduction has been poor or when there has been a mass mortality episode (common in toads, which form large seasonal aggregations). Low populations using isolated breeding sites are vulnerable to extirpation, a common situation in the North.

Amphibian populations in Yukon are connected to populations in British Columbia, the Northwest Territories and Alaska, but their degree of isolation is not known. In northwestern British Columbia, only 7 major Western Toad breeding sites are known within 50 km of the Chilkoot Trail National Historic Site (Slough 2004). Yukon populations of Western Toads and Columbia Spotted Frogs appear to be similarly isolated. Breeding sites in Yukon are widely spaced and linked by forested corridors containing some lesser breeding sites. Extirpation and colonization rates are functions of breeding site spatial arrangement.

Threats and Limiting Factors

Amphibians face many global threats, and they are declining faster than any other group of vertebrates. Almost one-third (32.5%) of known amphibian species are threatened, while 12 per cent of birds and 23 per cent of mammals are threatened. Permeable skin combined with a reliance on aquatic and terrestrial environments contributes to their vulnerability. Some factors interact resulting in stress and lower immunity to diseases. Major threats to amphibians include:

- habitat loss;
- habitat fragmentation;
- traffic mortality;
- collecting for food, bait, medicine and education;
- acid rain;
- chemical pollutants including pesticides and toxins;
- introduction of exotic species such as competitors and predators (e.g., rainbow trout and bullfrogs);
- diseases from non-native fish;
- emerging diseases such as chytrid fungus;
- ultraviolet radiation (which may reduce hatching success);
- and global climate change (changes to water levels and temperature).

Many common causes of declines do not yet threaten amphibians in Yukon, but some do. Amphibian populations in pristine areas which are not apparently affected by human activities have declined and have even gone extinct. Climate change and emerging diseases likely pose the greatest threats to Yukon amphibians (Slough 2009b).

Over the years fish species known to prey on amphibians have been introduced into about 50 Yukon pothole lakes. These include Rainbow trout (*Oncorhynchus mykiss*), arctic char (*Salvelinus alpinus*), kokanee (*O. nerka*) and chinook salmon (*O. tshawytscha*). Fish-less lakes are valuable Wood Frog breeding habitats. Besides preying on amphibians, introduced fish may carry pathogens and parasites that affect amphibians, such as aquatic water mould *Saprolegnia ferax*, which causes mass mortality of amphibian embryos.

Irons Creek Lake (stocked 1990-2003), was one of only 4 known breeding sites for the Columbia Spotted Frog in Yukon (Slough 2005b, Slough and Mennell 2006). The impact of rainbow trout on the Columbia Spotted Frog population is unknown; however, no Columbia Spotted Frogs have been observed since 2005 (B. Slough, unpublished data). Environment Yukon has removed Irons Creek Lake from the list of stocked lakes.

An emerging disease, chytridiomycosis, caused by the chytrid fungus *Batrachochytrium dendrobatidis* (*Bd*), has been found recently in Western Toads in northwestern British Columbia and at the Coal River Springs in Yukon (Slough 2009a). Wood Frogs were also found to carry the fungus at the Coal River Springs. The disease has been responsible for amphibian mass mortality and population declines in all continents with amphibians.

At least some Western Toad declines in the southern part of their range in the United States have been attributed to the disease (Pearl et al. 2007, Deguise and Richardson 2009). Toads infected by this disease generally show skin lesions and sloughing and thickening of the skin. Death likely occurs because the disease interferes with skin functions including maintenance of fluid balance, respiration and preventing infections.

Confirmed in North America in the mid-1990s, *Bd* has been traced back to amphibian declines in Australia as early as 1978. The origins of the disease (whether it has recently spread or is endemic; Rachowicz et al. 2005) and reasons for its emergence are still unknown. In some areas *Bd* is widespread without associated amphibian declines. Co-stressors, such as UV-B, chemical pollution or climate change may predispose amphibian populations to opportunistic pathogens such as *Bd* (Daszak et al. 1999). The effect of *Bd* on amphibian populations in the North is unknown, but the disease may have caused a suspected Western Toad population decline at the Atlin Warm Springs (Slough 2009a).

Ranavirus, another emerging infectious disease, may also be contributing to amphibian declines (Daszak et al. 1999, Shock et al. 2008). This virus has been detected in Wood Frogs in the Northwest Territories (D. Schock, unpublished data), but it has not been sampled for in Yukon.

