Western Toad Report: Tsolum Watershed

A guide to Western Toad life history, mortality, and management practices paired with community-collected observations

July 2026 - Tsolum River Restoration Society - by Georgia Veale

Table of Contents

Table of Contents **1**
Introduction **1**
Life Cycle 2
Migration Behaviour and Roads 2
Observations and Data **3**
Data Limitations 5
Road Mortality, Best Practices **6**
Conclusion **7**
References **8**

Introduction

Western toads, or Anaxyrus boreas, are a native species characterized by varying colour (green, brown, red, etc.) with dry skin covered with ‘warts’ glands of distasteful bufotoxin. Their undersides are usually pale and mottled. They are typically 5.5 to 14.5 cm from snout to vent with a lighter stripe along their back. Other identifiers include horizontal pupils and large parotoid glands behind the eyes (BC Frogwatch). There are two subspecies and 2 designateable units. The subspecies, the Boreal toad and the California toad, are delineated by their range but share no genetic dissimilarities. The two designateable units are the calling and the non-calling. The calling kind has a vocal sac for sound amplification and produces a loud mating call. The non-calling do not possess this vocal sac and only chirp to communicate. The calling unit inhabits only Alberta and the eastern margin of the Rocky Mountains. Therefore, this report will address only the non-calling unit and refer to the species as the Western Toad rather than the subspecies, the boreal toad. The range of this species stretches from the south of the Yukon, through British Columbia and western Alberta, down the west coast of North America into Mexico (Committee on the Status of Endangered Wildlife in Canada [COSEWIC], 2012). This species was designated as a species of Special Concern in 2002 by COSEWIC and listed under Schedule 1 of the Canadian Species at Risk Act (SARA) in 2005. In 2012, COSEWIC reconfirmed this designation and separated it into its two units, calling and non-calling. In 2018, Schedule 1 of SARA was amended to include this same division (Environment and Climate Change Canada [ECCC], 2020). In Canada, the general status of the Western Toad is Sensitive in all jurisdictions except the Northwest Territories, where it is classified as ‘May Be at Risk’ (COSEWIC, 2012).

Life Cycle

Western Toads begin their life cycle in late spring, as eggs in freshwater bodies, such as lakes, marshes, ponds, and wetlands. Eggs appear as single-file black pearls in translucent jelly and are

commonly found in highly vegetated areas (COSEWIC 2012). They metamorphose into tadpoles after 3-12 days, during which they will spend time in the water eating algae and detritus (BC Frogwatch). These tadpoles aggregate in groups and are small and fully black. While temperature dependent, they typically complete metamorphosis after 3 months, by August. Their next stage of life development is as juveniles or toadlets. Before migrating, toadlets are small, dark, and may retain their tail. They lack the warts and colour typical of adult toads. They migrate en masse from waterbodies into nearby forests to forage for food and spend their time until they reach sexual maturity. This is the first migration of their life cycle and is typically associated with rain events. It is 2-6 years until they are ready to reproduce, at which they return to the waterbodies and congregate in the shallow margins (Mahr et al., 2025; COSEWIC 2012; Deguise & Richardson, 2009). This is the second migration of their life. Females can breed 1-3 times in their life, but more typically breed only once; males may breed multiple times in a season (COSEWIC 2012). A breeding pair lays 3,000-17,000 eggs in less than a week (Mahr et al., 2025; Deguise & Richardson, 2009). During winter, they hibernate in mammal burrows below the snowline until the warmer temperatures of spring (COSEWIC, 2012).

Migration Behaviour and Roads

They are at higher risk from human activity because this species migrates en masse to forests as toadlets and as adults back to breeding sites (Mahr et al., 2025). They are known to travel large distances and may utilize roads as transportation corridors. Deguise & Richardson (2009) found that most toads in their sample that encountered a road stayed on or near it. They bask along edges, burrow in side-ditches, or use roadside culverts and edges for movement (Deguise & Richardson, 2009). Other factors may influence toad behaviour to seek out roads, such as seeking out abundant earthworms on roads after heavy rains (Ministry of Environment and Climate Change Strategy [ECCS], 2020). Gravid (i.e., egg-bearing) females appear to linger on or near warm asphalt, increasing their risk of being killed by vehicles, along with their eggs (Mahr et al., 2025). This risk increases when roads are placed near waterbodies toads migrate to and from to breed. The study also found that toad mortality increases with traffic volumes, which is common during the summer months when toadlet migration occurs (Mahr et al., 2025). As well, recreational activities pose a threat for the same reasons (Deguise & Richardson, 2009). These issues are exacerbated by other threats like amphibian chytrid fungus, climate change, and habitat loss/degradation/fragmentation (COSEWIC, 2012). This report identifies areas of high use for Western toads as well as management recommendations.

