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Four Seasons Environmental Centre



Reptiles and Amphibians

Herptiles

The herptiles, or herpetofauna, is the group of vertebrates that include all the reptiles and amphibians. Herptiles are found in a variety of habitats, from deserts to rainforest, even into temperate mountainous regions. The most important features in determining range and habitable biomes for reptiles and amphibians are temperature and water availability¹. These animals are ectothermic, meaning that they produce little body heat of their own, relying on the external environment to provide thermoregulation. Behaviours such as basking and seeking shade are critical to allow warming or cooling, and aids in maintaining moisture levels.



Differences between Amphibians and Reptiles

There are many differences between amphibians and reptiles. Amphibians have a more porous, membrane-like skin while reptiles have developed more keratinized and scaly skin which retains moisture. All reptiles have tails while salamanders are the only amphibian with tails. Frogs and toads are part of the order called anurans, which means “no tail”. Reproduction is also different between the two groups. Fertilization is external for amphibians, while it is internal in reptiles. The female amphibian lays a clutch of membranous eggs and the nearby male immediately fertilizes the eggs once they are laid. Reptiles also lay eggs, however, unlike amphibian eggs, reptile eggs are cleidoic (shelled) which create a stable environment for the developing embryo by protecting it from desiccation and physical damage. These eggs do not rely on water or moist environments to develop, as amphibian eggs do. Some species of snakes, such as garter snakes, retain the eggs until they hatch. These species are classified as “live-bearers”¹. These characteristics have allowed reptiles to utilize a larger variety of habitats than amphibians.

In Alberta, only 18 species of amphibians and reptiles are native to the province, made up of two species of salamander, three toads, four frogs, one turtle, one lizard, and six snakes¹. Though they are modest compared

to some exotic species, within these few species, there is a great diversity. No only are there representatives from the turtles, snakes, lizards, toads, frogs, and salamanders, but there is a great range in the type of habitats these species utilize. Most of these organisms are at the most northerly extent of their range, thus they must be able to tolerate our climate of extremes. Overwintering in extreme environments, such as Alberta winters, requires some special adaptations. Some species of amphibians and reptiles have behavioural adaptations, such as overwintering in large numbers or burrows that extend beyond the frost line. Physiologically, some are capable of supercooling and even freeze-tolerance.

In the Camrose area, we have 6 species of reptiles and amphibians: two species of snake, two species of frogs, one species of salamander, and one species of toad. The reptiles are represented by two species of garter snake, the plains garter snake *Thamnophis radix*, and the red-sided garter snake *Thamnophis sirtali parietalis*. The amphibians include the tiger salamander *Ambystoma tigrinum*, Canadian toad *Bufo hemiophrys*, wood frog *Rana sylvatica*, and the boreal chorus frog *Pseudacris maculate*.

Reptiles

The two species of garter snake, representing reptiles in this area of Alberta, overlap in their range in this region of the province, which can make differentiation between the two species difficult as they may appear similar and are found in similar habitats. They also are very similar in their natural history and behaviour. In this area of the province, a few mammalian and avian predators feed on snakes.

Plains Garter Snake *Thamnophis radix*

The plains garter snake *Thamnophis radix* is common in southeastern Alberta except in heavily urbanized areas. *T. radix* inhabits the short grasses of the prairies, aspen parkland, and somewhat in the boreal forest¹. Studies suggest that *T. radix* prefers areas with vegetation that is older (3-5 years) and not recently used as conventional crop land². In the province, they emerge from hibernation about mid-April until around mid-October if it remains somewhat mild. Adults reach 500-1000 mm, with ventral stripes variable in colour (from yellow, orangeish, greenish, or bluish) with black spots, yellow lateral stripes and dorsal stripes that range from orange to yellow. These snakes often live near ponds, marshes, ditches, dugouts and streams. This snake eats small invertebrates, such as snails, slugs, and worms, and also small birds and mammals, fish, amphibians and carrion. When *T. radix* is threatened, it may bite

