Canadian Herpetological Society 2018

5th Annual Meeting of the
Canadian Herpetological Society

5ème Congrès Annuel de la
Société d'Herpétologie du Canada

Thompson Rivers University
Kamloops, British Columbia, Canada
September 21st to 24th, 2018

Canadian Herpetological Society 2018

Acknowledgements

Organizing Committee:

- Karl Larsen (Chair)
- Christine Bishop
- Purnima Govindarajulu

Local Support Team:

- Marcus Atkins
- Joey Chisholm
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- Vanessa Robinson
- Anna Skrurikhina
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- Joe Crowley
- Jose Lefebvre

And thanks to:

- British Columbia Wildlife Park
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- COSEWIC Amphibians and Reptiles Specialist Subcommittee
- David Green (Session Chair)
- Tom Herman (Session Chair)
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Welcome!

Thompson Rivers University and the Organizing Committee welcomes you to the Thompson-Nicola region of BC, the City of Kamloops, and the 2018 (5th Annual) Meeting of the Canadian Herpetological Society/Société d'Herpétologie du Canada.

You find yourself situated in the unique arid grassland ecosystem of south-central British Columbia, within the traditional territory of the Tk'emlúps te Secwe̓pemc people of British Columbia. We hope you will have an opportunity to get out and see some of the unique flora and fauna of this area. Our logo reflects the region's herpetofauna by featuring the Rubber Boa and Great Basin Spadefoot, two species found right here in the southern portion of the province.

If you have any questions, please feel free to approach one of support team (the green conference shirts) or any one of the local committee. Thanks for coming!

- KL, CB, PG

Canadian Herpetological Society
Société d'herpétologie du Canada
Conservation - Research - Education
Conservation - Recherche - Éducation

2018 Canadian Herpetological Society Conference
and BC Herps & Roads Workshop

Schedule-At-A-Glance

All events occur in Campus Activity Centre (CAC) on TRU campus

FRIDAY Sept. 21

7:30	*Registration open*
8:15	Herps & Roads Workshop Starts *Presentations*
10:30	Coffee Break *Presentations resume*
12:00	Lunch served and poster viewing
1:00	Working groups on Best Management Practices
2:30	Coffee break & poster viewing
3:00	*Working groups resume*
5:00	End of Workshop
7:00	**Ice-Breaker Social in The Den pub** for Workshop &

SATURDAY Sept. 22

7:30	*Registration open*
8:15	CHS Conference starts *Morning session starts*
10:00	Coffee Break
10:30	*Paper session resumes*
11:45	Group photo
12:00	Lunch break* *BoG Meeting*
1:30	*Paper session resumes*
14:45	Coffee Break
3:15	*Paper session resumes*
4:00	**Annual General Meeting**
5:00	Poster session and social on rotunda
7:00	Banquet Social in The Den pub

SUNDAY Sept. 23

8:00	*Registration open*
8:30	CHS Conference resumes *Morning session starts*
10:00	Coffee Break
10:30	*Paper session resumes*
11:45	Lunch break* *Meeting IUCN Amphibian Specialist Group*
1:30	*Paper session resumes*
2:45	Coffee Break
3:15	*Paper session resumes*
16:30	Closing remarks

*on Saturday and Sunday, lunch served in Mountain Room for conference delegates that ordered online during initial registration

MONDAY Sept 24

8:30	Field trips (optional) depart from CAC with pickup at host hotels
3:30 or earlier	Field trip vans rendezvous at Harper's Trail Vineyard for wine and down-time
5:30 or thereabouts	drop-offs at host hotels done