Observations and Data

Data were collected by the community via iNaturalist using the Automated Project feature. Western Toad observations (or subspecies Boreal toad) published within the Tsolum Watershed boundary were automatically included and organized within this project: ‘Tsolum Western Toads’. Annotations were added to denote the life stage of each observation, and heat maps were produced with this data using QGIS Kernel Density Estimation with a radius of 300 metres.

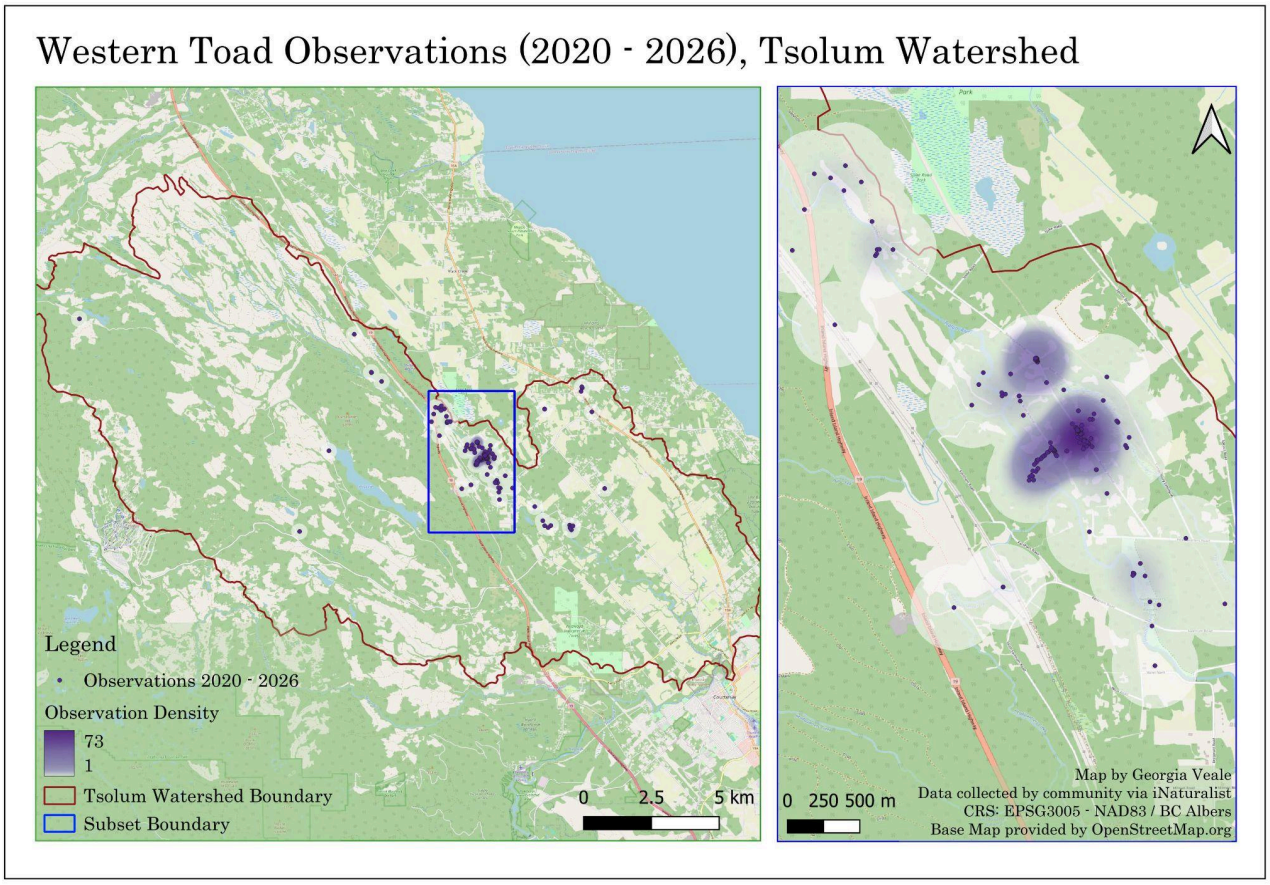
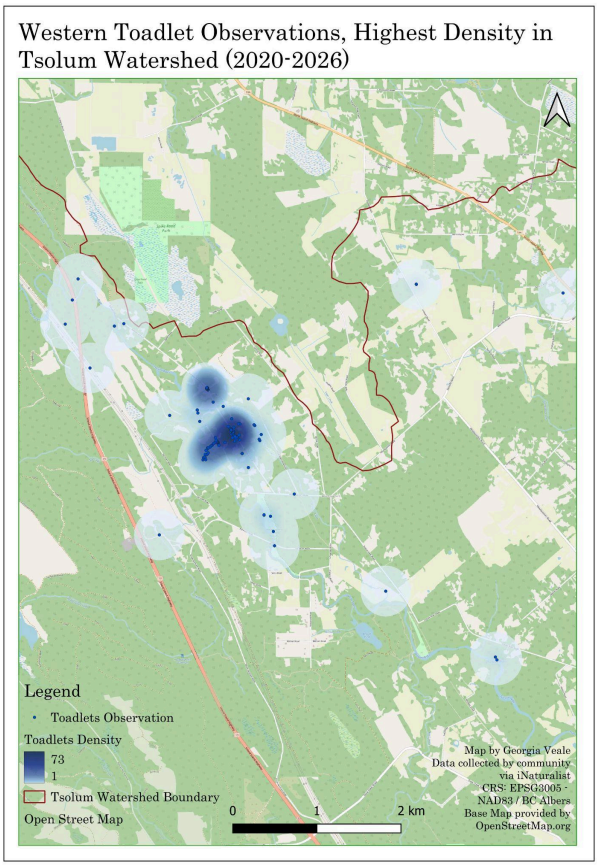


