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# THE CANADIAN HERPETOLOGIST / L'HERPÉTOLOGISTE CANADIEN



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# THE CANADIAN HERPETOLOGIST/ L'HERPÉTOLOGISTE CANADIEN

The Canadian Herpetologist (TCH) is an annual publication of the Canadian Herpetological Society. Correspondence should be addressed to the Editors. *Opinions expressed by authors contributing to The Canadian Herpetologist are not necessarily shared by the publication, its editors, or the Canadian Herpetological Society.*

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Cover photograph of a Northern Dusky Salamander (*Desmognathus fuscus*) taken by Joe Crowley during the fall of 2022 in Fredericton New Brunswick.



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**INSTRUCTIONS FOR AUTHORS**

All submissions should be relevant to Canadian herpetofauna or other topics related to Canadian herpetology. Submissions by Canadian herpetologists about research or programs they have been involved with outside of Canada are also considered for publication. Please submit:

- Citations of recent (within the last 2 years) publications relevant to Canadian herpetology that have not already been listed in TCH. If the publication was "in press" in the previous issue, we will re-list it

in the upcoming issue with the full citation information

- Abstracts of student theses (4th year, M.Sc., Ph.D.) that have not already been listed in a previous issue of TCH
- Feature articles on topics such as ecology, genetics, taxonomy, conservation issues, field techniques, recovery programs, etc.
- Field notes outlining the results of recent herpetological work
- News, announcements, job postings, collaboration opportunities or any other information that may be of interest to Canadian amphibian and reptile researchers and conservation practitioners
- Photographs and art
- Book reviews

Please e-mail your submissions as MS Word documents with photos attached separately as JPEGs to the Editors (thecanadianherpetologist@gmail.com).



**EDITORIAL NOTES**

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Welcome to another edition of The Canadian Herpetologist (TCH) the annual newsletter of the Canadian Herpetological Society (CHS). We endeavor to bring you reports, notes and information about amphibians, reptiles and those humans that study them from across the country. For the past several years this has been even more important to maintain a sense of community as we have not been able to meet in the fashion that we have become accustomed to over the history of CHS and CARCNET before it. We feel considering the conditions that as a society we have done this quite well through this publication, social media as well a number of online conferences and forums organized by a wonderful group of hardworking volunteers.

This felt like a slow return to normalcy or at least a reasonable facsimile for many of us. That is not to say global issues have subsided. The world is still

very much in flux with individual, national and ecological suffering still common and likely that will be the case for many in the foreseeable future. We occupy a wealthy, stable country where we can pursue our niche obsessions and some can even make a career of it. This statement is not meant to inspire guilt or shame but joy at our good fortune and an admission that we have it pretty good relative to many.

Reviewing all the amazing submissions and traveling to Fredericton N.B. this year for an in-person conference was a wonderful reminder of how things are returning to normal and the how good we do have it. Many students who attended in-person and online have spent much of their academic careers in pandemic restrictions but persevered and produced incredible research. The passion for conservation and for knowledge by CHS members remains inspiring and the love of species and natural history is a delightful reminder as to why this group continues to grow.

In this issue of the TCH (Sorry it's a bit late...again) we have a number of interesting articles and notes as well as thesis and citations that our communities have produced recently. We hope this newsletter brings you enjoyment and some connectivity with a community that shares your interest/obsession across a very big country.



Greater Short-horned Lizard (*Phrynosoma hernandesi*). Photo by N.A. Cairns.



## MEETINGS

*TCH will post announcements about upcoming herpetological meetings and provide reports of recently-held meetings.*

## Canadian Herpetology Society 2022 Conference and Annual General Meeting

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The 2022 Canadian Herpetological Society (CHS) conference and annual general meeting was held as a hybrid meeting from 16-20 September. In total 108 people attended the conference with 77 making the trip to Fredericton and 31 joining virtually. Attendees represented all of the Canada provinces, the United States, and from as far away as Australia. It was an absolute joy to see so many people reconnect and new connections be made over the four days.

The conference kicked off Friday with a workshop on Community Science lead by Hannah McCurdy-Adams and Dr. James Baxter-Gilbert. The workshop presented a series of case studies and included a tutorial and open discussion. With 40 in person attendees and several more joining online it was a resounding success. After the workshop, we took advantage of sublime conference timing and had our evening social at the Harvest Music Festival downtown Fredericton. We wandered the closed streets, listened to live music, enjoyed the buskers, and a lucky few saw Blue Rodeo and The Sheepdogs perform.

Saturday morning the conference opened with a welcome and opening remarks from the local organizing chair, Dr. Chris Edge, and the current CHS president Dr. Pamela Rutherford. The first Keynote speaker was Dr. Don McAlpine who delivered a wonderful talk entitled "Ever the humblest plodder": Philip Cox and the rise of scientific herpetology in Maritime Canada 1898-1970. Dr. McAlpine took us on a fascinating journey detailing the significant contributions New Brunswick's early herpetologists made to the field, connecting the past work to his current work on the herpetological fauna of New Brunswick.

We then began our first of six contributed talk sessions to be given over two days which included 52 oral presentations (34 platform, and 18 lightning talks) with a good mix of in person and virtual talks. The content of the talks was incredible, particularly talks given by students which demonstrate how gifted the next generation of herpetologists in Canada are. Facilitating a fully hybrid meeting was led by the amazing Dr. Pamela Rutherford with assistance from Dr. Julia Riley and Damien Mullin. During lunchtime on Saturday a workshop on Equity Diversity and

Inclusion was hosted by Briar Hunter, and the formal conference day wrapped up with 8 poster presentations.

The always well attended banquet was held Saturday night. While we ate our dinner our second keynote speaker, Dr. Georgia Ward-Fear, joined us from Australia to deliver an absolutely enthralling talk, *Dancing with Danger: using taste aversion to conserve reptilian predators in Northern Australia*. Dr. Ward-Fear told us about her research, collaborations with Indigenous peoples, and early success training predators to avoid eating invasive cane-toads. Dr. Ward-Fear's talk sparked great conversation, questions, and inspired us to do better.

No banquet would be complete without awards, Dr. Don McAlpine was awarded the Blue Racer award for his lifetime of academic and conservation work on amphibians, reptiles, and almost every other taxa in New Brunswick and Canada. Dr. McAlpine was given a temporary, stand in award at the banquet. The Silver Salamander award was given to Dr. Maureen Toner for her excellent contributions to the conservation of amphibians and reptiles in New Brunswick. For bios of both award winners please see the News and Announcement sections of this issue of the TCH. The banquet concluded with the always competitive Herp Quiz delivered by Steve Marks. Steve pushed our knowledge to the limit with questions on how many lizard species are found in Canada, and what toe is the long toe on the long-toed salamander.

Following the last talk, the CHS annual general meeting was held with 36 attendees in person and 14 online. The big accomplishment for 2022 was the hybrid conference, with options to join online or in person. Members were also informed of upcoming elections for three vacancies on the Board of Directors, to be held later this year. Committee updates and the report from the Treasurer confirmed that CHS is an active society, with many ongoing initiatives and a healthy bank balance. Planning for the 2023 and 2024 conferences were discussed, with CHS looking to be central next year (Ottawa 2023) and out west in 2024 (somewhere in the Prairies ... details TBD).

The CHS conference wrapped up with a field trip organized by Shaylyn Wallace and Dr. Greg Jongsma. A tour of Hyla Nature Preserve, the first Amphibian Park in Canada, and Odel park enticed 41 herpetologists out for a day of herping and exploring. With beautiful fall weather the participants saw several native herps including Northern Dusky Salamanders and Eastern Painted Turtles, not to mention some of the oldest trees still standing in New Brunswick. A wonderful way to wrap up.

Overall, CHS2022 was a resounding success, the local organizing committee was sad to see everyone leave. A huge thank you is owed to members of the LOC who went well above the call of duty, Dr. Graham Forbes, Hannah McCurdy-Adams, Dr. Julia Riley, Dr. James Baxter-Gilbert, Dr. Constance Browne, Damien Mullin, Dr. Amanda Bennet, and Dr. Pamela Rutherford.

We would also like to thank our gold sponsor, Little Rays Nature Centres, our silver sponsors JD Irving Woodlands, ACO, and Natural Resource Solutions Inc, and our bronze sponsors 8Trees Inc and ECOKARE International. The conference would not have been possible without their generous support.

If you missed any of the talks, please subscribe to our YouTube channel - [Canadian Herpetologist](#).



## FEATURE ARTICLES

### Update on the CHS iNaturalist project to document amphibians and reptiles on roads

David Seburn

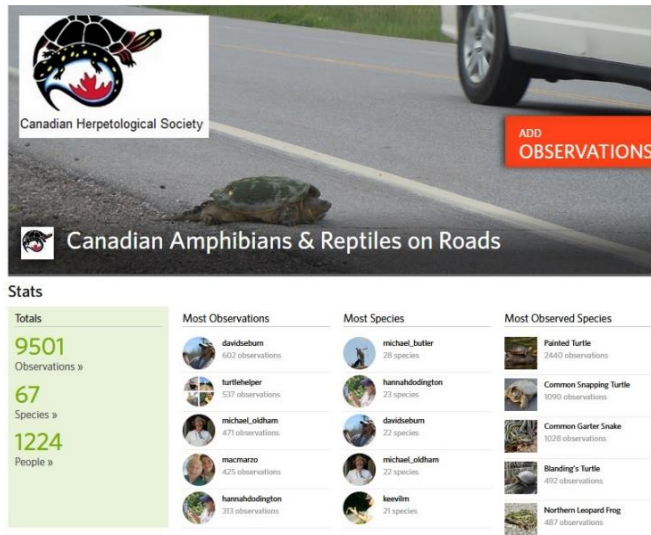
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In the last issue of this newsletter, I introduced a new initiative by the CHS conservation committee to create a project on iNaturalist Canada to collate observations of amphibians and reptiles (alive or dead) on roads: Canadian Amphibians and Reptiles on Roads (CARR, Figure 1).

Such data can have many uses. For example, these observations can be valuable for future status assessments of species to help determine whether roads are a widespread and significant threat to that species. The observations can also be useful for helping to identify areas where amphibians and reptiles are commonly found on roads (hotspots), while recognizing that the data collected may be biased by a few keen observers in one area. The data can also be used by researchers to answer a variety of questions.

What has changed in the last year? Over 2000 observations were added to the project from October

2021 to October 2022 increasing the total number of observations to more than 9,500. Not all of these new observations were from 2022, they also include older observations recently added to iNaturalist or recently added to the project. There are still likely hundreds of observations of herps on roads from the past that have not been added to the project. There are now observations of 67 species of amphibians and reptiles on roads made by more than 1,200 people. Reptiles continue to make up almost 80% of the observations and over 80% of observations are from Ontario. The top 5 species found on roads have not changed since last year, although the rankings of these species has changed (Figure 2). Unsurprisingly, the widespread and abundant Painted Turtle is still clearly in first place. Over 400 observations of Painted Turtles on roads were added in 2022 alone. The Snapping Turtle moved into second place, pushing the Common Gartersnake into third place, and the Blanding's Turtle narrowly moved into fourth place, although we should really call it a tie with the Northern Leopard Frog.



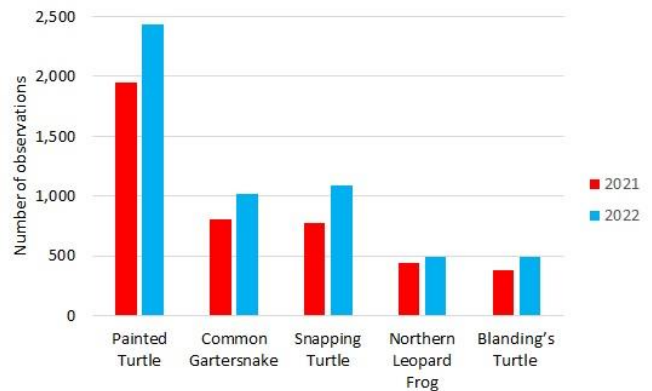
**Figure 1.** Canadian Amphibians and Reptiles on Roads, an iNaturalist project created by the CHS conservation committee.