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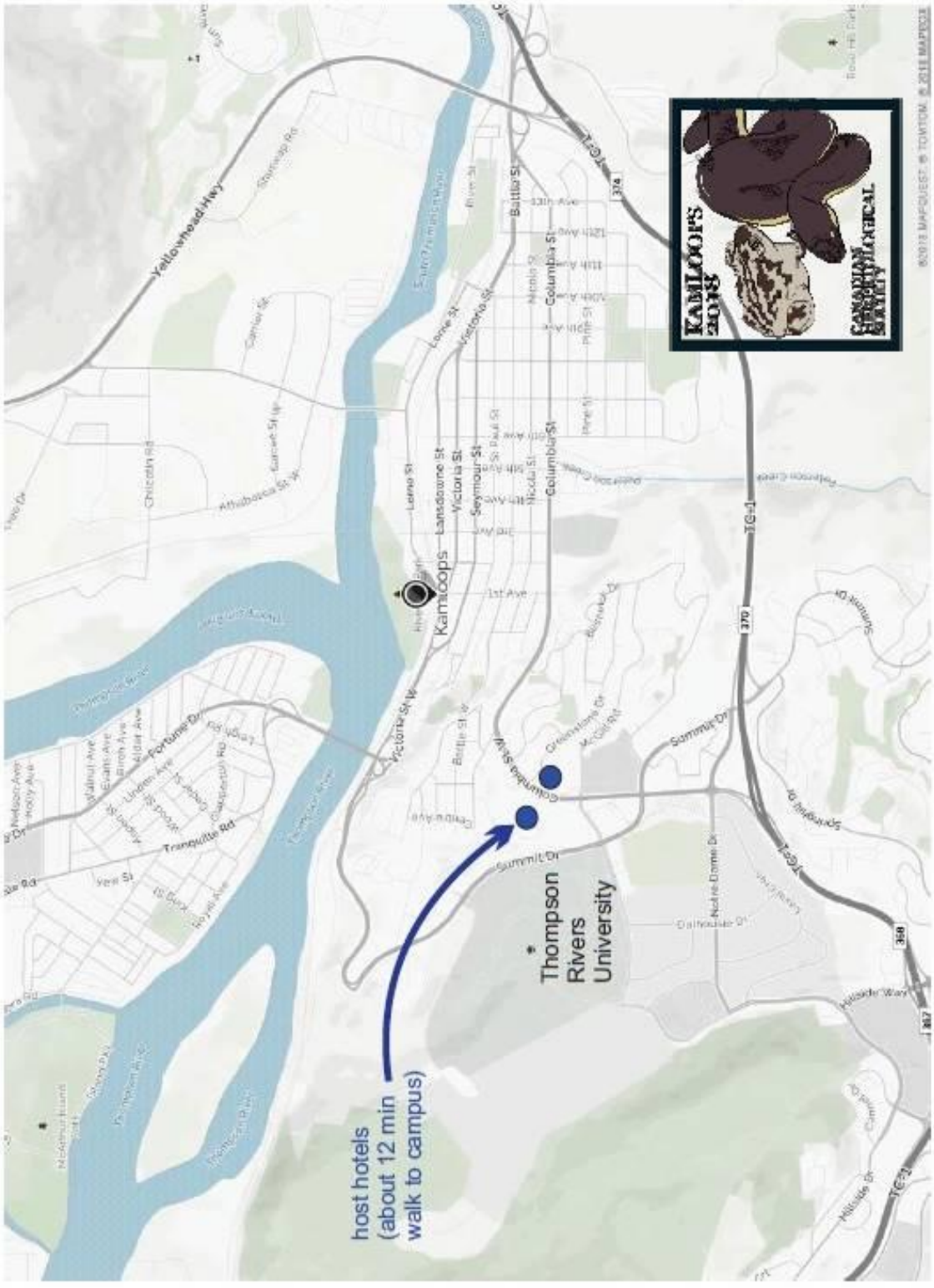