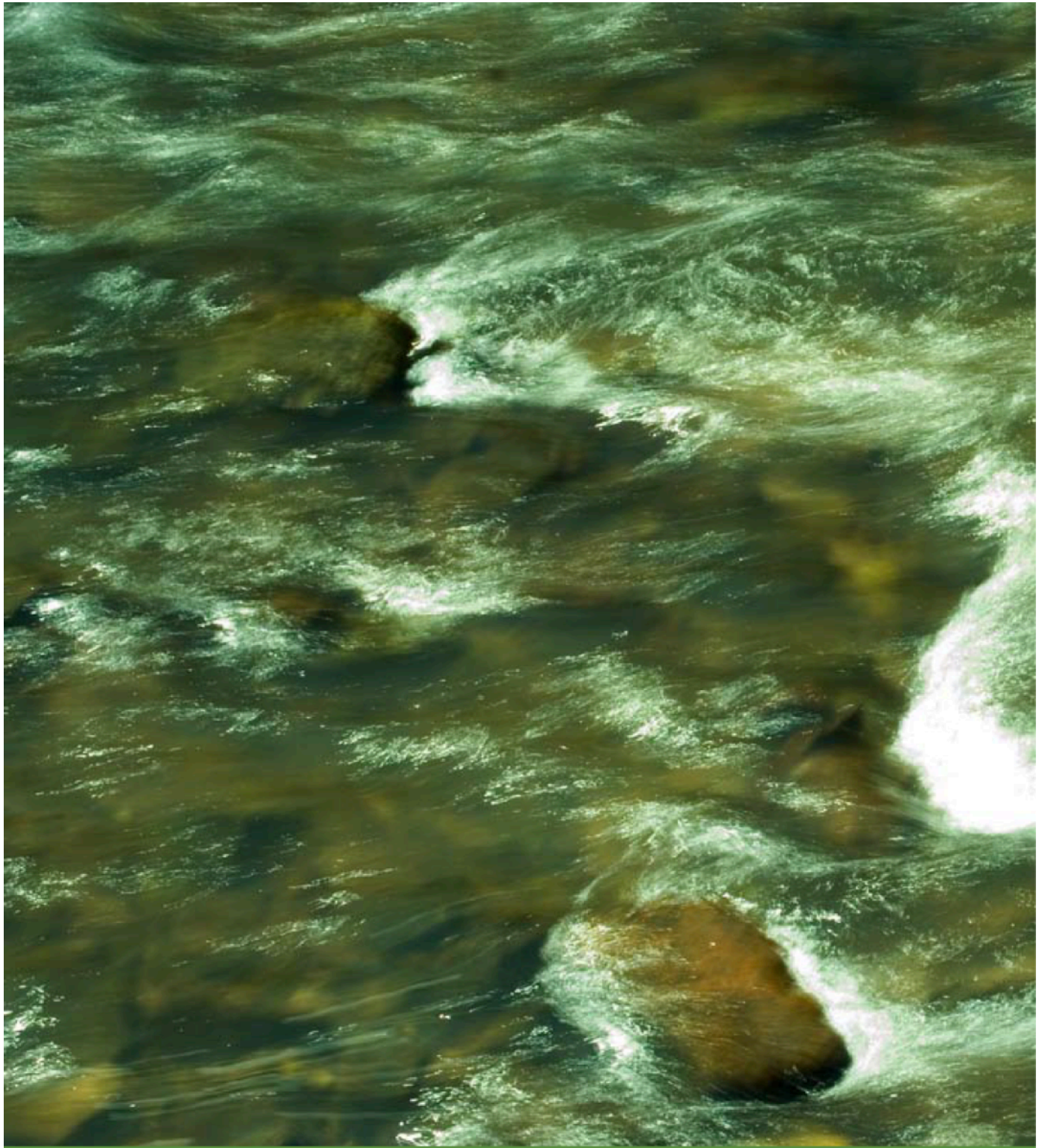
and/or smear the attacker with its foul-smelling secretions. *T. radix* is mildly venomous to order to immobilize prey. The venom may not affect humans, but the bites of garter snakes do hurt. Like most herptiles, *T. radix* uses mammal burrows, rock piles, and natural sink holes for hibernacula in the winter¹).