If you make use of iNaturalist, please consider joining the project and adding your own observations of amphibians and reptiles on roads, alive or dead, to the project. Check out my article in last year's issue for tips on how to add large numbers of your observations to a project at once.

I have also recently learned of some great iNaturalist search tools. I had bulk added all of my DOR and AOR tagged observations to the project but I knew I probably had missed some observations that I neglected to tag with those terms. It turns out it is easy to search

through all of your records on iNaturalist and find ones not added to a given project. It is then easy to scroll through those observations and add those with photos of herps on road to the CARR project. By using this search function, I found about 50 more of my observations to add to the project. This has to be done on a computer, not a phone. Log in to iNaturalist and then enter the following link into the search bar. Replace "YourName" with your iNaturalist username.

[https://inaturalist.ca/observations?iconic\\_taxa=Amphibia,Reptilia&not\\_in\\_project=canadian-amphibians-reptiles-on-roads&place\\_id=6712&subview=map&user\\_id=YourName](https://inaturalist.ca/observations?iconic_taxa=Amphibia,Reptilia&not_in_project=canadian-amphibians-reptiles-on-roads&place_id=6712&subview=map&user_id=YourName)



**Figure 2.** The top 5 species in the Canadian Amphibians and Reptiles on Roads iNaturalist project in 2021 and 2022.

You can also search through all records of a specific species and only display observations not part of our project. Here is the search string for the Bullsnake:

[https://inaturalist.ca/observations?place\\_id=6712&taxon\\_id=60347&not\\_in\\_project=canadian-amphibians-reptiles-on-roads](https://inaturalist.ca/observations?place_id=6712&taxon_id=60347&not_in_project=canadian-amphibians-reptiles-on-roads)

To search for a different species just replace the taxon ID number with the number for the desired species. To find that number for any species simply search for the species by name on iNaturalist and the taxon id number will be visible in the web address.

It is also possible to search for herps on roads that are not part of the CARR project but in a given province or territory. Here is the link for searching for British Columbia records:

[https://inaturalist.ca/observations?place\\_id=7085&iconic\\_taxa=Amphibia,Reptilia&not\\_in\\_project=canadian-amphibians-reptiles-on-roads](https://inaturalist.ca/observations?place_id=7085&iconic_taxa=Amphibia,Reptilia&not_in_project=canadian-amphibians-reptiles-on-roads)

To search a different province or territory just enter the appropriate place ID number into the web address. To find the place ID just enter the name of the province or territory into the location box near the top right of the screen. The place ID number will appear in

the web address at the top of the page. If you enjoy browsing through iNaturalist observations I think you will enjoy using some of these search tools.



Western Tiger Salamander (*Ambystoma mavortium*). Photo by N.A. Cairns



## Filling Knowledge Gaps to Inform the Restoration and Conservation of Turtle Habitat in Greater Sudbury

Dan Guinto and Miranda Virtanen

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The Junction Creek Stewardship Committee (JCSC) has recently revived turtle research in the Junction Creek Watershed in the Greater Sudbury area of Ontario. We are conducting a collaborative study in partnership with Laurentian and McMaster Universities to fill scientific data gaps and identify the usage and quality of turtle habitat to guide ecological restoration and promote the recovery of Blanding's Turtles. This study complements prior research conducted in 2013, 2014, and 2019; filling important knowledge gaps about populations near the species' northern range limit. The project is undertaken with the financial support of the Government of Canada provided through the federal Department of Environment and Climate Change.

Turtles in Greater Sudbury encounter similar conservation threats as other urban turtle populations, however, they have other, unique challenges to face. Greater Sudbury is in a state of ecological recovery from historic logging and mining practices. Regreening

efforts have been transforming a black, barren landscape back to functional ecosystems, resulting in the return of wildlife, including turtles. Turtle conservation in Greater Sudbury requires assessing critical habitat and prioritizing restoration and mitigation efforts according to the level of quality and species use. A habitat that we are particularly interested in, is the sparsely vegetated, black rock outcrops that Blanding's Turtles use for nesting.



Figure 1. Blanding's Turtle captured during turtle research study in Sudbury, Ontario (2022). Photo by D. Guinto

The 2022 field season kicked off a bit late in Mid-August upon the arrival of funding. Over a month of field work, Junction Creek Stewardship Committee staff completed 616 trap nights at under-sampled sites, resulting in 23 unique individuals: 4 Blanding's Turtles (*Emydoidea blandingii*; Figure 1), 1 Common Snapping Turtle (*Chelydra serpentina*), and 18 Midland Painted Turtles (*Chrysemys picta marginata*). Students from local environmental programs volunteered with the project and gained valuable hands-on field experience. All 4 Blanding's Turtles along with 5 adequately sized Midland Painted Turtles were fit with radio transmitters and will continue to be tracked frequently until they begin brumation so that wintering habitat can be identified (Figure 2). Project results will be used for site-specific habitat restoration and conservation efforts for the improvement and management of critical habitat to meet recovery needs of Blanding's Turtles in Greater Sudbury.

In addition to field research, the Junction Creek Stewardship Committee has been delivering free outreach programs to spread conservation messages and promote community science. We hosted a turtle information session with Science North, provided outreach at local community events and delivered interactive educational programs at schools to educate

the public and youth about the importance of turtle conservation and community science.



**Figure 2.** D. Kennis-Nadon and D. Guinto conducting turtle radio-telemetry surveys in Sudbury, Ontario (2022). Photo by Junction Creek Stewardship Committee



### Late-season brooding in Eastern Red-backed Salamanders (*Plethodon cinereus*)

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The Eastern Red-backed Salamander (*Plethodon cinereus*) is a widespread and fairly common plethodontid (lungless salamander) in Northeastern North America (Petranka 2010). In Canada, it is found

in appropriate habitat throughout Nova Scotia, New Brunswick, and Prince Edward Island, and across southern Quebec and Ontario, up to around 50 degrees North latitude (Atlas des amphibiens et reptiles du Québec 2022, Ontario Nature 2020). It is famously abundant in good habitat, estimated to account for more than half the vertebrate biomass in some Northeastern forests (Burton and Likens 1975). As a consequence of this sheer natural abundance, it is highly significant in terms of ecology.

Within its range in Eastern Canada, *Plethodon cinereus* is the only salamander that breeds entirely on land, whereas other species require water in some fashion - permanent water, temporary ponds, or streams. As such, it is able to exploit a wider range of forested habitats away from specific water features, and unlike other species, it can persist in remnant forests if those microhabitat features are lost (Harding 1996). *P. cinereus* typically lays eggs in June through early July, but occasionally as late as August (Petranka 2010). With an average incubation of six weeks, most young hatch in August through early September (Petranka 2010), not unlike many other reptile and amphibian species found in southern Canada. An apparently anomalous, late date for nesting was recorded near New York City in 1894, when a clutch of eggs was discovered on October 25<sup>th</sup> of that year (Sherwood 1895). This is the latest nesting date known, and until now the only one formally recorded in October.



**Figure 1.** A cut section of hardwood log adjacent to a campsite in Murphy's Point Provincial Park (Ontario) on 12 October 2020, under which three adult *Plethodon cinereus* were found, including one with a clutch of eggs. Photo by J. Mueller

On 12 October 2020, the author was at a campsite in Murphys Point Provincial Park in Ontario (approximately 44.779° N, 76.229° W, between Ottawa and Kingston). The campsite was situated in a mature second-growth forest composed primarily of deciduous

trees, notably Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), Bitternut Hickory (*Carya cordiformis*), and Hop-Hornbeam (*Ostrya virginiana*). Some cut sections of logs, presumed to be discarded firewood but possibly from a tree cleared nearby, were lying on a mat of Pennsylvania Sedge (*Carex pensylvanica*). Underneath one section of log (Figure 1), three adult *P. cinereus* were discovered, including one that was guarding a clutch of eggs (Figures 2). Two more adults were found under an adjacent section of log, also with eggs - either one clutch broken apart, or two smaller clutches (Figure 4). This is the second-latest date recorded for a nesting *P. cinereus*, and the latest date documented in Canada.

The spring of 2020 was particularly dry in Eastern Ontario. For example, Ottawa recorded 44.2 mm of rain in May, 88.7 mm in June, and 54.0 mm in July (Government of Canada 2022), versus averages of 92 mm, 102 mm, and 101 mm for those months respectively (climate-data.org 2022), only 63% of “normal”. Most of June was considerably dry, as the majority of that month’s precipitation (52.1 mm) arrived in a single rain event on 5 June (Government of Canada 2022). A consequence of this, observed in the field, was that many plants which normally flower or fruit during this time either did not develop, or aborted their fruits. Some of these plants re-flowered later in the season, at times much later than typical. Examples include Common Milkweed (*Asclepias syriaca*) and American Red Raspberry (*Rubus idaeus* ssp. *strigosus*) flowering in August at sites nearby, at a time when they usually have mature or well-developed fruit (pers. obs., see Mueller 2020). Whether the salamanders were affected in a similar manner by the year's climatic trends, and thus induced to nest much later than normal, is an open question.



**Figure 2.** An adult *Plethodon cinereus* guarding a clutch of eggs in Murphy’s Point Provincial Park (Ontario) on 12 October 2020. Photo by J. Mueller



**Figure 3.** Another *Plethodon cinereus* with eggs, 12 October 2020. In addition to the eggs visible to the left of the salamander, there are more eggs visible in a cavity just above it. It isn’t clear whether these are separate clutches, or one clutch that broke apart. Photo by J. Mueller

Presumably, eggs laid so late in the fall would be vulnerable to freezing, but as documented nesting at this time is extremely rare, this has not been studied. To assess these specific salamanders, a return to the same site in the spring of 2021 was planned, but had to be cancelled due to Covid-19 restrictions imposed at the time.

More detailed fall monitoring of *P. cinereus* populations may be warranted. Due to the energy expenditure required to develop a clutch of eggs, female *P. cinereus* in northern populations are believed to only reproduce biennially (Petranka 2010). Late-season nests that fail due to the onset of cold weather may have detrimental effects on the species’ reproductive capacity at a given site. However, if late-season nests are successful, they may provide the species with beneficial adaptability, either in the case of extended periods of warmer weather in the autumn, or as an adaptation mechanism to spring droughts. Given the ecological significance of the species to regional forests, a more complete and thorough understanding of the species’ biology is important, especially if it is prone to disruption from the effects of climate change.

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**Trent University currently considering action required to mitigate mortality risk to salamanders on campus during their spring migration**

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A distinguishing feature of the Trent University campus is the high amount of native biodiversity. At least eleven species of frogs, toads, and salamanders call our campus home. The local populations of amphibians enrich the lives of our students, play an important role in our teaching, and are regularly used in our research programs. Despite changes to the campus over time, these animals have been able to persist. In a way, this is a testament to the university's ability to find a balance between developing space as the campus expands and maintaining the green space and natural habitat required for these animals. Yet, some of the amphibian populations on campus need help in order to ensure their long-term viability. Specifically, a population of salamanders which breeds in a wetland just south of the Gzowski College building and west of Gzowski Way Rd. is currently facing significant mortality as a result of a curb which prevents migrating adults from reaching their breeding site. Instead, they end up crushed by cars on the road or falling into a storm drain. Addressing this problem is straightforward, but requires the university to modify the curb along Gzowski Way Rd.