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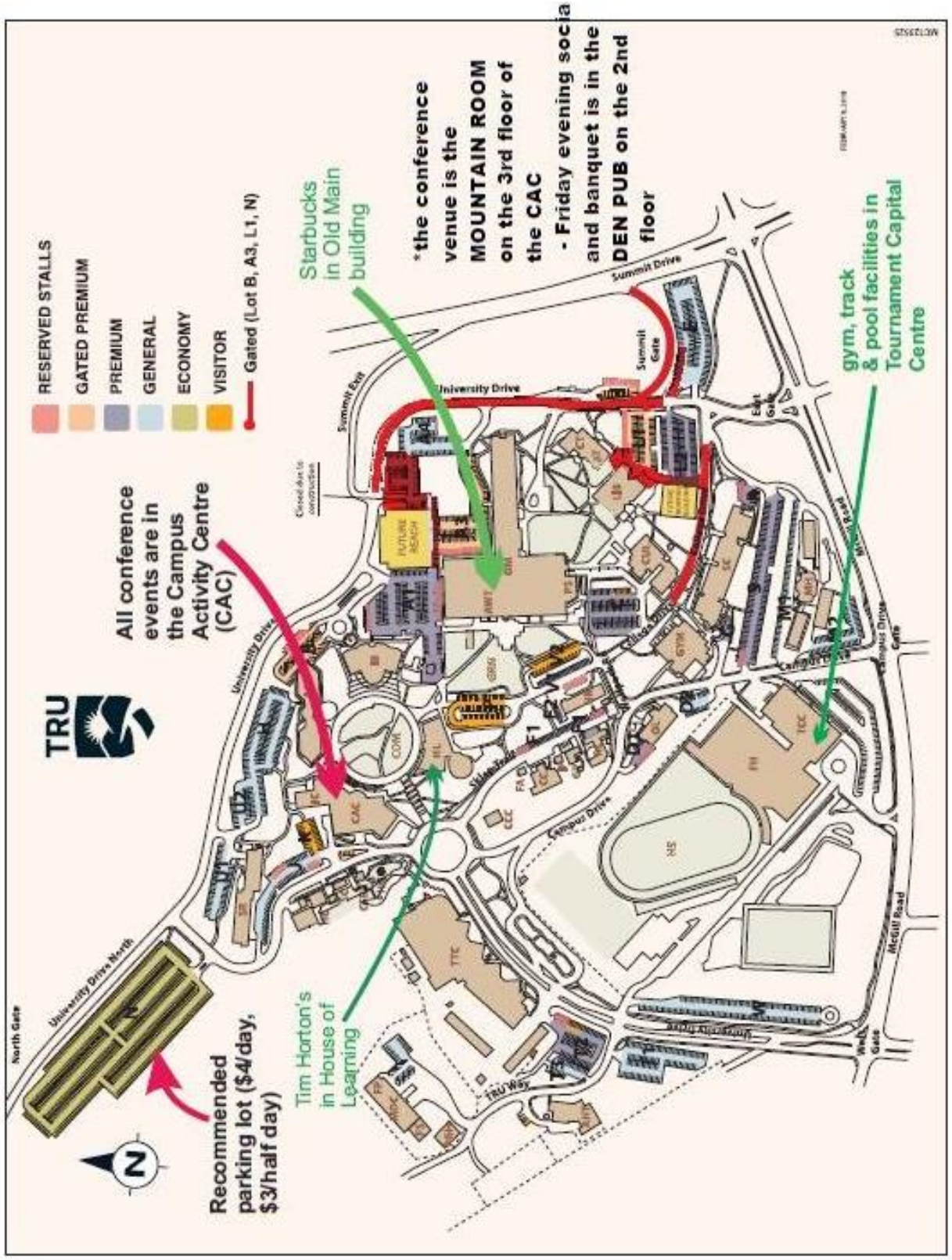

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Friday September 21st, 2018

08:15-17:00 Roads Workshop, Mountain Room, Campus Activity Centre

18:00-22:00 Registration at The Den Pub, Campus Activity Centre

19:00-22:00 Wine and Cheese Reception, Den Pub, Campus Activity Centre

Saturday September 22nd, 2018

07:30-08:15 Registration at Mountain Room, Campus Activity Centre

08:15-08:30 Opening Remarks

08:30-09:00 *****Plenary Speaker*****

CURRENT STATE OF PRACTICE FOR HERPETOFAUNA ROAD-MITIGATION SOLUTIONS AND RECOMMANDATIONS FOR IMPLEMENTATION.
Kari E. Gunson

Session 1 (Ecology part 1) Chair: Jackie Litzgus

09:00-09:15 **THE THERMAL ECOLOGY OF EASTERN GARTER SNAKES: WHY HOTTER IS NOT ALWAYS BETTER**
Curtis Abney*, Anne Yagi, and Glenn Tattersall