Red-sided Garter Snake *Thamnophis sirtali*

The red-sided garter snake *Thamnophis sirtali* (possibly of the subspecies *parietalis*) is common throughout the province, preferring the boreal forest and the aspen parkland. It is identified by the dark spots on the back and red to orange bars on the side. Vertebral and lateral stripes are variable in colour, from yellow, orangeish, greenish, or blueish. Adults range in size from 460 to 1300 mm. Like *T. radix*, *T. sirtali* emerge from hibernation about mid-April and head back to hibernacula around mid-October. This species often lives near ponds, marshes, ditches, dugouts and streams, eating invertebrates, such as snails and slugs, worms, but also small birds and mammals, fish, amphibians and other reptiles. They too are slightly venomous for prey immobilization, but, like *T. radix*, this venom poses no harm to humans. Like the plains garter snake, when the red-sided garter snake is threatened, it may bite and/or smear attacker with foul-smelling secretions. It may also flee to the water if harassed. *T.*



sirtali often travels great distances between the hibernacula and summer foraging areas, sometimes up to nine kilometers³. Such “migrations” in snakes is unheard of. *T. sirtali* over-winters in hibernacula in large numbers in the more northern limits of its range, often with thousands of animals³. In more extreme environments, such as in Manitoba (Alberta as well), snakes grow as much in three months as snakes in Montana do in five months³. This is due to the reduced growing season in the northern limits of range of *T. sirtali*³. Large numbers of reproductive adult snakes in hibernacula is a reproductive strategy: in a short growing season, not much time can be afforded to finding a mate. The males emerge first and sit in wait of the females. The females leave in small groups, and are mated as they leave. A similar strategy is employed by *T. radix*¹. Then the females disperse to summer habitat. They must often travel great distance to find a site available and suitable for hibernacula, which requires great energy expenditure. The immature, non-reproducing snakes over-winter in summer habitat to conserve energy¹.



Amphibians

The amphibians of Camrose are represented by four species. As is true with all amphibians, they rely on water for laying eggs and larval development. Some are able to reproduce in ephemeral water sources, and may prefer these sites. However, permanent water sources are the most reliable breeding areas⁴. Amphibians are primarily insectivorous, while some tadpoles may eat other tadpole¹. A variety of predators eat amphibians. Fish, some insect larvae, and some birds, prey on tadpoles and juveniles, while birds and some mammalian carnivores feed on adults¹.

Toads and frogs differ from other orders of amphibians in a few ways. They have no tails and are stouter. Their physiology is specialized for optimal locomotion in the form of hopping. They also have webbed hindlimbs (to varying degrees) for swimming in water. Amphibians have developed a voice box and an external tympanum (ear drum) located behind the eye. Males also usually have an air sac to amplify calls used in mating. Vocalizing is primarily done in mating season, in the spring. In some species there is a sexual dimorphism.

Though frogs and toads look similar in overall body morphology, there are some distinguishing characteristics that can be used to distinguish frogs from the toads. Toads are relatively stout, and have rougher, “warty” skin. Cranial crests are also present to some degree in toads, with parotoid glands that hold poison on either side of the head. Hindlimbs of toads are less webbed¹. Frogs generally are more slender with smoother skin with more webbing on the hindlimbs.