The wetland adjacent to Gzowski College (part of the Nassau Wetland Complex, evaluated wetland ID: 126262440) is a high-quality, provincially significant marsh where at least 8 species of amphibian currently breed. Among these are Blue-spotted salamanders (*Ambystoma laterale*) as well as the unisexual *Ambystoma* who are reproductively dependent on Blue-spotted salamanders. These are large-bodied salamanders, reaching sizes up to 14-20 cm in length. In early spring (i.e., early to mid-April in Peterborough) they migrate to fishless ponds or wetlands from their underground overwintering habitat, usually on nights following heavy rains. During these migrations the adults are particularly vulnerable, especially if they need to cross a road in order to reach their pond. Once they reach the pond, the adults will mate and lay eggs then return to their terrestrial habitats after about 10-14 days. The eggs hatch into aquatic larvae which reach metamorphosis in late summer (usually July-August) and will then leave the pond to find a place in the surrounding terrestrial habitat to live. They reach sexual maturity after about 2-3 years and can live well over a decade. *Ambystoma* salamanders usually remain within about 300-400 m of their breeding pond, but can disperse up to ~1 km, and make annual or biennial migrations each spring to breed. As is the case for most reptiles and amphibians, mortality of breeding adults has the strongest negative impact on population size and roads which bisect their habitat present a significant threat.

The ~150m long, high curb running along the west side of Gzowski Way creates an impassable barrier for migrating salamanders, preventing them from reaching their breeding site during spring migrations from their terrestrial habitat located east of the wetland. Once the salamanders reach this curb, they walk along its length until they die of desiccation (drying out), fall into the stormwater drain, or wander back onto the road where they are crushed by vehicles (https://www.inaturalist.org/observations/111266700). A small number of salamanders may occasionally reach the northern edge of the curb where they can enter the pond. Failure to mitigate this issue will likely lead to the decline and local extinction of salamanders from this well-documented breeding site for *Ambystoma* salamanders on campus.



**Figure 1.** A salamander along Gzowski Way, prevented from reaching its breeding pond (April 2022). Photo by T. Hossie.

The salamanders which breed in this wetland would greatly benefit from a simple redesign of the curb adjacent to the breeding pond. Redesigning the curb into a ‘mountable’ or ‘rolled’ curb with a gentle slope (i.e.,  $\leq 45$  degrees) is the most practical solution to this problem. A ramp would allow salamanders and other wildlife to easily climb the curb and continue to the wetland, while maintaining its original purpose of preventing salt-filled runoff water from entering the wetland. Relative to other mitigation strategies, this is more cost-effective and easier to implement (Ministry of Environment and Climate Change Strategy, 2020). Installing an underpass or overpass is not only more expensive, but would fail to adequately manage storm water drainage. Moreover, it may not fully mitigate the barrier or road mortality due to the width of the area where salamanders may attempt to cross Gzowski Way (~150 m) combined with the general reluctance of salamanders to use crossing structures. Mountable curbs have been used effectively in other jurisdictions to mitigate similar issues with curbs as barriers for wildlife. For a recent example, see this article on

mitigation in Ottawa to assist snapping turtles: <https://ofnc.ca/conservation-2/victory-for-the-snapping-turtles>. We have now made this recommendation to the university, with support from the student societies here at Trent, including the Trent Herpetological Society and the Society for Ecological Restoration.



**Figure 2:** Salamanders unable to climb the curb walk along the curb until they die of desiccation, fall into the stormwater drain, or wander back onto the road where they are crushed by vehicles. (April 2022). Photo by T. Hossie.

Amphibians that migrate during breeding season face road mortality rates ranging from 18-95%. Even when the road mortality rate is as low as 10%, the population is at significant threat of extinction (Gunson *et al.* 2016). It is reasonable then to presume that the populations of salamanders, and other amphibians which rely on this wetland, have already been impaired. Without intervention the population will decline towards local extinction. Maintaining ecosystem health and biodiversity across campus is central to the goals and values of the Trent Nature Areas Committee, and Trent University has publicly stated their dedication to environmental stewardship. Replacing the current barrier curb by modifying it to a ‘mountable’ or ‘rolled’ curb clearly falls within the mandate of the Trent Lands and Nature Area Plan and would have lasting value for the animals which live there.

Thankfully, our initial meetings with representatives from the university have been promising.

They have acknowledged the issue and are currently looking at the price tag associated with replacing the full 150m stretch. The solution could also include improving the storm drain cover, and/or adding regularly spaced sloped portions opposed to replacing the full curb. We remain hopeful that the university proceeds with this mitigation effort, helping to ensure future generations of students (and salamanders) can continue to enjoy the greenspace on campus.

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Blue-spotted Salamander (*Ambystoma laterale*). Photo by K. Martin



### Overwintering larvae of long-toed salamander (*Ambystoma macrodactylum*) at northern latitudes (Alberta, Canada)

Emily A. Baumgartner and Heidi Wicker

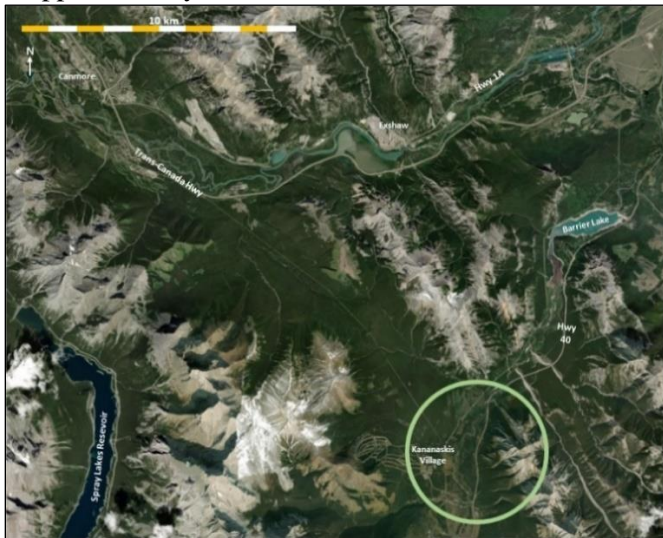
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The process of amphibian breeding, hatching, and metamorphosis is particularly difficult at northern latitudes. This is due to a relatively short window in which adults can breed and young can complete metamorphosis before frost comes. It is well documented that size at completion of metamorphosis in pond-breeding amphibians has significant implications on young's ability to survive the winter and develop into a healthy breeding adult (Werner 1986; Semlitsch *et al.* 1988). At lower latitudes and elevations, many pond-breeding amphibians postpone metamorphosis and remain in their natal pond through the winter. This enables them to increase in size and better prepare for terrestrial life, prior to emergence from their aquatic stage (Howard and Wallace 1985). However, this is not always possible at high elevations, at northern latitudes, and for species who use shallow, temporary ponds that aren't resistant to deep freezing or drying. In this article, we focus on a breeding population of long-toed salamanders (*Ambystoma macrodactylum*) living at 1400m elevation in southern Alberta, Canada (Figure 1). This population is of interest because some young have been observed overwintering in their larval stage during their first year of life, which is unusual in this region (Figure 2).

Early documentation of variation in life history characteristics of *A. macrodactylum* in western Idaho and Oregon, USA, suggest that adults breed at lowland sites (420-610m) from February-April, at mid elevation sites (1140m) in April, and high elevation sites (1500-2470m) during June-July (Kezer and Farner 1955; Howard and Wallace 1985). Documentation of breeding activity at higher latitudes (British Columbia and Alberta, Canada) is typically recorded in May, though

this varies based on elevation (Carl and Cowan 1945; Graham and

Powell 1999; Eaton and Hiltz 2012). In general, the length of this species' larval period is highly variable and heavily depends on the size, depth, elevation, and latitude of their natal site. At southern latitudes, this ranges from 3-26 months from low to high elevations respectively (Howard and Wallace 1985). Higher latitude populations (i.e., in Alberta), are presented with a unique challenge in relation to their southern relatives: their larval period is restricted by both a harsh winter likely to freeze their natal pond and a relatively cool, dry summer that impedes rapid development. This means that they have to develop quickly, metamorphose, and leave their pond without the help of warm rainy weather. As a result, they are uniquely challenged by size in their first few years of life. The larval period documented for long-toed salamanders living in Alberta is approximately 3 months (Graham and Powell 1999).



**Figure 1.** No exact breeding site locations are being published to maintain the security of long-toed salamanders in the region as they are at-risk. All 20 sites monitored on this project are included in this map area and are distributed along the Trans-Canada Highway, AB Highway 1A, and AB Highway 40. The green circle (2.5km radius) gives the boundaries for an area which includes the main site of interest in this article where larvae overwinter in their natal pond as well as a typical breeding site within our study area. Both sites are at approximately the same elevation (1400m) but the larval period for the more-typical site lasts from late June to early August and young complete metamorphosis and exit the pond within the same year they were hatched. The map imagery was developed using Logan Earth (Porter *et al.* 2018)

This unique observation was made while conducting monitoring field work for a Ph.D. project (Ph.D. thesis: On the population trajectory of at-risk long-toed salamanders, *Ambystoma macrodactylum*, in and around the Bow River Corridor, *in progress*) at ~20

breeding sites (Figure 1). This work focuses on assessing the status of the species in this region, measuring the health of these breeding groups, and identifying relationships among them through immigration. Trapping for this project is conducted during the breeding season and larval period at most sites: 4 nights per alternating week using minnow traps checked every 24 hours. At most sites we've observed the breeding period beginning in late April or early May and larval period as lasting 8-12 weeks beginning in late June.



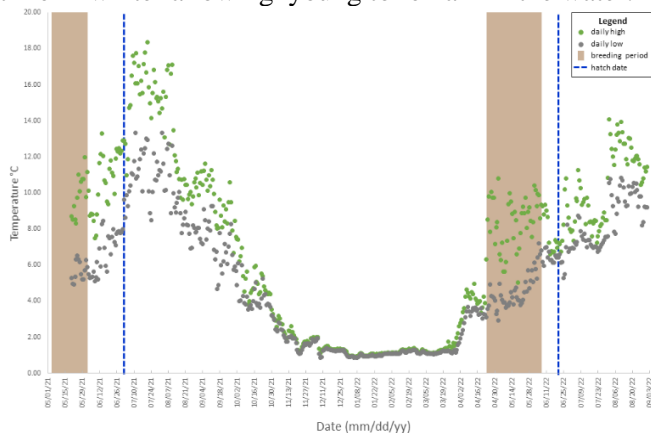
**Figure 2.** Photos showing size variation in long-toed salamander young at study site of interest. The two left individuals were captured in the same day (July 7, 2021) at the site of interest. The smallest individual (far left) is a newly hatched young-of-the-year at approximately 2 weeks post-hatching. The middle individual was likely hatched in late June of 2020 and overwintered in their natal pond. The individual on the right was captured on August 10, 2022, at a nearby site (within 5 km, within the circle on Figure 1) and is a newly metamorphosed young-of-the-year presented for size reference at this developmental stage.

During the first season of field work in 2021, we noticed that one site (out of 20) had large unmetamorphosed young in the pond during the first week of May. This observation was surprising given documentation of this species exiting the pond prior to their first winter in this area. Upon making this observation, we thought the occurrence of an early breeding event to be unlikely. We considered this because the preceding winter was relatively cold, and the young were quite late in their development as

compared to what would be expected from larvae in their first weeks of life (Figure 2). In total, we had 35 captures of nearly metamorphosed young (identified through five toes on the rear foot) between May 7, 2021 and July 7, 2021. We usually captured between two and four individuals per capture event but caught up to six in one day during 2021. On July 7 2021, we captured young hatched in 2020, and the first newly hatched salamanders of 2021 (Figure 2). During the 2021 season at this site, we did not capture any fully metamorphosed individuals, despite capturing fully metamorphosed individuals at other sites from mid-July through August.

During 2022, we again captured young approaching metamorphosis in the early season. Based on their size, these young were likely hatched in 2021. The first capture was on April 22, 2022 and the last was on June 24, 2022. During 2022, we captured between two and seven individuals per capture event and had 57 captures in total of young hatched in 2021.