Figure 1 Total observations (2020-2026). The red boundary indicates the Tsolum Watershed. Area of greatest density indicated by blue subset (right).

The highest density of observations indicates which roads and trails are at risk for migration. According to our data, Railway Avenue (south of Spike Road), North River Avenue, and Tsolum River Commons Trail are areas of greatest density. Secondary hotspots include One Spot Trail, Railway Main, RWM100, and Headquarters Townsite Regional Park. The blue subset shows the areas of highest density in greater detail, shown in Figure 1. These densities are further delineated by lifestage, denoting hotspots for toadlets and adults in Figure 2.



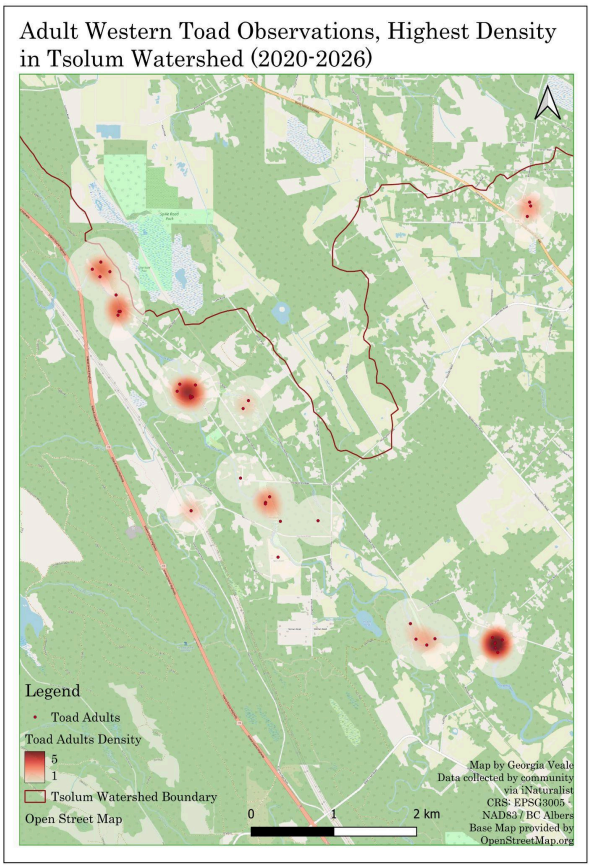
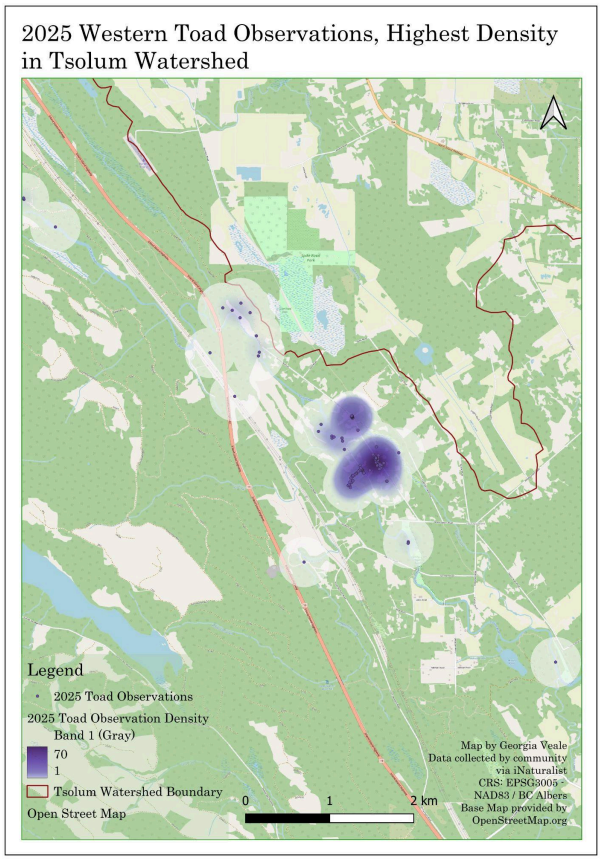