Tiger Salamander *Ambystoma tigrinum*

The tiger salamander, *Ambystoma tigrinum*, is one of the two species of salamander present in Alberta, but is the only one found outside the mountainous regions. It is found in the short-grass prairie, aspen parkland, boreal forest, and the sub-alpine regions. It is common in suitable habitats, though its range has been fragmented. This may have disrupted the natural range of this salamander¹. Tiger salamanders tend to prefer more mature vegetation that has not recently been used for cropland². Only a couple were found in surveys at Beaverhill Lake 1998-2000⁵. Adults grow up to 140-180mm, rarely reaching up to 200 mm. It has a large and robust body with unwebbed feet. This salamander gets its name from its blotched/banded coloration with yellow-white and black (or grey, dark brown or olive green). *A. tigrinum* is active from early spring to early fall, especially active in the spring rains. Though it can tolerate dry conditions, it is usually associated with ponds, small lakes, and dugouts. *A. tigrinum* overwinters in subterranean burrows the salamander excavates. It eats a diet of invertebrates: insects, molluscs, mites, and earthworms. This amphibian is also primarily nocturnal, spending days in burrows or other sheltered spaces¹.

Canadian Toad *Bufo hemiophrys*

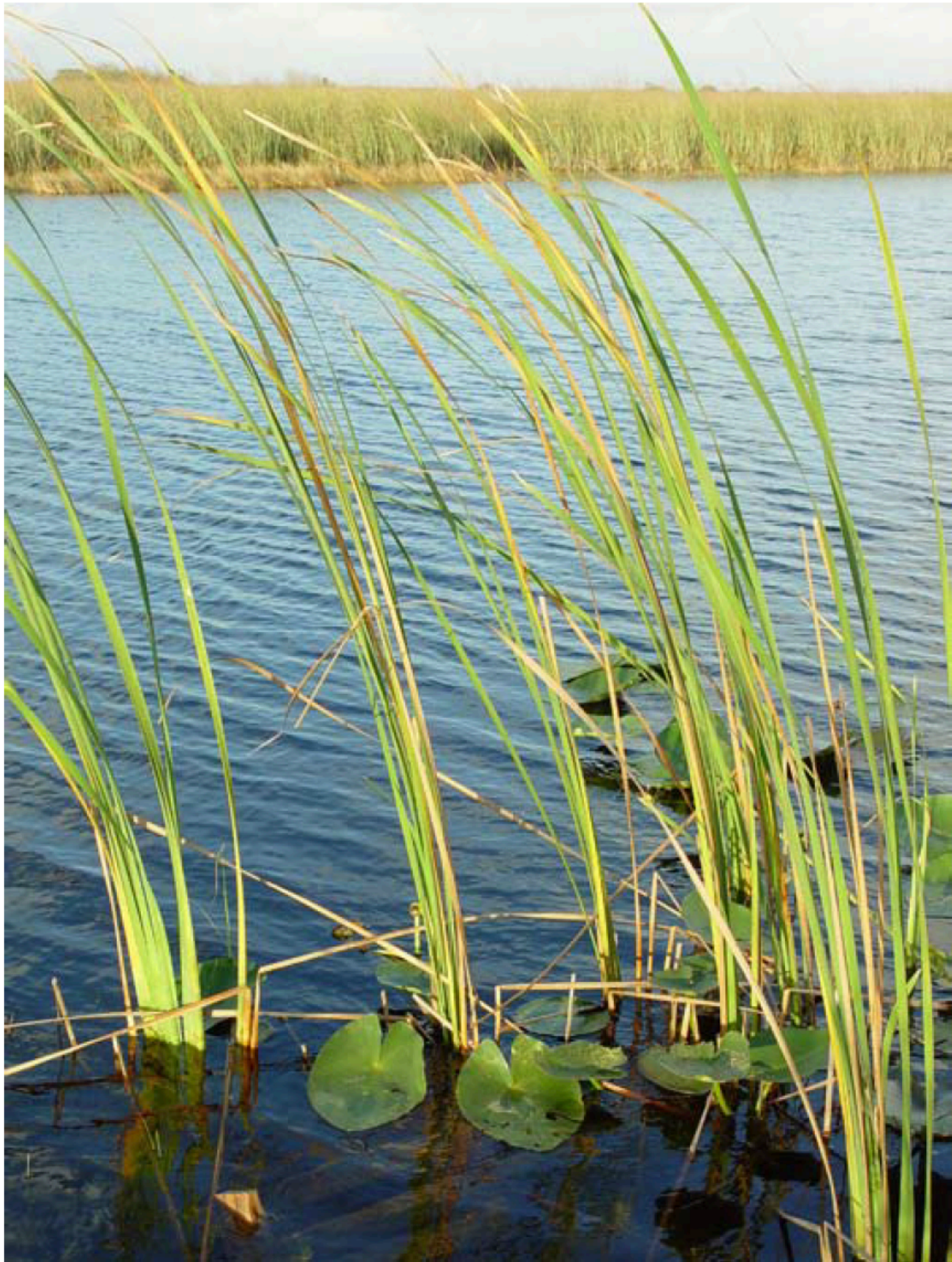
The only toad found in the Camrose area is the Canadian Toad, *Bufo hemiophrys*. It is found in the eastern half of the province except for the very arid areas of the southeast. *B. hemiophrys* occurs primarily in the boreal forest and aspen parkland. Numbers have declined in recent years due to habitat destruction, with no sign of recovery¹ In 1992, no Canadian Toads were found in any of the study sites, including sites northeast of Camrose¹. Two years later in 1994, no specimens were found in a survey conducted in the surrounding area². None were found nearby in Beaverhill Lake in 1998-2000 (Wilkinson & Hanus, 2003). In 1998, one was found in a survey at Lesser Slave Lake⁵. The toad has a short body (37-75mm) with its skin covered with small irregular warts. The colouration is grey-green to brown with a whitish vertebral stripe, and dark spots. This species of toad is diurnal, burrowing at night¹.