In addition to our trapping, we installed a data logger (Onset HOBO Pendant® logger MX2201) in the pond to record water temperature every four hours. Because of shipping times, we did not install the logger until May 20, 2021, but the logger was left in the pond until our most recent data export on September 2, 2022. During this time, temperatures ranged from 0.86°C during the coldest winter months to 18.36°C at the highest in summer of 2021 (Figure 3). These temperatures were relatively cold compared to other sites in the dataset during the summer months but indicate that the pond was not fully frozen at the coldest time in winter allowing young to remain in the water.



**Figure 3.** Plot showing daily high and low water temperatures (°C) over time (May 20, 2021 to September 1, 2022) in long-toed salamander breeding pond. Temperatures were collected every four hours during the sampling period using Onset HOBO Pendant® logger (MX2201) placed in the deepest area of the pond. Breeding period is estimated between the first and last adult capture of the breeding season. Hatch date represents five days before the first larval capture of the season.

Long-toed salamanders are at-risk in Alberta (IUCN SSC Amphibian Specialist Group 2015; Alberta Environment and Parks 2016), and although larval salamanders were observed during the breeding period at one site in our study it may have significant impacts on the species' long-term trajectory in the region. The Researching Amphibian Numbers in Alberta (RANA) program is integral to the maintenance of long-toed salamanders in the region (Eaton and Hiltz 2012). In the program's most recent report, data analysis of age class assumed that amphibians in Alberta breed in spring and their young develop and emerge in mid-summer to fall (Eaton and Hiltz 2012). Because the monitoring program relies on this expectation, official monitoring may need to be adjusted if more ponds support overwintering individuals who are consequently larger upon completion of metamorphosis.

We plan to continue monitoring these sites within the 2023 breeding season and will continue to collect data on larval overwintering patterns. We are curious and eager to hear from other biologists and organizations working on the species at these latitudes. Together we could discuss and compile other instances of long-toed salamanders overwintering as larvae in order to understand the prevalence of this occurrence as well as potential environmental factors that support or limit this trait.

### Acknowledgements

We thank Steven Vamosi (University of Calgary) for supervision and support of the research that led to this observation.

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## Toads on the Plains Appear Mainly After Rains?

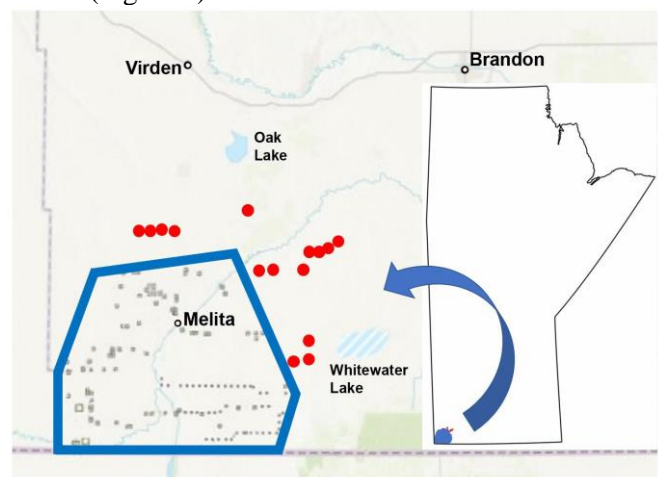
### Manitoba Great Plains toad survey, June 13-18, 2022

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Last spring was a very wet one in southern Manitoba, with heavy winter snows contributing to meltwater saturating the ground, followed by historic rainfalls across much of the south in May and June. This meant extraordinary numbers of temporary pools in even what are normally the driest parts of the province. This seemed an ideal time to reconsider a possible monitoring project aimed at Great Plains toads (*Anaxyrus cognatus*) that, like many amphibians, are reliant on temporary ponds. This work was originally planned to begin in spring 2019, but was first delayed by exhibit work that year, and then postponed twice more in spring 2020 and 2021 due to COVID-19 protocols. So you might imagine that I was anxious to get back into the field and see if I could remember what this species even sounded like!

Not a great deal is known about the biology of Great Plains toads (hereafter GPT) in Manitoba, although it is likely not too different than elsewhere in its range (see Graves and Krupa, 2005). Surveys have been performed almost yearly since 2014 by the Manitoba Conservation Data Centre over various portions of its known provincial distribution, limited to the extreme southwest (Figure 1, in blue), and augmented by surveys completed by others since its discovery in 1983 (Preston, 1986). Toads are usually detected in the first two weeks of June, although there have been years where they have not been relocated during this time; few surveys have been undertaken outside of this time period. I found GPTs and plains spadefoot toads (*Spea bombifrons*) calling in large choruses as late as June 29<sup>th</sup> in 2018 about 8 km ESE of Melita (Figure 2).

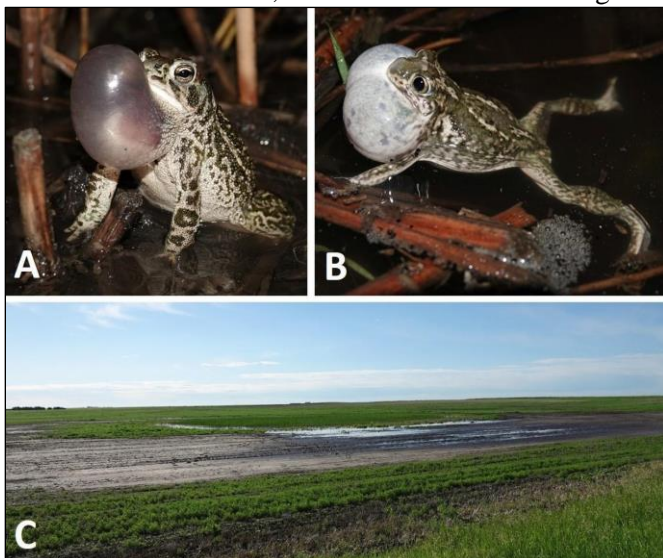


**Figure 1.** Map of known distribution of Great Plains toad (*Anaxyrus cognatus*) in Manitoba, shown as solid blue in inset of province, and as gray squares bounded by blue line in the enlargement. Red circles indicate new localities found June

13-18, 2022. Known distribution modified from mapped data provided by the Manitoba Conservation Data Centre.

One aim of this spring's five-night field trip was to locate large enough concentrations of GPTs for future placement of autonomous recording units that would sample calling periods throughout spring and summer. Calling periods will be correlated to weather variables captured via data logger. A secondary goal was to survey around the edges of the known distribution and determine if additional habitat is considered suitable by the toads themselves, or at least suitable this year with the unusual availability of temporary ponds. Finally, other anurans would also be noted. I was joined by Peter Taylor, Manitoba naturalist extraordinaire, who has written several articles on provincial herps, including range of extensions of gray treefrog (*Dryophytes versicolor*; previously *Hyla*, see Duelman *et al.*, 2016) in central-west Manitoba and the first confirmed records for Saskatchewan (Taylor, 2009).

Southern Manitoba is pre-adapted for survey work, being crisscrossed by a road grid of mile by mile squares. This provides excellent access, albeit simultaneously being a source of toad mortality and likely contributor to habitat degradation. The functional, perhaps delusively-named, Dreamland Motel in Melita was basecamp. Preparation for surveys began during the day by scouting routes for that evening. This served two purposes: 1) determining availability of suitable habitat; 2) confirming that roads were passable – discovering a Manitoba-gumbo-slick, impassable road at 3 am is not ideal! Surveys would commence at about 10 pm or later (toads do not call consistently before near darkness) and would continue until almost dawn or when listening conditions deteriorated, from either weather or fatigue.



**Figure 2.** Calling toads near Melita, MB, on June 29, 2018 and the locality as photographed the following day: A) Great Plains toad (*Anaxyrus cognatus*); B) Plains spadefoot (*Spea bombifrons*); C) flooded farm field where the toads were calling in large numbers. Photos by R.D. Mooi

The first night afforded perfect conditions with occasional very light rain and temperatures still hovering around 17C at midnight. Our circuit took us just east of Melita initially, to check known sites to confirm toads were calling. Both GPTs and spadefoots (hereafter SFT) were deafening. If you have never experienced these two species together in full chorus, it is something to put on your herping bucket list. From there we headed north, zigzagging to check unsurveyed stretches within the known range, filling a number of gaps. On highway 83 north of Melita there were several locations with toads on the road (Figure 3); unfortunately, we found a road-killed specimen (now Manitoba Museum catalogue number MM 1517, tissue samples available if anyone is interested).

We eventually worked our way NNE, ending up just south of Oak Lake (Figure 1). We found GPTs and SFTs in numerous spots, adding the northernmost record of GPT for Manitoba by about 10 km (Figure 1). This was an individual hopping across the road in front of the vehicle at 4 am (Figure 4) – no GPTs were heard calling in this area!



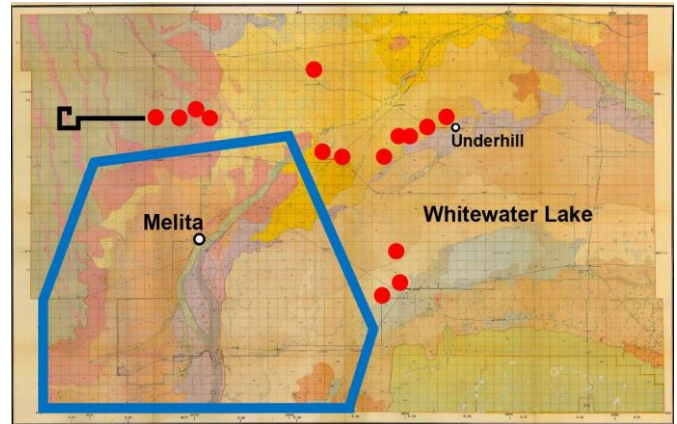
**Figure 3.** Great Plains toad (*Anaxyrus cognatus*) being cryptic on Highway 3 north of Melita on June 14, 2022, 2:44 am. Photo by P. Taylor

The following evening, it was substantially cooler and quite windy. We began by listening for Cope's gray treefrogs (*Dryophytes chrysoscelis*), a Manitoba specialty, along the northwest portions of Turtle Mountain, south of Whitewater Lake. Although there appeared to be good habitat, we did not detect any treefrogs, only boreal chorus frogs (*Pseudacris maculata*). By about 11pm we arrived in the area west

of Whitewater Lake. Although conditions were not ideal (12C and windy), we did find GPT in a few spots just east of their previously known range (Figure 1). The next night was even windier. We heard no GPT at any sites, not even at our regular confirmation sites near Melita where they had been calling in strong winds the previous evening.

Late on June 16, from about 10:30 pm to almost midnight, an area to the northwest of known GPT distribution was surveyed (Figure 5, in black). We had checked these areas on a previous night with no luck, but under less-than-ideal conditions. This night, though, was windless and about 14C. That no GPTs or SFTs were heard is at least suggestive that they do not occur here. Heading just eastwards of this toadless area, at about midnight on the 17th, we began finding GPTs in gradually increasing numbers until there were very impressive choruses directly north of Melita but about 7 km north of the known range (Figures 1, 5). Because things were ‘hopping’, we tried our luck farther east, finding large choruses of GPTs NNE of the known range, as well as three individuals calling at 3:25am (now 12C) almost as far east as the tiny hamlet of Underhill, about 15 km east of any previous record (Figures 1, 5). Another notable aspect of this locality is that just down the road we heard Canadian toad (*Anaxyrus hemiophrys*), boreal chorus frog, SFT, and Cope’s gray treefrog; for Manitoba, hearing 5 anuran species simultaneously is herp diversity heaven! In the day, the area hardly looks like heaven, unless you are a toad with an affinity for flooded farm fields (Figure 6).