Protection, Status and Ranks

Legal Protection and Status

Amphibians are classified as wildlife under the *Yukon Wildlife Act* in the general category of a vertebrate animal that is wild by nature. Under this act, people must have a license or permit to harvest or study amphibians.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2002, 2009) designated the Western Toad as a species of *Special Concern* because they are relatively intolerant of urban expansion, conversion of habitat for agricultural use, non-native predators and competitors, and disease. The Western Toad is legally protected under the federal *Species at Risk Act* (SARA). Under the national *Accord for the Protection of Species at Risk*, the federal, provincial and territorial governments agree to develop management plans for species of *Special Concern* within 5 years.

COSEWIC assessed the Columbia Spotted Frog as being *Not at Risk* in 2000 (Ovaska 1999, COSEWIC 2009), so the species is not protected by SARA. The Wood Frog and Boreal Chorus Frog have not been assessed by COSEWIC.

Non-Legal Status and Ranks

Environment Yukon uses the general status ranking program that was developed by Canada, the provinces and territories. The ranking provides a simple, standardized system that highlights species in need of a more detailed assessment by COSEWIC. The ranks are updated and reported on every 5 years (Canadian Endangered Species Conservation Council (CESCC 2006). The next report is due in 2010. The 2005 ranks and recommended 2010 ranks are:

1. Wood Frog – *Secure*;
2. Western Toad – *Sensitive*;
3. Columbia Spotted Frog – *May be at Risk*; and
4. Boreal Chorus Frog – *May be at Risk*.

Criteria include population size, population trend, Yukon range, number of occurrences, area of occupancy, and threats.

NatureServe (NatureServe 2009) ranks all species globally (G), based on the status of the species throughout its entire range, and territorially (S, or sub-nationally) based on the status of the species within the territory, province, or state. In fact, general status ranking factors are based on NatureServe ranking factors. The NatureServe rankings are:

1. Wood Frog - G5S5 (*Secure*);
2. Western Toad - G4 (*Apparently Secure*) S3 (*Vulnerable*);
3. Columbia Spotted Frog - G4 (*Apparently Secure*) S2S3 (*Imperilled-Vulnerable*); and
4. Boreal Chorus Frog - G5 (*Secure*) S1S2 (*Critically Imperilled – Imperilled*).

The International Union for the Conservation of Nature (IUCN 2009) ranks Wood Frogs, Boreal Chorus Frogs and Columbia Spotted Frogs as *Lower Risk – Least Concern*, and Western Toads are *Near Threatened*. The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES 2009) does not list any Yukon amphibian species.

Habitat Protection and Ownership

Most Yukon protected areas (e.g., National and Territorial Parks, Special Management Areas, Habitat Protection Areas) encompass some Wood Frog habitat and range. Coal River Springs Ecological Reserve, a 16 km² territorial park, protects some key Western Toad habitat, including breeding sites. Known habitats of the Columbia Spotted Frog and Boreal Chorus Frog are not protected.

Outside of protected areas, most amphibian habitats are on Crown Lands or First Nations Settlement Land.

Information Sources

- Canadian Endangered Species Conservation Council (CESCC). 2006. Wild Species 2005: The general status of species in Canada. Website: <http://www.wildspecies.ca/wildspecies2005/>. [Accessed 3 September 2009].
- CITES. 2009. Appendices I, II and III: valid from 22 May 2009. Convention on International Trade in Endangered Species of Wild Fauna and Flora. 41 pages. Website: <http://www.cites.org/eng/app/e-appendices.pdf>. [Accessed 3 September 2009].
- Corkran, C.C., and C. Thoms. 2006. Amphibians of Oregon, Washington and British Columbia: A field identification guide. 2nd edition. Lone Pine Publishing, Edmonton, Alberta, Vancouver, British Columbia and Auburn, Washington. 175 pages.
- COSEWIC. 2002. COSEWIC assessment and status report on the Western Toad *Bufo boreas* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 31 pp. Website: http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_western_toad_e.pdf. [Accessed 3 September 2009].
- COSEWIC. 2009. Canadian Species at Risk. Committee on the Status of Endangered Wildlife in Canada, August 2009. iii + 92 pages. Website: http://www.cosewic.gc.ca/eng/sct0/rpt/rpt_csar_e.pdf. [Accessed 3 September 2009].
- Crother B.I., Committee Chair. 2008. Scientific and standard English names of amphibians and reptiles of North America north of Mexico, with comments regarding confidence in our understanding. 6th edition. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 37: 1-94.
- Daszak, P., L. Berger, A.A. Cunningham, A.D. Hyatt, D.E. Green, and R. Speare. 1999. Emerging infectious diseases and amphibian population declines. *Emerging Infectious Diseases* 5: 735-748.
- Deguisse, I., and J.S. Richardson. 2009. Prevalence of the chytrid fungus (*Batrachochytrium dendrobatidis*) in Western Toads in southwestern British Columbia, Canada. *Northwestern Naturalist* 90: 35-38.
- Environment Yukon. 2005. Yukon Amphibians. Yukon Wild Brochure, Wildlife Viewing Program. 24 pages.