B. hemiophrys is more aquatic than other species of toads, spending about two months in and around water around breeding season. The call is a short trill repeated about every 30 seconds. After breeding season, individuals move upland⁴. This species overwinters in large numbers in burrowing sites⁴. In Alberta, adults move to hibernation sites around mid-September, with juveniles following shortly after. Spring emergence is around late April or early May. Adult males emerge first, followed shortly by the adult females. Juveniles emerge after the adults (Hamilton et al, 1998). Throughout Alberta, the size of the toads varies between populations. Toads in the southern part of the province are larger than frogs in more northern populations⁴.

Wood Frog *Rana sylvatica*

The wood frog, *Rana sylvatica* is widespread and abundant in most areas of the province with no evidence of decline. This species has been recorded in many studies done at Beaverhill Lake from the early 1990s to the present^{2,5}. It is the only North American amphibian whose range crosses the Arctic Circle. Adult frogs are 30-60mm in length. *R. sylvatica* is brownish with two light-coloured dorsal stripes and may also have a whitish vertebral stripe, with dark lateral spots. It also has a prominent dark brown or black facial mask bordered by white. This species is primarily diurnal, meaning it is active during the day, as opposed to many other species of amphibians. The call is made up of a series of higher frequency “grunts”, “chuckles” and “snores”¹. Adult *R. sylvatica* will also produce an escape scream if molested by a predator. During the mating season, it is found in open ponds, but largely terrestrial in the non-breeding season, preferring wooded areas¹. Males overwinter closer to the water, while females are further upland in wooded areas.

Wood frogs are very cold-tolerant and hibernate on land beneath plant litter. This species of frog employs freeze tolerance. This physiological adaptation is accomplished by the presence of cryoprotectants, carbohydrates that lower the freezing point of the cellular fluids. Other frogs may use glycerol in the same way. These cryoprotectants prevent the fluid from freezing at temperatures down to -6°C, and allow the frog to survive even with ice formation in two-thirds of the body (Russell & Bauer, 2000).