Toad was moving east to west across road where vehicle is parked. Photo by R.D. Mooi



**Figure 5.** Distribution of Great Plains toad in Manitoba superimposed on a soil map. Previous known distribution bounded by blue line, extralimital records found June 13-18, 2022 in red. Black line marks 25 kms of road surveyed that did not yield records despite toads being found the same evening along adjacent surveyed roadway to the east. Toads seem to mostly avoid the dark green areas at the top left that are heavy loam and boulder till. Pink and yellow areas indicate sandier, lacustrine soils. Map modified from Ellis and Shafer (1940).

Our last field evening was warm (20C) but very windy. We re-located the GPTs of the “far east”, and went from there. Initially things were promising with more Cope’s, but even large groups of SFTs close to the road could only be heard faintly over the wind gusts. After 3 hours of unproductive surveying southwards to Whitewater Lake, we called it a night. It is interesting to note that GPTs and SFTs were in fine voice with loud choruses at our confirmation spots ESE of Melita, despite what seemed like gale force winds (50-70+ kph estimated).



**Figure 4.** Northernmost record of Great Plains toad in Manitoba, June 14, 2022: A) toad and GPS. Photo by P. Taylor; B) looking north at location, photographed June 18.



**Figure 6.** Eastern-most known site for Great Plains toad in Canada near Underhill, Manitoba, looking north and taken June 18, 2022. Photo by R.D. Mooi

That our brief surveys discovered new localities for GPT that considerably expands its known range, both eastward and northward, indicates that we have a long way to go to understand this species in Manitoba. As a simple exercise, I overlaid the GPT range onto a soil map (Figure 5). To my ignorant eye, there appears to be some correlation, with toads mostly avoiding the heavy loam NW of their known range (green of the upper left, Figure 5); this region is labelled 'boulder till' on other maps. Our surveys during favourable conditions, with GPTs calling elsewhere, did not find them over much of this soil type (Fig. 5, black route) whereas surveys east of these soils found that numbers increased as sandier, lacustrine deposits (dark pink) became available. Many other factors are likely at play, and more work than this simplistic approach will be needed to define habitat characteristics for Great Plains toads in Manitoba.

We did not spend a great deal of time trying to determine population sizes except in very general terms (for example: few, many). I find GPT numbers very difficult to estimate as they are deafening when nearby, likely resulting in overestimates. In my limited experience, they seem not to be found in the same densities that American toads can be found in some parts of the province, nor in the same densities as SFTs with which they co-occur. Quick visual surveys following auditory estimates would be helpful to determine population sizes, although more involved methods (e.g., drift fencing) would be more accurate.

I hope to place a small number of automated recording units next spring and continue surveying for Great Plains toads in southwestern Manitoba.

#### Acknowledgements:

I would like to thank The Manitoba Museum Foundation for partial funding of this fieldwork. The Manitoba Conservation Data Centre kindly provided access to previous survey results and maps of these in various formats, with particular thanks to Colin Murray. Carla Church provided in-the-field notice of possible frog and toad sites. And, of course, thanks to Peter Taylor for use of his photos, and for his companionship and enthusiasm, which remained steadfast even while straining to hear distant anurans in gale-force winds in the wee hours of the morning.

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### Length matters! A reminder to collect and report biometric data

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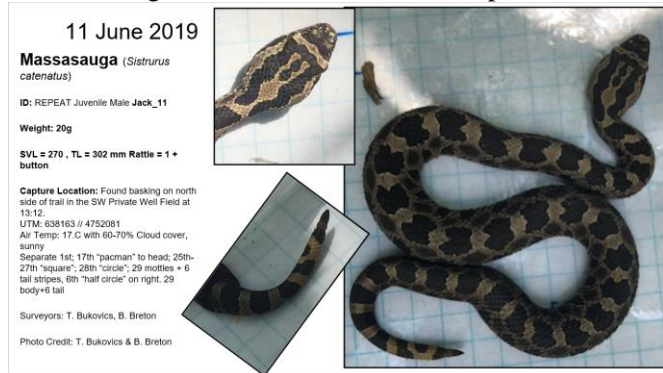
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The emphasis when reporting observations to a central agency is to include date, species, and location. This information helps inform the geographic distribution of species and confirm area presence. The evidence that the observation is correct is based upon the qualifications of the observer, the description of the observation, the location, and the experience of the reviewing body. The better the information, the better the confidence with the identification. Contemporary location information is important and meaningful for status assessments, environmental impact studies, hearings, tribunals, investigations, and court proceedings. However, the biological data: length, weight, age class and maturity are equally important and are often missing from public data sources. There is also no specific field assigned for biometric data in Ontario's Natural Heritage Information Centre (NHIC) reporting forms. However, that should not prevent anyone from

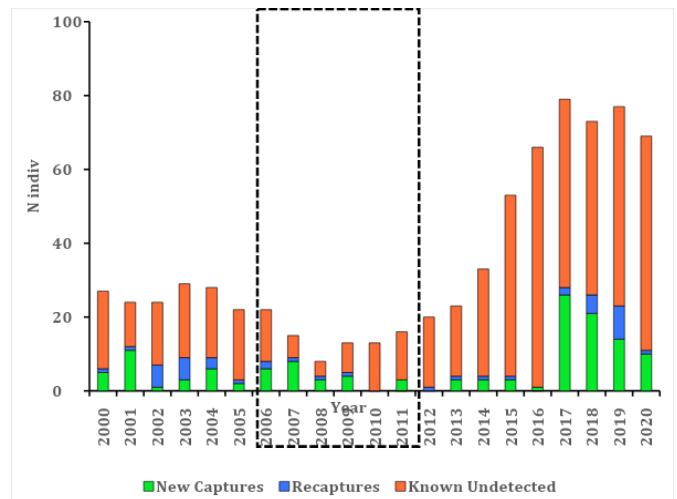
providing the biological data within one of the many additional fields. Any observation of rare species that does not include biological data is a lost opportunity for collecting pertinent population data for future population viability analyses and population trend assessments. This type of information is needed but often lacking within COSEWIC status reports.



**Figure 1.** Example of Biological Data Collection Sheet stored using Google Slides.

As an example, we found the back casting encounter method to be very useful to highlight trends in the Wainfleet Bog Massasauga population before, during and after the first flood event within the former peat mined fields (Yagi *et al.*, 2020). The information needed to construct a back cast curve relies on constructing a capture history matrix and the individuals estimated age. We used a scaled digital image for each snake encounter. The image is used for individual ID, a record for the number of rattle segments, rattle size, and for measuring total length (Figure 1). The age data for Massasaugas comes from either the presence of a complete rattle (i.e., if it includes the button), or mark-recapture history. If neither of the aforementioned methods are viable or available, age is estimated from the length of the individual (Yagi *et al.*, 2018). Different populations may have different age-length relationships (Hileman *et al.*, 2017), and growth rate also declines with age. Therefore, large snakes are likely older than we can reliably estimate. By applying a conservative approach, we back cast snakes with an unknown age up to 5 years depending upon their size. Therefore, the resulting population trend is least accurate within the most recent 5 years of estimated age. To reduce bias we publish the capture history excluding the most recent

two years because we found these years change the most with future observations. Then we overlay relevant environmental event time periods (Figure 2).



**Figure 2.** Backcast encounter index created for the Wainfleet Bog Massasauga Population from mark-recapture and biometric data collected from 1998 to 2022. The encounter index “N indiv” includes new captures, recaptures and individuals known to be present base upon future captures and their backcast age. From 2006 to 2011 about 30% of the central peat mined area flooded for the first time. The population survived in higher elevation areas where most of the observations from 2011 after occurred.

All species (whether mottled or not) can benefit from including biological data with the observation. For example, length-frequency histograms can also provide insight into age structure of a population. We measured Eastern Gartersnakes (n=135) and Northern Red-bellied snakes (n=125) from the Wainfleet Bog to confirm the length range for neonatal snakes (Yagi, 2020). Neonatal Eastern Gartersnakes were  $\leq 260$ mm, and Red-bellied snakes were  $\leq 200$ mm by the fall season. A cluster analysis by date and length indicated four age classes for Eastern Gartersnakes and three age classes for Northern Red-bellied snakes (Yagi, 2020).

Overtime geographic areas can accumulate biological data if they are reported and collected in a standard manner. This data can then be available for future research. With the advent of smartphone technology relevant biological data can be collected in a standardized manner and stored on the internet within a cloud-based server when the GPS is enabled, and the digital image is properly taken and scaled. We are working on a smartphone tool to support base line data collection including tools for measuring a variety

of species (including fish, frogs, lizards, salamanders, snakes, and turtles). We hope to have this available to the public soon, so stay tuned.

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An apparently eyeless Spotted Turtle (*Clemmys guttata*).  
Photo by T. Ambeau



Boreal Chorus Frog (*Pseudacris maculata*). Photo by N.A. Cairns

## A Tale of two Culverts

**Frederick W. Schueler**

Fragile Inheritance Natural History  
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The “Great Lakes/St Lawrence” populations of Chorus Frogs (*Pseudacris cf maculata*) have probably been declining for half a century, at first in Quebec, and then in Ontario (Schueler 1999, COSWIC 2008). Their moist-open field habitat has pretty clearly been reduced by urbanization, intensified agriculture, and secondary succession, and I've speculated in the past that filling of roadside ditches to improve road safety may have reduced their metapopulation ability to disperse between breeding ponds (Schueler 2014).

In recent years, two populations using flooded portions of fields in Grenville County, Ontario, have exemplified another road-maintenance threat to the isolated populations that remain. The first of these is a pond west of our home and listening station in Bishops Mills (Schueler & Karstad 2013). This is an 8 x 15 m flooded area in a grassy field across from a dense creekside *Thuja* stand, 623 m SSW Bishops Mills (44.86736°N 75.70407°W). In 2021 we discovered that this pond was created by a blocked culvert under Buker Road, which explains why we hadn't heard Chorus Frogs there before 2009.

The fact this culvert is blocked is an interesting contrast to a similar pond in a grassy field along the Branch Rd dogleg, 4.34 km NNE North Augusta (44.79790°N 75.71884°W). where we heard Chorus

Frogs in 2013 & 2015, but not before or afterwards In October 2017 the culvert here had been replaced by a new culvert. Another culvert had been added, ditches along the road had been deepened, and the pond was substantially drained (there was a 1 x 3 m skim of ice in the field on 4 Dec 2022). This situation has been complicated by our not hearing Chorus Frogs there in the springs of 2016 & 2017, and that in 2021 & 2022 we heard Chorus Frogs calling from the swampy woods north of the site of the drained pond where we hadn't heard them before. The point is that a classic flooded-field habitat had been very substantially diminished by the culvert replacement and ditching.

The habitat of a vernal pool-breeding species that is in steep decline from landscape-wide land use changes and secondary succession will always be precarious, and these plugged-culvert ponds point out a threat from routine road maintenance. The threat is complicated by the fact that the road work is done on municipal road allowances, while the ponds are largely on adjacent privately held land. There is now a movement to create ponds as Chorus Frog habitat (Ethier and Trudeau 2022), and I urge everyone who is concerned about the species' fortunes to bring the threats to their habitat to the attention of their local public and municipality.

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Chorus Frogs in Bishops Mills, Ontario? platform presentation, Canadian Amphibian and Reptile Conservation Network, annual meeting, Centre d'Arts Orford, Orford, Quebec.



## SHORTER COMMUNICATIONS

### An observation of spring courtship by prairie rattlesnake (*Crotalus viridis*)

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Here I report an observation of prairie rattlesnake (*Crotalus viridis*) courting in the spring at the den site. On May 4th 2022 at roughly 18:00 I observed a pair of *C. viridis* in a sagebrush (*Artemisia cana*) next (<1 m) to a known hibernaculum in the West Block of Grasslands National Park in SW Saskatchewan. The male had his tail wrapped around the females' tail searching for a copulatory attempt (Figure 1; Clark *et al.* 2014; Gordon W. Schuett, personal communication, Dec., 2022). Air temperature was 14C and gusty with an average wind speed of 20 km/h. Ground temperature was not measured at the time but as this was on a protected south facing slope; it is likely that ground temperatures were notably higher than air temperature. Given it was late in the day for the season, most of the snakes at that site had retreated into the den entrance with some eight other *C. viridis* visible. Four remained out (three adults and one young from the previous fall), all of which were, sheltering in/under the *A. cana*. Two snakes were evidently engaged, with intertwined tails. This was accompanied by additional courtship behaviours including head jerking and chin-rubbing on the mid body of the female by the male. The male was very large with an estimated SVL of at least 110 cm while the female was much smaller (estimated 70 cm; but was quite obscured by the male and the sagebrush).