- Hokit, D.G., and A. Brown. 2006. Distribution patterns of Wood Frogs (*Rana sylvatica*) in Denali National Park. *Northwestern Naturalist* 87: 128-137.
- IUCN 2009. 2008 IUCN Red List of Threatened Species. Website: <http://www.iucnredlist.org>. [Accessed 3 September 2009].
- Jones, L.C., W.P. Leonard, and D.H. Olson (editors). 2005. *Amphibians of the Pacific Northwest*. Seattle Audubon Society, Seattle, WA. 227 pages.
- LaBiche/Beaver Ecosystem Technical Group. 1999. Proposed forest ecosystem network for the LaBiche River watershed. August 30, 1999. Canadian Wildlife Service (Whitehorse), DIAND Forest Resources, Yukon Department of Renewable Resources, Whitehorse, Yukon. 32 pages.
- Matsuda, B.M., D.M. Green, and P.T. Gregory. 2006. *Amphibians and reptiles of British Columbia*. Royal BC Museum Handbook, Victoria, British Columbia. 266 pages.
- McClellan, C. 1975. My old people say: an ethnographic survey of southern Yukon Territory. *National Museum of Man Publications in Ethnology* 6: 1-637. National Museums of Canada, Ottawa.
- Moriarty-Lemmon, E., A.R. Lemmon, J.T. Collins, J.A. Lee-Yaw and D.C. Cannetella. 2007. Phylogeny-based delimitation of species boundaries and contact zones in the trilling chorus frogs (*Pseudacris*). *Molecular Phylogenetics and Evolution* 44:1068-1082.
- NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life. Website: <http://www.natureserve.org/explorer/> [Accessed 3 September 2009].
- Ovaska, K.E. 1999. Status report on the Columbia Spotted Frog, *Rana luteiventris*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-55 pp.
- Pearl, C.A., E.L. Bull, D.E. Green, J. Bowerman, M.J. Adams, A. Hyatt, and W.H. Wenthe. 2007. Occurrence of the amphibian pathogen *Batrachochytrium dendrobatidis* in the Pacific Northwest. *Journal of Herpetology* 41: 145-149.
- Rachowicz, L.J., J-M. Hero, R.A. Alford, J.W. Taylor, J.A.T. Morgan, V.T. Vredenburg, J.P. Collins, and C.J. Briggs. 2005. The novel and endemic pathogen hypotheses: competing explanations for the origin of emerging infectious diseases of wildlife. *Conservation Biology* 19: 1441-1448.