Figure 2 Hotspots for toadlets (left) and adults (right). Note the scale for hotspots differs between the life stages, toadlets are seen in densities up to 73 individuals while for toad adults the highest density is 5 individuals.



Data Limitations

The data for this report are limited to May 2020 to June 2026 and are skewed towards areas of higher pedestrian traffic and to people using iNaturalist. Other high-density areas of migrating toadlets and breeding adults are likely going unreported. The data often reflects a single observation for potentially multiple toad individuals when observed in large groups (such as mass toadlet migrations). The observations count as a single data point when the number of individuals could be much larger, further skewing the data.

Figure 3 Western toad observations for the entire period of 2025.

Road Mortality, Best Practices

Identifying key migration corridors and core habitat is the first step to protecting Western Toads. They should be set aside as “no disturbance areas” and include protected buffer zones. For wetlands, this should include 30 m from the high-water level. Limiting cycling and ATV recreation and reducing development and traffic are ideal measures to mitigate toad mortality (British Columbia Ministry of Environment [BCMOE], 2014). Utilizing fences and tunnels/culverts can decrease mortality in migration hotspots, where limiting traffic is unattainable (ECCS, 2020; BCMOE, 2014). Multiple tunnel forms can be implemented, though all should share the following characteristics to encourage use by Western Toads. To promote airflow and allow stable temperatures similar to outside, the tunnel’s width needs to be as wide as possible, and the length as short as possible. The more natural light within the tunnel, the more likely the use, which can be achieved by the above point or also by implementing grates. Amphibians prefer tunnels with high moisture levels due to their permeable skin and vulnerability to water loss; this can be achieved via grates, and consequently the tunnel should have a relatively level slope to prevent fast-moving water. A slight slope may be necessary to prevent water infilling. Amphibians are hesitant to use tunnels without natural substrate, such as local soil, branches, and sediment along its floor. This encourages use by mimicking the natural environment (ECCS, 2020). For further tunnel recommendations specific to amphibians, please see pages 38- 50 of ECCS (2020).

Implementing fences that divert individuals to these tunnels will also maximize use of tunnels/culverts, and prevent road mortality by creating a physical barrier between the toads and the road. The fencing should be either level with the road (with a downstep on the environment side) or use ramps so animals that are caught on the side of the fence with the road can bypass it and move back to the natural environment (Figure 4). For amphibians, the recommended depth of the buried fence, excluding the bottom lip, is 10–20 cm; the recommended height of the fence, excluding the top lip, is 50 cm. The fencing should be oriented to cover as much surface area as possible and divert toads efficiently; see Figure 5 for configurations. As a note, the use of fencing should be limited primarily to mortality hotspots and sites between key habitats. The environmental effects of implementing fencing should also be considered by reviewing the tradeoffs and payoffs (ECCS, 2020). For fencing recommendations, please review pages 53-68, 73-75 of ECCS (2020).