Across the range of *Crotalus viridis*, courtship and mating is typically reported from the late summer or fall. Duvall *et al.* (1992) reported "Mid-to late summer breeding window of ca. seven weeks in duration, which correspond exactly to the period of female receptivity." In Wyoming (also see Schuett *et al.* 1993). This matches

the patterns observed in Canada, although there is one observation that was recorded later in the spring and away from the den site (Sheri Monk, personal communication, Dec., 2022). In the warmer climates of Nebraska, Holycross (1995) did observe a single occurrence of spring mating. As with other North American temperate pitvipers, the reproductive biology of *Crotalus viridis* is temporally complicated. Vitellogenesis (yolk protein formation) occurs in late summer to early fall but ovulation (when the egg can be fertilized) occurs in the spring. Given this timeline, winter often interrupts egg maturation (Aldridge and Duvall 2002). Spermatogenesis (maturation of sperm) typically occurs in late spring but is temperature dependent (Aldridge 1975). This phenological mismatch can largely be explained by the fact that mature sperm can be stored by both males and females. This does allow for variation but the rarity of this observation makes it notable. This is to my knowledge, the only account of early spring courtship at the den site in Canada.



**Figure 1.** Prairie Rattlesnake (*Crotalus viridis*) engaged in courtship and tail-searching behavior on May 4th 2022 at a known hibernaculum. Photo by N.A. Cairns

**Experts consulted:** Andrew Didiuk; Laura Gardiner; Neil Gushulak; Ray Poulin; George Lawrence Powell; Gordon W. Schuett.

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Wandering Gartersnake (*Thamnophis elegans vagrans*). Photo by N.A. Cairns

### Preliminary characterization of overwintering habitat for Eastern Ribbonsnake (*Elapagtekjij*) Atlantic Canada population

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The Eastern Ribbonsnake (*Thamnophis sauritus*) is a slender semi-aquatic snake that inhabits freshwater wetlands and lakeshores during the active season. This species is listed as Threatened in Nova Scotia under both the federal Species at Risk Act and the provincial Endangered Species Act due to their apparent small population size and limited distribution. Little is known on the species' habitat requirements or the scale of threats it faces in Nova Scotia. To fill knowledge gaps on their overwintering ecology, we used the recently developed method of transmitter attachment via duct tape to track daily movements in spring and fall to and from summer and winter habitats. We tracked a total of

27 individuals in Queens County, Nova Scotia between 2018-2022 for an average of 18.8 days (range of 3 to 35 days). Effort was concentrated at Grafton Lake (n=17), Kejimikujik National Park and National Historic Site as well as other nearby waterbodies within 10 km. Of a subset of 7 individuals tracked to presumed hibernacula, habitat attributes included: forests dominated by white pine or intolerant hardwoods, close proximity to water (40-250 m), south facing aspect, slight elevation and well drained soil. The ability to successfully radio track Ribbonsnakes provides the opportunity to identify winter habitat characteristics to develop effective management plans. In the future, efforts will expand to explore unprotected landscapes and fully inform winter habitat preferences in Atlantic Canada.



Eastern Ribbonsnake (*Thamnophis sauritus*). Photo by J. McNeil

## THESIS ABSTRACTS IN CANADIAN HERPETOLOGY

*TCH publishes abstracts of recently completed Honours, M.Sc., and Ph.D. theses from Canadian universities and professors. Students or their supervisors are invited to send abstracts to the Editors.*

**Delay, S.J.** MSc. 2022. Laurentian University (supervised by J.D. Litzgus).

### **Impacts of a windfarm and wildfire on the spatial ecology and habitat selection of an endangered freshwater turtle.**

Wind is a source of renewable energy, and its use is projected to increase as governments look for solutions to reduce carbon emissions. Although wind energy presents many advantages, windfarms can pose risks to wildlife. I used a post-hoc design to investigate whether body condition, spatial ecology, and multiscale habitat

selection by spotted turtles (*Clemmys guttata*) differed among three treatment sites in central Ontario: Control, windfarm (Wind), and combined post-wildfire and windfarm (Windburn). I outfitted 9-10 turtles per treatment with VHF radio transmitters and tracked them approximately twice per week throughout the active season. Body condition, home range size and minimum daily distances moved by turtles did not differ among treatments, but it is possible that I did not detect acute responses to the habitat modification because turtles may have had sufficient time to adapt their behaviours as my study was conducted 2 years post-construction and 2.5 years post-wildfire. Turtles did not avoid habitats near turbines or roads but also did not cross roads unless a semi-aquatic culvert was present, highlighting the need to maintain habitat connectivity. In Windburn, turtles used wet depressions on rock barrens while Control and Wind turtles did not, possibly because Windburn turtles were exploiting new early successional macrohabitat resulting from the wildfire; however, pre-wildfire movement data would be required to confirm cause. In all treatments, turtles selected microhabitat based on temperature, water depth, available cover, and hummock presence, suggesting that turtles were able to find suitable microsites in the modified landscapes of my study area. My study is one of the first to assess the impacts of windfarms on semi-aquatic turtles, an at-risk and understudied taxon on windfarms, but more research is required to understand the acute and long-term impacts of windfarms and wildfires on turtles to inform data-driven mitigation strategies.



Eastern Musk Turtle (*Sternotherus odoratus*). Photo by K. Martin

**Vincent, K.D.** MSc. 2022. Laurentian University (co-supervised by J.D. Litzgus and J. Popp).

### **Weaving Indigenous knowledge and western science to investigate the impacts of railways on wildlife.**

Railways have been documented to cause mortalities for many different species, but overall, the ecological impacts of railways are under-researched and poorly understood. To date, railway ecology research has mainly focused on large mammals, but to develop effective railway mitigation, it is important to understand risks for underrepresented taxa. My aim was to use a Two-Eyed Seeing approach that weaved Indigenous knowledge and western science to improve understanding of railway ecology for understudied species and to help guide future mitigation efforts. In partnership with two First Nations, community members were invited to share Indigenous knowledge (IK) of wildlife-railway interactions to inform study design, then I conducted weekly visual surveys over three field seasons along two 3.6 km sections of railway in Eastern Georgian Bay, Ontario, recording the locations of live and dead wildlife. I recorded 462 observations of individuals from 42 different species, of which 76% were found dead, and 24% were encountered alive, findings complemented by shared IK. Reptiles and amphibians were the most severely impacted taxa, accounting for 87% of observed mortalities. Additionally, I identified hotspots of turtle and anuran interactions, and found that the locations of interactions were related to adjacent habitat use and railway features. Ultimately, this study highlights the value of collaborative research that uses complementary knowledge systems, indicates that reptiles and amphibians may be particularly susceptible to railway mortality, and identifies areas to target future mitigation both locally and in relation to broad scale landscape features for turtles and anurans.



American Toad (*Anaxyrus americanus*). Photo by K. Martin

**MacPherson, S.** BSc 2022. Laurentian University (supervised by J.D. Litzgus).

**Exposure to ultraviolet light may promote natural behaviours and better body condition in captive Ball Pythons (*Python regius*).**

Ultraviolet (UV) light has been shown to be essential for many species of reptile due to its role in the production of vitamin D3, but its potential to help regulate natural activity and behaviour is often overlooked, especially when it comes to nocturnal reptiles. Ball pythons (*Python regius*) are a nocturnal snake species often kept as pets, but not commonly provided UV light. I aimed to answer if exposure to UV light promotes natural behaviours, increased activity and good body condition in ball pythons. Two treatment groups of 4 snakes each were used, with one group receiving UV light (UV treatment) and the other receiving regular ambient lighting (No-UV treatment). Both groups were recorded with video cameras for 84 consecutive days and their behaviours, activity levels and body condition were quantified and compared. I found no significant difference in activity level or time displaying natural behaviours between the treatments, but there was significant variation in behaviour among individual snakes regardless of treatment. I also found that mean body condition did not differ between treatments; however, all UV treatment snakes increased in body condition over the course of the experiment, while all No-UV treatment snakes decreased in body condition over the course of the experiment. My research may be able to improve the husbandry practices and quality of life for reptiles being kept as pets, as well as those being kept in captive breeding colonies used for research and conservation purposes.

**Robinson, C.** M.Sc. 2022. Queen's University (Supervisor: D. Orihel).

**Naphthenic Acid Fraction Compounds Reduce the Reproductive Success of Wood Frogs (*Rana sylvatica*).**

Understanding the toxicity of the organic compounds in oil sands process-affected water (OSPW) is necessary to inform the development of environmental guidelines related to wastewater management in Canada's oil sands region. In the present study, we investigated the effects of naphthenic acid fraction compounds (NAFCs) on wood frog (*Rana sylvatica*) mating behaviour, fertility, and offspring viability. Wild adult wood frogs were exposed separately from the opposite sex to 0, 5, or 10 mg/L of OSPW-derived NAFCs for 24 h and then combined in outdoor lake water mesocosms containing the same NAFC concentrations (n = 2 males and 1 female per mesocosm, n = 3 mesocosms per treatment). Mating events were recorded for 48 h and egg masses

were measured to determine adult fertility. NAFC exposure had no significant effect on mating behaviour (probability of amplexus and oviposition, amplexus and oviposition latency, total duration of amplexus and number of amplexic events) or fertility (fertilization success and clutch size). Tadpoles (50 individuals per mesocosm at hatching, and 15 individuals per mesocosm from 42 d post-hatch) were reared in the same mesocosms under chronic NAFC exposure until metamorphic climax (61-85 d after hatching). Offspring exposed to 10 mg/L NAFCs during development were less likely to survive and complete metamorphosis, grew at a reduced rate and displayed more frequent morphological abnormalities. These abnormalities included limb effects at metamorphosis, described for the first time after NAFC exposure. The results of this study suggest that NAFCs reduce wood frog reproductive success through declines in offspring viability and that exposure to NAFCs during reproduction and development may affect the recruitment of native amphibian populations in the oil sands region.



Green Frog (*Lithobates clamitans*). Photo by K. Martin

**Moldowan, P.D.** Ph.D. 2023. University of Toronto. (Supervisor: N Rollinson).

**Population ecology and sensitivity of environmental change of the Spotted Salamander (*Ambystoma maculatum*).**

Amphibians perform numerous ecological roles—as predators and prey, as connectors of energy flow between aquatic and terrestrial landscapes, and as sizable contributors to vertebrate biomass—in wetland and forest ecosystems. Amphibians are also modern “canaries in the coal mine”, serving as a barometer for assessing environmental health. The Spotted Salamander (*Ambystoma maculatum*) is geographically widespread in eastern North America and is well-studied. This research arises from long-term monitoring

of Spotted Salamanders at Bat Lake in Algonquin Provincial Park, Ontario, Canada, approaching the species northern climatic range edge. In 2008, monitoring efforts were formalized into a capture-mark-recapture study, collecting morphological, reproduction, and population data. The long-term aims of this project are to monitor baseline population vital rates and assess the effects of climate (change) on the health of salamander populations in a minimally impacted environment. Chapter One introduces salamanders as research subjects and the ecology of Bat Lake. Chapter Two presents a synthesis of Spotted Salamander biology based on 15-years of monitoring data, including phenology of spring breeding and post-metamorphic dispersal, operational sex ratio, early life survival, body size of adults and metamorphic juveniles, age and size at maturity, longevity, and spatial habitat use. These findings are paired with a literature review to compare the natural and life history of Bat Lake salamanders to other populations. Chapter Three estimates population vital rates, including adult survival and abundance, and provides suggestions on how to sample the Bat Lake salamander population to inform continued long-term ecological and demographic study. Chapter Four investigates the influence of seasonal climate on body condition, reproductive output, and breeding phenology. Breeding body condition declined over a 12 year monitoring period (2008–2019) with warmer summer temperatures at least partly responsible for the observed decline in body condition, highlighting the vulnerability of fossorial taxa and subterranean environments amid accelerating climate change. This dissertation contributes to our understanding of salamander ecology and begins to address a knowledge gap about the consequences of climate (change) for amphibian populations.