09:15-09:30 **NATURAL HISTORY OF COMMON GARTERSNAKES (*Thamnophis sirtalis*) IN EAST-CENTRAL BRITISH COLUMBIA**
Jillian M. McAllister

09:30-09:45 **NESTING IN CLOSE QUARTERS: CAUSES AND BENEFITS OF HIGH DENSITY NESTING IN PAINTED TURTLES**
Steven J. Kell*, Ronald J. Brooks and Jacqueline D. Litzgus

09:45-10:00 **GEOGRAPHIC VARIATION IN LITTER SIZE AMONG BRITISH COLUMBIA POPULATIONS OF CANADA'S MOST INTERESTING SNAKE, THAMNOPHIS ELEGANS**
Patrick T. Gregory

1000-1030 **BREAK**

Session 2 (Climate Change and Habitat Selection part 1) Chair: Tom Herman

10:30-10:45 **EARLY SPRING AND EARLY VANISHING WETLANDS AS HARBRINGERS OF THE FUTURE? THE CLIMATE CHANGE TRAP FOR EPHEMERAL POND-BREDING RANA AURORA.**
David R. Clements, Curtis R. Abney, Sterling W. Balzer*, Ashely Dueckman and Andrew Baylis

10:45-11:00 **EXTINCTION AND RANGE EXPANSIONS OF NORTH AMERICAN HERPETOFAUNA UNDER CONTEMPORARY AND FUTURE CLIMATE.**
Barry Sinervo, Donald B. Miles, Fausto Méndez-De la Cruz and Rafael Lara-Reséndiz

11:00-11:15 **CRITICAL HABITAT IDENTIFICATION AND APPLICATION FOR REPTILES AND AMPHIBIANS IN BRITISH COLUMBIA UNDER THE SPECIES AT RISK ACT.**
Darcy C. Henderson

11:15-11:30 **INFLUENCE OF WETLAND SIZE AND FOREST CANOPY ON THE BREEDING SUITABILITY OF SMALL EPHEMERAL WETLANDS FOR WOOD FROGS (*Lithobates sylvaticus*) IN ALBERTA'S BOREAL MIXEDWOOD.**
Matthew P. Robinson*, Brian R. Eaton and Scott E. Nielsen

11:30-11:45 **FILLING KNOWLEDGE GAPS OF THE GRAY RATSNAKE (*Pantherophis spiloides*) CAROLINIAN POPULATION: HABITAT USE AND MOVEMENT PATTERNS.**
Heather A. Fotherby*, Ryan W. Archer, Tanya L. Pulfer, Amy K. Whitear and Jessica M. Ferguson

11:45-12:00 **GROU PHOTO**

12:00-13:30 **Lunch**

Session 3 (Conservation part 1) Chair: Joe Crowley

13:30-13:45 **THE EFFECTS OF ROADS ON CANADA'S AMPHIBIANS AND REPTILES: UNCERTAINTIES AND ROADBLOCKS TO CONSERVATION.**
Joe Crowley

13:45-14:00 **IMPACTS OF ROAD MORTALITY ON POPULATION PERSISTENCE OF THE WESTERN RATTLESNAKE (*CROTALUS OREGANUS*) IN BRITISH COLUMBIA.**
Stephanie A. Winton*, Richard Taylor, Christine A. Bishop, and Karl W. Larsen

14:00-14:15 **ASSESSING EFFECTIVENESS OF HEAD-STARTING AND CAPTIVE BREEDING PROGRAMS FOR THE RECOVERY OF THE ENDANGERED OREGON SPOTTED FROG IN BRITISH COLUMBIA, CANADA.**
Amanda Kissel, Rylee Murray, Pascale Gibeau, Dan Greenberg, Wendy Palen, and Purnima Govindarajulu*

14:15-14:30 **INVESTIGATING THE THREAT OF ANGLING ON TURTLE POPULATIONS IN AN URBAN PARK IN NEW BRUNSWICK.**
Constance L. Browne* and Andrew Sullivan