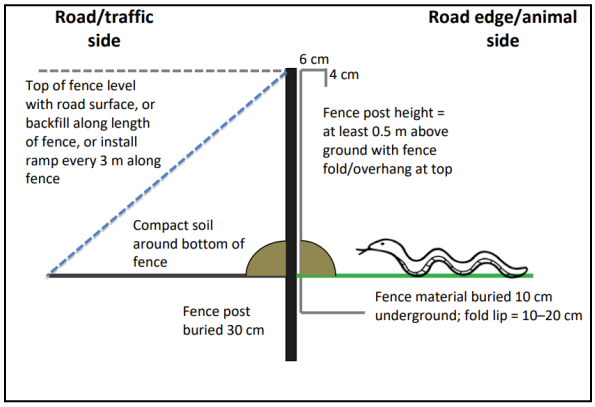


Figure 4 Fence design to prevent animal mortality using a reptile example (including measurements). Note the presence of ramps, infill, or leveling of road surface with top of fence, to prevent the trapping of animals on the road side. Sourced from ECCS p.56 (2020)

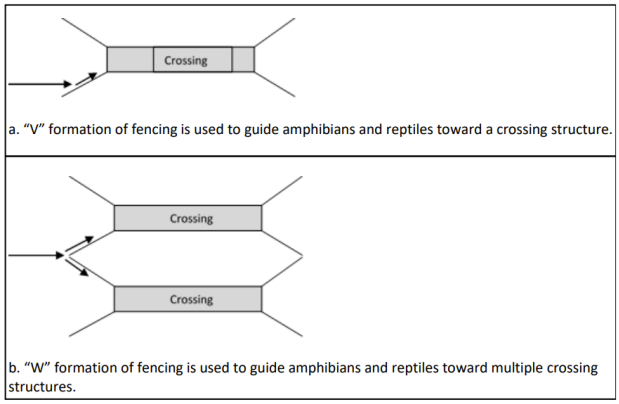


Figure 5 Fence orientation to crossing tunnels to maximize toad diversion. Includes fence orientation for one ("V" formation) or multiple crossings ("W" formation). Sourced from ECCS p.67 (2020).

Other methods of reducing road-related mortality include seasonal road closures (ie., when toad migration is identified), reduced speed limits, traffic calming (installing road features designed to reduce vehicle speeds without interfering with traffic flow), and implementing signage paired with public education campaigns (ECCS, 2020).

Conclusion

Continued monitoring, infrastructure and strategy implementation, and public education will help local governments and community groups better understand Western toad migration habits and reduce road-related mortality. As more observations are collected through this community initiative, Western toad hotspots will be better identified. We suggest protecting key habitat and hotspots with buffer zones. To reduce road- and recreation-based mortality, we can implement migration corridors with fences, tunnels, culverts, signage, and traffic-calming. The key areas of Railway Avenue (south of Spike Road), North River Avenue, and Tsolum River Commons Trail are considered the highest priority as they contain the highest density of migrating and individual toads. There are likely hotspots that are not being captured through community iNaturalist observations because A. The area is of low pedestrian traffic, B. The users of the area are not aware of iNaturalist or this Western Toad project, or C. Both. Mass summer migrations make toadlets particularly vulnerable to vehicle and recreational traffic as they move from breeding waterbodies to terrestrial foraging grounds. These threats are compounded by climate change and amphibian chytrid fungus.

References

British Columbia Ministry of Environment. (2014). *Western toad: Fact sheet #13* (Develop with care: Environmental guidelines for urban and rural land development in British Columbia). https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/best-management-practices/develop-with-care/fact-sheet-13-western-toad.pdf

BC Frogwatch, British Columbia Ministry of Water, Land and Air Protection. *Western toad* (Bufo boreas). https://www.env.gov.bc.ca/wld/documents/westerntoad.pdf

COSEWIC. 2012. *COSEWIC assessment and status report on the Western Toad in Canada*. Committee on the Status of Endangered Wildlife in Canada. Ottawa.

Deguise, I., & Richardson, J. S. (2009). Movement behaviour of adult western toads in a fragmented, forest landscape. *Canadian Journal of Zoology*, *87*(12), 1184-1194.

Environment and Climate Change Canada. 2020. *Management Plan for the Western Toad (Anaxyrus boreas), Calling and Non-calling populations, in Canada*. Species at Risk Act Management Plan Series. Environment and Climate Change Canada, Ottawa

Mahr, M. H., Marshall, N. D., Marley, J., Wyse, S. K., McCrory, W. P., & Tyson, R. (2025). Modelling road mortality risks to persistence of a Western Toad (Anaxyrus boreas) population in British Columbia. *Canadian Journal of Zoology*, (ja).

Ministry of Environment and Climate Change Strategy, 2020. Guidelines for Amphibian and Reptile Conservation during Road Building and Maintenance Activities in British Columbia. Version 1.0., March 30, 2020