Boreal Chorus Frog *Pseudacris maculata*

The boreal chorus frog *Pseudacris maculata* (sometimes referred to as *Pseudacris triseriata maculata*) is abundant in all regions of the province. Boreal chorus frogs have shown no preference to vegetation maturity². Adults range in size from 20-40 mm. Colour ranges from grey to brown to green with three dark longitudinal stripes along the back. It frequents ponds, grassy pools, lakes, marshes and any other body of water, but may also climb into low vegetation. It breeds between April and June. The call is a short inflected trill, often a few together in a phrase. It sounds similar to the sound produced by a finger running down a plastic comb. It eats ground-dwelling insects, snails, millipedes, and other small invertebrates. This species overwinters in relatively dry conditions. *P. maculata* overwinters by employing freeze-tolerance (as similar to the wood frog, *Rana sylvatica*).

History and Conservation

Information on the historical range and population of amphibians and reptiles is scarce. Though changes in herpetofauna numbers were gradual, any significant changes were difficult to notice until recently for a couple reasons. The lack of historical knowledge, along with difficulties in distinguishing between the species, and the current abundance of a number of these species has made changes less obvious¹.

Despite the fact that some of the species of reptiles and amphibians found locally seem fairly common, there is a decline in herpetofauna numbers in Alberta and around the world¹. Due of their larger dependence on water, amphibians seem to be disappearing more substantially⁶; however, reptiles are also affected. No single issue is the cause of this decline, but is a result of a number of compounding factors.

All these species are habitat specific. Though they are widespread, they require specialized habitat. Most these species are abundant in the habitats left, but as habitat is changed, disturbed, and altered, this may change¹.

Loss of wetlands in Alberta due agricultural practices, development, or drought has had a substantial impact on amphibians that rely on water for reproduction and the first couple life stages². Loss of breeding habitat may be particularly damaging to a population as some species exhibit breeding site fidelity². Loss of important shoreline habitat is also an

issue. This can occur due to cattle ranching and recreational activities⁷. By allowing native vegetation to remain around wetlands, an appropriate microclimate for amphibians, notably wood and boreal chorus frogs, could be established².

Protection of hibernacula is also critical⁷. Destruction or disruption of hibernacula could result in whole populations being wiped out⁷. Some reptiles and amphibians cannot dig their own burrows, so they rely on burrows made from small mammals¹. Those with limited burrowing capabilities rely on muddy or moist soils. Thus, the conservation of the animals that burrow, or maintenance of the burrows, is vital in hibernacula protection. Some reptiles and amphibians, such as the red-sided garter snake, require large hibernacula to accommodate large numbers of reproductive adults¹. Some herptiles exhibit site fidelity to specific hibernacula¹, which means that any disruption could be lethal. Decreases in burrow availability due to agricultural disruption have been attributed to some possible population declines in amphibians². Some species utilize different habitats in the non-breeding and overwintering seasons. The impact of upland forest loss near wood frog breeding pools differs by season⁹. Habitat destruction near breeding ponds between November and March (in this region) might kill large numbers of wintering wood frogs, whereas similar activities at other times of year would not. This

would primarily affect females as they overwinter further upland from the males. Upland habitat loss during summer would still compromise the females who hibernate in wooded area. Habitat degradation, such as the removal of trees and vegetation, would eliminate the insulating layer of vegetation that some species use in overwintering². Garter snakes are currently common in the river valley in Camrose. However, if possible hibernacula sites are destroyed or disturbed, fewer snakes will be able to survive overwintering and numbers could decline.