14:30-14:45 **USING SPATIAL ECOLOGY AND CIRCUIT THEORY TO INFORM AGE-CLASS APPROPRIATE ROAD MORTALITY MITIGATION FOR TURTLES**.
Cory L. Kozmik* and Jacqueline D. Litzgus

14:45-15:15 **Break**

Session 4 (Climate Change and Habitat Selection part 2)
Chair: Pamela Rutherford

15:15-15:30 **MANAGING AN ECOLOGICAL TRAP ON AN ENDANGERED SPECIES MASSASAUGA (*Sistrurus catenatus*) BY USING FORCED HIBERNATION.**
Anne R. Yagi and Glenn J. Tattersall

15:30-15:45 **GIS-BASED MODELS TO INFER SUITABLE HABITAT FOR A DISJUNCT NORTHERN PRAIRIE SKINK (*PLESTIODON SEPTENTRIONALIS*) POPULATION IN MANITOBA.**
Pamela L. Rutherford*, Nicholas A. Cairns and Dion J. Wiseman

15:45-16:00 **POTENTIAL CLIMATE CHANGE EFFECTS ON INTRODUCED AND INVASIVE HERPETOFAUNA IN CANADA: A REVIEW.**
Leslie Anthony Lowcock* and Purnima Govindarajulu

16:00-17:00 **Annual General Meeting: Open to all members and guests.**

17:00-19:00 **Poster Session**

19:00-23:00 **Banquet, Awards Presentation, Presentation on the herpetofauna and natural history of the area, Herp quiz.**

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Sunday September 23rd, 2018

08:00-08:30 Registration

08:30-09:00 *****Plenary 2*****

MY #SCICOMM LIFE: SNAKES, ALIENS AND OTHER TALES OF SCIENCE COMMUNICATION.
Leslie Anthony Lowcock

Session 5 (Survey Methods and Results)
Chair: Jonathan Choquette

09:00-09:15 **CHECKLIST AND STATUS OF THE AMPHIBIANS AND REPTILES OF ESSEX COUNTY, ONTARIO: A 35 YEAR UPDATE.**
Jonathan D. Choquette* and Eric Jolin

09:15-09:30 **BEYOND THE FENCE: ENGAGING LANDOWNERS TO FIND SPECIES AT RISK.**
Hannah L. McCurdy-Adams*, David Seburn

09:30-09:45 **WETLANDS AND AMPHIBIAN HABITATS IN THE PEACE REGION OF BC: UPDATES FROM A 4-YEAR STUDY.**
Mark D. Thompson

09:45-10:00 **HERPS IN THE WIND: THE ECOLOGY OF HERPETOFAUNA IN WINDFARMS.**
Cory M. Trowbridge*, Kelly Withers, and Jacqueline D. Litzgus

10:00-10:30 **Break**

Session 6 (Ecology part 2) Chair: David Green

10:30-10:45 **DESCRIPTION OF A NOVEL SEXUAL DIMORPHISM AND WEAPON IN A WELL-STUDIED FRESHWATER TURTLE (*Chrysemys picta*).**
Deborah Hawkshaw, Patrick D. Moldowan *, Jacqueline D. Litzgus, Ronald J. Brooks and Njal Rollinson

10:45-11:00 **HOW DIET, PREDATION-RISK, AND THEIR INTERACTIONS AFFECT MULTIPLE RESPONSES TO RISK IN LARVAL SPOTTED SALAMANDERS (*Ambystoma maculatum*).**
Patrick S. Heney*, Thomas J. Hossie, and Dennis L. Murray

11:00-11:15 **FOWLER'S TOAD UPS AND DOWNS AT 30.**
David M. Green

11:15-11:30 **POPULATION ESTIMATE, SURVIVORSHIP AND GENERATION TIME OF THE NORTHERN PACIFIC RATTLESNAKE (*CROTALUS O. OREGANUS*) AT ITS NORTHERN-MOST RANGE LIMITS.**
Jared R. Maida, David Anthony Kirk, Owain McKibbin, Jeffrey R. Row, Karl W. Larsens, Charlotte Stringam, and Christine A. Bishop*