- Russell, A.P., and A.M. Bauer. 2000. The amphibians and reptiles of Alberta: a field guide and primer of boreal herpetology. 2nd edition. University of Calgary Press, Calgary, Alberta. 279 pages.
- Schock, D.M., T.K. Bollinger, V.G. Chinchar, J.K. Jancovich, and J.P. Collins. 2008. Experimental evidence that amphibian ranaviruses are multi-host pathogens. *Copeia* 2008: 133-143.
- Slough, B.G. 2004. Western Toad inventory in the Chilkoot Trail National Historic Site, July-August 2004. Parks Canada Species at Risk Inventory Fund Project SARINV04-30. 54 pages.
- Slough, B.G. 2005a. Western Toad, *Bufo boreas*, stewardship in the Yukon. NatureServe Yukon, Whitehorse. 26 pages.
- Slough, B.G. 2005b. Assessment of the Impact of Rainbow Trout Introductions on Columbia Spotted Frogs in Irons Creek Lake, Yukon. Prepared for Fish and Wildlife Branch, Yukon Department of Environment, Whitehorse. iv + 17 pages.
- Slough, B.G., and R.L. Mennell. 2006. Diversity and range of amphibians of the Yukon Territory. *Canadian Field-Naturalist* 120: 87-92.
- Slough, B.G. 2008. Northern boreal forest. Pages 62-64 *In* D.S. Pilliod and E. Wind, eds. Habitat management guidelines for amphibians and reptiles of the northwestern United States and western Canada. Partners in Amphibian and Reptile Conservation, Technical Publication HMG-4, Birmingham, AL. 139 pages.
- Slough, B.G. 2009a. Amphibian chytrid fungus in Western Toads (*Anaxyrus boreas*) in British Columbia and Yukon, Canada. *Herpetological Review* 40: 319-321.
- Slough, B.G. 2009b. Yukon Territory. Page 67 *In* D.H. Olson (coordinating editor), *Herpetological conservation in northwestern North America*. *Northwestern Naturalist* 90: 61-96.
- Smith, C.A.S., J.C. Meikle, and C.F. Roots (editors). 2004. Ecoregions of the Yukon Territory: biophysical properties of Yukon landscapes. Agriculture and Agri-foods Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia. 313 pages.
- Stebbins, R.C. 2003. A field guide to western reptiles and amphibians. 3rd edition. The Peterson Field Guide Series. Houghton Mifflin Co., Boston,

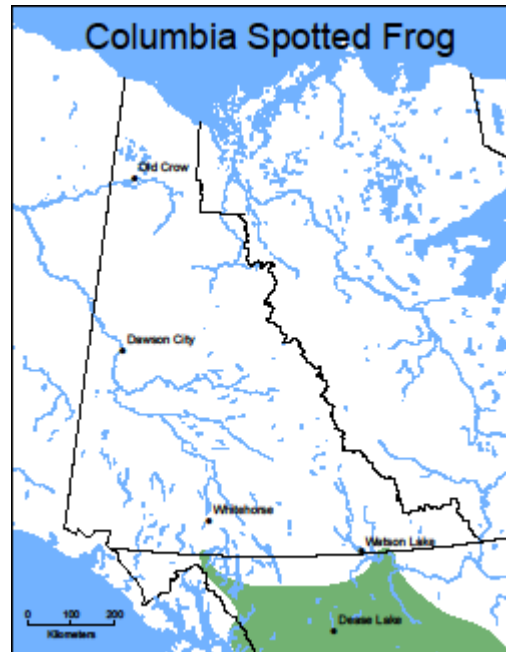
New York. 533 pages.

- Tessler, D. 2008. Arctic and Coastal Tundra. Pages 75-76 *In* D.S. Pilliod and E. Wind, eds. Habitat management guidelines for amphibians and reptiles of the northwestern United States and western Canada. Partners in Amphibian and Reptile Conservation, Technical Publication HMG-4, Birmingham, AL. 139 pages.
- Thoms, C., C.C. Corkran, and D.H. Olson. 1997. Basic amphibian survey for inventory and monitoring in lentic habitats. Pages 35-46 *In* D.H. Olson, W.P. Leonard and R.B. Bury, eds. Sampling amphibians in lentic habitats. Northwest Fauna 4: 1-134. Soc. for Northwestern Vertebrate Biology, Olympia, Wash.
- Wind, El and L.A. Dupuis. 2002. COSEWIC status report on the Western Toad *Bufo boreas* in Canada, in COSEWIC assessment and status report on the Western Toad, *Bufo boreas*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-31 pages.

Figure 1 Distribution of Amphibians in Yukon.



a) Wood Frog



a) Columbia Spotted Frog



b) Western Toad



b) Boreal Chorus Frog

Figure 2 Colour variations of the wood frog.





Figure 3 Columbia spotted frog.



Figure 4 Colour variations of the western toad.





Figure 5 Western toad tadpole aggregation in warm, shallow water.



Figure 6 Boreal chorus frog, may also be green or grey (photo S. Kinsey)



Figure 7 Shallow pond and meadows that are wood frog breeding, foraging and hibernating habitats near Whitehorse.



Figure 8 Beaver pond that is Columbia spotted frog breeding, foraging and hibernating habitat near the West Arm of Bennett Lake.



Figure 9 Shallow, silty backwater channel of the Coal River that is western toad breeding and tadpole rearing habitat (S. Cannings).



Figure 10 Roadside ditch that is boreal chorus frog breeding habitat in the La Biche River valley.