Metamorphic Spotted Salamanders (*Ambystoma maculatum*). Photo by P.D. Moldowan

**Milliard, L. M.** Sc. 2022. Université Laval.  
(Supervisor: M.J. Mazerolle and L. Imbeau).

### Utilisation des bassins de rétention d'eaux pluviales dans les emprises routières par les amphibiens

La restauration et la création de milieux humides sont des stratégies envisagées comme mesures de compensation à la perte de milieux humides naturels. Dans ce contexte, la création de bassins de rétention d'eaux pluviales lors de construction de routes figure parmi ces méthodes potentielles de compensation. L'objectif de mon projet était de quantifier l'utilisation de bassins de rétention par les amphibiens, en comparaison avec des milieux humides de référence. Ces bassins permettent la rétention des eaux de ruissellement provenant de surfaces imperméables qui sont chargées en polluants. Nous avons émis l'hypothèse que les amphibiens utilisent davantage les milieux humides éloignés que les milieux humides près des routes et qu'à distance égale à la route, ils utilisent davantage les milieux humides naturels que les bassins de rétention. Nous avons évalué la présence d'adultes à l'aide de points d'écoute de chants d'anoures et le succès reproducteur à l'aide de décomptes de masses d'œufs et de têtards. Ces inventaires ont été effectués dans 20 bassins de rétention construits par le Ministère des Transports du Québec, 20 milieux humides naturels près des routes (< 50 m) et 20 milieux humides éloignés des routes (50 m – 500 m). La qualité des sites a été évaluée en mesurant des caractéristiques locales comme la taille de l'étang, la végétation, les propriétés physico-chimiques, l'hydropériode et des variables à l'échelle du paysage. Nos résultats révèlent que la conductivité et le pH sont plus élevés dans les bassins que dans les milieux humides naturels. Nos analyses n'ont dévoilé aucun effet des variables explicatives sur l'occupation des amphibiens aux stades de têtards et d'adultes d'anoures. Toutefois, l'abondance de masses d'œufs de salamandres fougères diminuait avec l'augmentation de la conductivité et de l'hydropériode. Malgré certaines caractéristiques différentes des milieux naturels, les bassins sont utilisés par plusieurs espèces d'amphibiens pour la reproduction et le développement. La diminution d'application de sels de déglacage devrait augmenter la qualité des milieux humides en bordure de route pour les communautés d'amphibiens.

Wetland restoration and creation are strategies considered to compensate for the loss of natural wetlands. In this context, the creation of stormwater retention ponds (hereafter, stormwater ponds) during road construction is a potential method of compensation. The objective of our project was to quantify the use of

roadside stormwater ponds by amphibians. Roadside stormwater ponds allow for the storage of rainfall and runoff. These waters are loaded with pollutants, such as road salts. We hypothesized that amphibian use of natural wetlands is greater than in roadside wetlands, and that at equal distances from the road, amphibians are more likely to use natural wetlands than stormwater ponds. We assessed adult presence using anuran call surveys and reproductive success using egg masses and tadpole counts. These surveys were conducted in 20 roadside stormwater ponds, 20 natural roadside wetlands (< 50 m), and 20 wetlands far from roads (50 m - 500 m). We evaluated site quality based on local characteristics such as pond size, vegetation, water physicochemical properties, hydroperiod, as well as landscape-scale variables. Our results revealed that conductivity and pH were substantially higher in roadside stormwater ponds than in natural wetlands. Occupancy of adults and tadpoles did not vary with the pond and landscape-scale variables we considered. However, the abundance of mole salamander egg masses decreased with increasing water conductivity and pond hydroperiod. Despite certain characteristics that differentiate them from natural environments, roadside stormwater ponds provide breeding and larval development habitat to several amphibian species. However, decreasing de-icing salt applications will increase the quality of stormwater ponds for amphibian communities.



American Toad (*Anaxyrus americanus*). Photo by P.D. Moldowan

**Fayard, A. M.** Sc. 2022. Université Laval. (Supervisor: M. J. Mazerolle and V. Trudeau).

### État des populations naturelles de rainette faux-grillon boréale (*Pseudacris maculata*) et stratégies de réintroduction en milieu aménagé

La rainette faux-grillon boréale (*Pseudacris maculata*) est menacée dans certaines régions du Canada. Un fort déclin de sa probabilité d'occupation a été noté au cours des 20 dernières années dans la région de la Montérégie au Québec, Canada. Néanmoins, les tailles de populations sont méconnues à cet endroit. Peu d'information est disponible sur la dynamique de reproduction de cette espèce, ce qui entrave la planification d'actions de conservation telles que la réintroduction. Pour combler ces lacunes et préparer adéquatement la première réintroduction, nous avons réalisé un projet visant les populations naturelles et le développement larvaire. Trois populations de rainette faux-grillon boréale ont été suivies durant une saison de reproduction afin d'estimer leur abondance et d'identifier l'influence de facteurs environnementaux sur l'intensité des chants. Nous avons également comme objectif d'évaluer l'effet de la densité et de ressources additionnelles sur le développement et la survie larvaire en mésocosmes, ainsi que d'estimer la survie des métamorphes après réintroduction. Nous avons trouvé une relation quadratique entre l'intensité du chant et la température de l'air. L'occurrence des chorales de *P. maculata* était faible. Une des trois populations naturelles s'est éteinte. Dans les deux autres étangs, les tailles de populations moyennes ont été estimées à 28 adultes (IC à 95% : [23,38]) et 10 adultes (IC à 95% : [8,16]). La condition corporelle des métamorphes était meilleure lorsque la densité larvaire était basse, avec supplément de litière dans les mésocosmes. Un total de 732 métamorphes a été réintroduit dans des étangs construits au parc national du Mont-Saint-Bruno. Quelques individus réintroduits ont été recapturés, mais aucune estimation de la survie n'a pu être modélisée à cause de la perte de marque. Cette étude met en évidence la situation précaire des populations de *P. maculata*, qui étaient autrefois plus abondantes dans le sud du Québec. Nous avons montré que le développement larvaire en mésocosmes est une stratégie efficace pour élever cette espèce en vue d'une réintroduction. Ces données permettront de guider d'autres réintroductions d'amphibiens dans des environnements protégés.

The boreal chorus frog (*Pseudacris maculata*) is a threatened species in parts of Canada. A significant decline in its occupancy has been noted over the last 20 years in the Montérégie region of Québec, Canada. However, the size of these populations is unknown. Limited information is available on the reproductive dynamics of this species, which hinders the planning of conservation actions such as reintroduction. To fill these gaps and adequately prepare for the first reintroduction,

we conducted a project targeting natural populations and larval development. Three populations of boreal chorus frogs were monitored during one breeding season to estimate their abundance and to identify the influence of environmental factors on call intensity. We also aimed to evaluate the effect of density and additional resources on larval development and survival in mesocosms, and to estimate the survival of metamorphs after reintroduction. We found a quadratic relationship between the calling intensity and air temperature. There was a low occurrence of choruses of *P. maculata*. One of the three natural populations went extinct. In the other two sites, population sizes were estimated at 28 adults (95% confidence interval: [23,38]) and 10 adults (95% CI: [8,16]). Body condition of metamorphs was better at low larval density with additional litter in mesocosms. A total of 732 metamorphs were reintroduced into ponds constructed in Mont-Saint-Bruno National Park. Some reintroduced individuals were recaptured, but no survival estimation could be modelled due to the high incidence of tag loss. This study highlights the precarious situation of the populations of *P. maculata*, which were once more abundant in southern Quebec. We showed that larval development in mesocosms is an effective strategy for rearing individuals for reintroduction. These data will help guide other amphibian reintroductions in protected environments.



Portrait of an Eastern garter snake (*Thamnophis sirtalis*). Photo by T. Ambeau



## RECENT PUBLICATIONS IN CANADIAN HERPETOLOGY

*TCH lists recent publications by Canadian herpetologists working in Canada and abroad. Please send to the Editor a list of your recent papers, and send citation information for new papers as they come hot off the presses.*

- Albertson Kok, A. and S.J. Hecnar. 2022. *Hyla versicolor* (Gray Treefrog). Habitat use. *Herpetological Review*. 53(4): in press.
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Prairie Rattlesnake (*Crotalus viridis*). Photo by N.A. Cairns



Midland Painted Turtle (*Chrysemys picta marginata*). Photo by A. Carthew

## NEWS AND ANNOUNCEMENTS

### 2022 CHS Award Recipients

#### *Silver Salamander Award*

The Silver Salamander Award is presented to an individual or an organization in recognition of a specific contribution to the conservation of amphibians and reptiles in Canada. This year the Fredericton 2022 Annual Meeting Organizing Committee (Graham Forbes, Chris Edge, Connie Brown, Damien Mullin, Julia Riley, Hannah McCurdy-Adams, James Baxter-Gilbert) nominated Dr. Maureen Toner from the New Brunswick Department of Natural Resources and Energy Development for this award.

Dr. Maureen Toner was presented with the Silver Salamander Award in recognition of her long-term contributions to herpetofauna conservation, particularly Wood and Snapping Turtle, in the Province of New Brunswick. As a member of the Species at Risk Program in the Department of Natural Resources and Energy Development with the New Brunswick provincial government, Maureen has been the lead manager for various herpetofauna, mainly wood turtle and snapping turtle, for over 30 years. She has been responsible for or heavily involved in all work with these species, including landowner contact, environmental impact assessment, public interaction, research, enforcement, and conservation. Maureen is the NB provincial representative on the Habitat Stewardship Program with CWS, the provincial representative on

COSEWIC (2003-2011), Recovery Planning initiatives (2004 - present), and RENEW (2012-2015) [RENEW was the precursor for national recovery plans]. She has organized numerous meetings with stakeholders on wood turtle, and recently published: Browne, Constance L. and Maureen Toner. Open Standards Planning for Wood Turtle in New Brunswick. In American Turtle Observatory (ATO). 2016. Blanding's and Wood Turtle Conservation Symposium, 2016. Westborough, MA. 28 pp.



Maureen Toner (left) recipient of the 2022 Silver Salamander Award with Graham Forbes (right) of the local Fredericton Organizing Committee of the 2022 CHS Annual Meeting.

### *Blue Racer Award*

The Blue Racer Award is presented to an individual in recognition of cumulative contributions to the conservation of amphibians and reptiles Canada. This year the Fredericton 2022 Annual Meeting Organizing Committee (Graham Forbes, Chris Edge, Connie Brown, Damien Mullin, Julia Riley, Hannah McCurdy-Adams, James Baxter-Gilbert) nominated Dr. Don McAlpine from the New Brunswick New Brunswick Museum for this award.

Don McAlpine was presented with the Blue Racer award in recognition of his long-term, cumulative contribution to the conservation of amphibians and reptiles in Canada. Don McAlpine is a leading researcher and zoologist in Atlantic Canada. He has worked as the Zoologist (since 1981), and since 2006, as Head of the Natural History Department of the New Brunswick Museum. Don's knowledge of natural

history is unmatched and spans several taxa including herps, whales, fish, molluscs, and soil invertebrates.



Don McAlpine recipient of the 2022 Blue Racer Award.