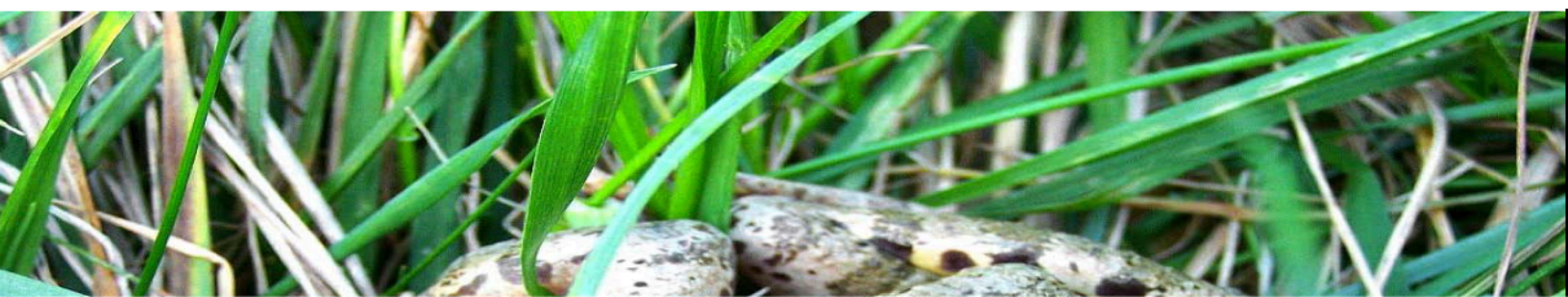
Fragmentation of habitat is also a problem for some species. Not only do populations get cut off by agricultural habitat destruction, but infrastructure such as highways and roads are problematic. Though individuals can attempt to cross these barriers, if it is along a migration route to or from breeding habitats, large numbers may be killed⁸.

Environmental degradation directly affects the reproduction of amphibians. Decreased water quality, through the input of hormone mimics, pesticides, and herbicides, affects the development of eggs and larvae. Hormone mimics disrupt developmental processes and metamorphosis^{1,2,3,4}. Due to the porous nature of the integument of amphibians, even adults are susceptible to water pollutants. Pollutants interfere with reproductive cycles and cell growth¹. Increased levels

of ultraviolet (UV) light from the sun, caused by the depletion of the ozone layer, also affects amphibians in all life history stages. Three species of amphibians in Alberta, one of which is the Canadian Toad *Bufo hemiophrys*, have demonstrated to be the most susceptible to UV radiation⁴. Runoff from livestock agricultural lands can introduce disease into the water system or wetland, which could decimate herpetofauna populations⁷.

Critical habitat for the reptiles and amphibians varies on the time of the year. Work is being done to conserve and re-establish some of these habitats that have been lost due to agriculture, development, and climate change. Work done by Ducks Unlimited and the North American Waterfowl Management Plan to restore wetlands has also helped to restore vital habitat for amphibians and reptiles². However, most species of local herptiles preferred older vegetation, with boreal chorus frogs being abundant in all ages of vegetation².

A recent article by Stevens et al (2007) indicates that beaver ponds are important in creating wetland habitat for amphibians. There was an increase in juvenile recruitment and the number of calling males in a



couple species of frogs when compared to unobstructed streams. Beaver ponds, especially older ones, provide good breeding habitats with warm and well-oxygenated water, enhancing growth. Beaver ponds may also decrease the number of predatory fish. Information of dam-building patterns could be integrated into forest management strategies to aid amphibian conservation.

Lack of information on previous populations and ranges is a large factor in not detecting declines in amphibians and reptiles earlier⁶. Accurately monitoring populations of herpetofauna is the only way to track population cycles and any long-term changes to populations^{6,7}. New methods are being employed as a means of counting amphibians. Previously, most surveys were conducted using pitfall traps⁶. Though this method is still useful for reptiles and other less vocal amphibians, amphibian calls are also being used to determine species and abundance⁷. Due to the visually cryptic nature of many amphibians, call surveys may be less invasive and may be more accurate when combined with other methods. Researching Amphibian Numbers in Alberta (RANA) conducted surveys at a number of designated locations around the province every few years.

Getting Involved with Herptiles

Alberta Conservation Association – Alberta Volunteer Amphibian
Monitoring Program (AVAMP)

<http://www.ab-conservation.com/frog/monitoring>

<http://www.srd.gov.ab.ca/fw/amphib/index.html>

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Researching Amphibian Numbers in Alberta (RANA)

<http://www.srd.gov.ab.ca/fw/amphib/RANA.html>