Don has authored more than 250 publications including 160 peer-reviewed publications and over 20 book chapters. His expertise has been requested for advising on or editing several publications, including *Amphibiens et Reptiles du Québec et des Maritimes* (Rodrigues, D. and Desroches, J.F., 2018; as well as the 2004 edition), *Environment Canada Ecological Monitoring and Assessment Network Protocols for Measuring Biodiversity*, and *Parasites of Amphibians and Reptiles* (2009). He is an associate editor at four journals, and is adjunct (or similar) at five Canadian and American universities. There even is a beetle named after him, *Atheta mc Alpinei*. Don began his career working on amphibians as part of his graduate degrees and has continued to contribute to the conservation of reptiles and amphibians in eastern Canada throughout his career. Don has served on numerous provincial and national committees for protected areas, and varied initiatives, such as being the Eastern Coordinator on the Taskforce on Declining Amphibian Species, and the Leatherback Turtle Recovery Team. Don was a member of COSEWIC's Amphibian and Reptile Specialist

Group (2000–2008). He has been heavily involved with CARCNET and CHS (i.e., Board of Directors, (1997–2001, 2006–2011), Conference Committee (1996–97, 2009–10), Awards Committee (2006–2016)). Don has mentored over 33 graduate and undergraduate students as committee member, supervisor, and examiner. For over 10 years, he has organized intensive week-long Bio-blitzes in different new protected areas in NB. Don has made the time for over 800 media interviews, and is a well-known, and respected naturalist, curator, and researcher in Atlantic Canada, and nationally.



*But what are mentors without people to share their experience with? The strength of the CHS also stems from the fantastic students working on reptiles and amphibians across Canada. Every year there are always a number of great talks given by students at our annual meeting. 2022 was no exception and we were treated to many outstanding presentations. Unfortunately, we are only able to present awards to a few individuals. This year the best student presentations were by Madelaine Empey (Best in-person 15-minute presentation), Jenna Kentel (Best in-person 5-minute presentation), Morgan Skinner (Best virtual 5-minute presentation), Nathalie Jreidini (Best virtual 15-minute presentation) and Jeanne Dudemaine (Student Poster Award Recipient). Many thanks to James Baxter-Gilbert, Amanda Bennett, Connie Browne, Joe Crowley, Madelaine Empey, Jeffrey Ethier, Graham Forbes, Purnima Govindarajulu, Matthew Keevil, Jolene Laverty, Chantal Markle, Lea Randall, and Rebecca Stanton for serving the difficult position of judges.*

*Best in-person 15-minute presentation*

**Empey M.** 2022. University of Ottawa  
**Authors:** M.A. Empey, M.Y. Reyes and V.L. Trudeau

### **Invertebrate and vertebrate species sensitivity distribution for insecticides derived from insecticidal toxins of *Bacillus thuringiensis***

**Abstract:** Information on how insecticides containing toxic proteins from *Bacillus thuringiensis* (Bt) affect non-target organisms is largely unknown. Effects on Canadian species have also been undetermined despite the wide application of Bt insecticides. Acute toxicity tests (96-h LC50 estimates) of Bt israelensis (VectoBac

200G®, potency of 200 ITU/L) on northern leopard frog (*Lithobates pipiens*) and chorus frog (*Pseudacris maculata*) tadpoles were conducted. The median lethal concentration of these species were 75 500 and 70 560 ITU/L, respectively. These LC50 values were compared to others using Species Sensitivity Distribution (SSD) curves constructed from median lethal concentrations of Bt insecticides (International Toxicity units for spp. israelensis, kurstaki, and sphaericus) obtained from published peer-reviewed literature. LC50 estimated for anurans is approximately 400 times higher than for certain target species such as the mosquito, *Aedes aegypti*. It was found that some non-target Dipterans and Lepidopterans may be at risk. Canadian anurans were found to be more tolerant than South American counterparts. There are large gaps in data regarding the susceptibility of fish, amphibians, and mammals. The use of SSDs is important to assess which organisms are most at risk, and how to mitigate possible ecological effects in habitats in which these agents are applied. Funding: City of Ottawa, University of Ottawa Research Chair in Neuroendocrinology (VLT).

*Best in-person 5-minute presentation*

**Kentel J.** 2022. Laurentian University  
**Authors:** J.L. Kentel, T. Burke, S. Kell and J.D. Litzgus.

### **A rocky solution: Evaluating the use of common construction materials as road effect mitigation for turtle communities in a rock barren landscape**

**Abstract:** Roads create an ecological trap for female turtles during nesting forays because exposed road shoulders are attractive nesting habitats despite the risk to female turtles' fitness. While the viability of turtle populations is dependent on the survivorship of reproductive females, few cost-effective mitigation strategies directly address their vulnerability to roads. Here, we evaluated a new mitigation strategy that aimed to deter female turtles from nesting in unsafe road-side habitat. This mitigation design made use of routine road maintenance to replace exposed gravel on road embankments with rock rip-rap and paved road shoulders. Nesting survey data collected over three consecutive years (2020–22) was used to determine if this mitigation strategy deters females from nesting on the road. We evaluated the effectiveness of this mitigation strategy in the context of the local turtle population, using a rigorous mark-recapture study to quantify abundance and a before-after comparison. Across all 3 study species, the number of nests on the

road were similar in the before (n=133) and after (n=138) periods of the study. Turtles did not nest in road sections with rip-rap; however, turtles continued to gain road access to nest in the nearest available road-side habitat. Turtles may still be nesting on the road because naturally occurring nesting habitat is limited in the surrounding rock barren landscape; therefore, we assessed the availability of nesting habitat based on soil depth and canopy openness by conducting habitat transects around nesting hotspots on the road. Our study contributes to the limited literature that quantifies the efficacy of road-effect mitigation strategies at the population level.



American Toad (*Anaxyrus americanus*). Photo by P. Knaga

*Best virtual 15-minute presentation*

**Jreidini N. 2022.** McGill University  
**Authors:** N. Jreidini and D.M. Green

### **Artificial displacement alters movement behavior of a terrestrial amphibian**

**Abstract:** Homing abilities have been widely documented in amphibians, but it remains unclear whether individuals have homing tendencies in the absence of motivational cues related to breeding and site fidelity. We tested whether artificial displacement would impact the movement behavior of a non-philopatric terrestrial amphibian, the Fowler's Toad (*Anaxyrus*

*fowleri*), within its home range and after its breeding season had ended. We translocated 65 male and female Fowler's Toads from their initial points of capture a total of 104 times over one of three different distances (100 m, 250 m, and 500 m) and compared these toads' subsequent 24-h movements to those of a control group of 43 un-translocated toads. To shield the translocated toads from auditory, visual, and olfactory cues en route, we translocated them in opaque enclosed boxes and performed the experiment in the uniformly unobstructed landscape of the Lake Erie shoreline of Long Point, Ontario. We mainly investigated directionality bias as the orientation between control and translocated groups, homing tendency as the correlation between movements post-translocation and translocation distance, and homing accuracy as the variation in distance between final and initial capture points. Our results provide clear evidence that translocation changes the movement behavior of these toads and that they possess homing tendencies outside of their breeding season. Toads had a strong directional bias to move in the opposite direction to the one they were artificially displaced, in contrast with the control group which showed no directional bias among 61 recorded 24-h movements. This tendency for amphibians to home following artificial displacement might be a significant confounding factor in any procedure involving their relocation.

*Best virtual 5-minute presentation*

**Skinner M, 2022.** Wilfrid Laurier University  
**Authors:** M. Skinner, M. Hazell, J. Jameson and S.C. Loughheed

### **Butler's gartersnake communities have female leaders**

**Abstract:** Animal social groups can often be divided into subgroups of individuals that tend to interact with each other. In the social science literature, these subgroups are often referred to as communities. In some animal groups, there are sex and age differences in community integration where individuals can emerge as highly central to their community. Most of what is known about differences in community centrality comes from research done on highly social mammals. Due to challenges in observation, and arguably the largely untested assumption that they are non-social, much less is known about community structure in snakes. To investigate the community structure of snake groups, we constructed social networks from the observed and inferred social interactions that occurred among Butler's

gartersnakes (*Thamnophis butleri*) during an 11-year mark-and-recapture project. Based on recent laboratory work showing sex and size differences in gartersnake sociability, we hypothesized that large females might be central to their communities within the social networks. To test this hypothesis, we identified the smaller communities that existed within the larger networks and looked for sex and weight differences in the individuals that emerged as community ‘leaders’ (i.e., had high community centrality). We found that heavier-bodied individuals were more likely to be central to communities, and that females had higher community centrality than males. Understanding social interactions and intraspecies community structure can have important implications for conservation. For example, community leaders can provide valuable information about food and shelter locations to other group members, and the importance of such individuals should be considered when modifying, bolstering, or translocating populations.

*Student Poster Award Recipient*

**Dudemaine J.** 2022. Université Laval

**Authors:** J. Dudemaine, M.J. Mazerolle, V.L. Trudeau, A. Fayard, E. Wong, O. Colin, L. Bouthillier, C. Doucet and S. Tessier

**Survival of chorus frogs in natural and restored environments**

**Abstract:** Several amphibian species have experienced population declines in recent decades. The Great Lakes, St-Lawrence, Canadian shield populations of the western chorus frog (*Pseudacris triseriata*) has suffered reductions in its distribution. Wetland habitat loss following urban expansion is one reason of the decline in the Montérégie area of southern Quebec. Different tools have been considered to promote the conservation of the species, including releasing individuals in restored environments. Our project aims to evaluate the persistence of chorus frog populations following reintroduction in restored habitat. The project has three objectives: (1) to assess the abundance and survival of individuals in reintroduced populations and compare them to natural populations, (2) to determine the impact of larval density in mesocosms on short term and long-term survival, (3) to evaluate the use of environmental DNA to estimate the abundance of individuals. In 2021, we released 732 metamorphs in two constructed ponds in Parc national du Mont-Saint-Bruno. We conducted a capture-mark-recapture study in three natural ponds and

three constructed ponds during the 2022 breeding season. One of the three natural populations became extinct, whereas the two other natural populations had a low number of adults captured (12-20 individuals). At the ponds constructed for chorus frog reintroduction, we captured adults released the year before as metamorphs, although captures were low (5-10 individuals). We reared a total of 1191 individuals in mesocosms during the summer 2022, distributed along six larval densities. A total of 583 individuals reached metamorphosis. Preliminary results show that individuals reached metamorphosis at a lower size and weight when reared at higher density. The metamorphs were marked with Visible Implant Elastomer and released in two constructed ponds. The results obtained from this project will allow us to better orient reintroduction efforts to promote the persistence of introduced populations.



**2021 IMPARA Update**

There are no updates for the IMPARA program this year. However, for more details on locations, the IMPARA program, and for information on how to nominate a site, please visit the Conservation and Research link on the CHS webpage:

[www.canadianherpetology.ca/conservation/impara.html](http://www.canadianherpetology.ca/conservation/impara.html)



Scenic outlook in Grasslands National Park, one of our IMPARA sites. Photo by NA Cairns



### TOAD Talks

CHS members are excited to offer some online learning opportunities for audiences across the country. Please spread the word to educators or community groups that might be interested in learning more about amphibians and reptiles. CHS can provide the zoom resources and help you connect with a speaker. If you are interested in presenting or know someone who is interested in learning, please email [conference@canadianherpetology.com](mailto:conference@canadianherpetology.com). Provide us with your name, contact information, and area of interest or knowledge (5 key words).



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### Membership Fees:

Membership begins and ends on January 1 of each year. Please consider signing up for multi-year membership, which provides a small discount, allows you to avoid the hassle of registering every year and protects you from increases in membership fees.

Student Membership:      \$20 / year       or \$90 / 5 years     

Regular Membership:      \$30 / year       or \$135 / 5 years     

I wish to donate to the on-going work of the Canadian Herpetological Society in the amount of:

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