11:30-11:45 **THE INDIRECT EFFECTS OF ROADS ON SPECIES-AT-RISK REPTILES: ROAD AVOIDANCE AND ENERGETIC CONSEQUENCES.**
James E. Paterson* & and Christina Davy

11:45-12:00 **WHERE DO AMPHIBIANS LAY THEIR EGGS?**
Andrea Paetow

12:00-13:30 **Lunch**

Session 7 (Conservation part 2) Chair: Karl Larsen

13:30-13:45 **CONNECTING THE PUBLIC WITH BLANDING'S TURTLE (*EMYDOIDEA BLANDINGII*) RECOVERY IN ONTARIO.**
Crystal A. Robertson, Paul L. Yannuzzi, Katherine A. Wright*, Andrew M. Lentini, Bob Johnson, Rick L. Vo

13:45-14:00 **EVALUATING THE EFFECTIVENESS OF HEADSTARTING FOR WOOD TURTLE (Glyptemys insculpta) RECOVERY FROM A SUSPECTED POACHING EVENT.**
Damien I. Mullin, Rachel C. White, Andrew M. Lentini, Jory L. Mullen, Ronald J. Brooks, Jacqueline D. Litzgus*

14:00-14:15 **EXAMINING POPULATION AND SPATIAL ECOLOGIES OF BLANDING'S TURTLES *Emydoidea blandingii* TO INFORM MITIGATION PLANS FOR QUARRY DEVELOPMENT.**
Gabriella M. Zagorski*, James J. Trottier, Douglas J. Boreham, Jacqueline D. Litzgus

14:15-14:30 **TESTING EFFICACY OF MITIGATION FENCING DESIGNS AT PREVENTING ROAD ACCESS BY SNAKES IN THE FRONTENAC AXIS, ONTARIO.**
Matthew R. Macpherson*, Jacqueline D. Litzgus, Patrick J. Weatherhead, and Stephen C. Lougheed

1430-1445 **MIGRATION AND DISTURBANCE: IMPACT OF FENCING AND DEVELOPMENT ON RATTLESNAKE SPRING MOVEMENTS.**
Jared R. Maida*, Christine A. Bishop, and Karl W. Larsen

14:45-15:15 **Break**

Session 8 (Survey Methods and Results part 2)
Chair: Christine Bishop

15:15-15:30 **TWO CAMERA SYSTEMS FOR USE IN HERPETOLOGICAL RESEARCH.**
Jakob A. Dulisse

15:30-15:45 **QUANTIFYING THE DETECTION PROBABILITY OF MASSASAUGAS AND EASTERN FOXSNAKES USING ONTARIO'S SNAKE SURVEY PROTOCOL.**
John Urquhart*, Sean Hudson and Dennis Murray

15:45-16:00 **DESIGN AND USE OF SNAKE REFUGIA IN VINEYARDS IN THE OKANAGAN VALLEY, BC**
Karl W. Larsen, Valerie Law, Owain McKibbin, Laura Gardiner, Christine A. Bishop*

16:00-16:15 **NOVEL SURVEY METHODS USED FOR MARK-RECAPTURE OF COASTAL GIANT SALAMANDERS (*Dicamptodon tenebrosus*): IMPLICATIONS FOR SURVEY PROTOCOLS AND POPULATION STUDIES.**
Deborah L. Lacroix, Heidi M. Regehr, and Alicia D. Newbury*

16:15-16:30 **THE ROLES OF WATER QUALITY, NUTRITION, AND TRACE ELEMENTS IN THE OCCURRENCE OF SPINDLY LEG SYNDROME IN GEMINIS' DART FROG (*Andinobates geminisae*) TADPOLES.** Kathleen Higgins*, Jorge Guerrel, Elliot Lassiter, Roberto Ibanez and Arne Mooers

Monday September 24th, 2018

Field Trip Itinerary (tentative)

08:30 **Depart from CAC with pickup at host hotels**

15:30 **Field trip vans rendezvous at Harper's Trail Vineyard for tasting**

17:30 **Approximate drop-off time at host hotels. Done!**

POSTERS

PAEDOMORPHIC BLOTCHED TIGER SALAMANDER (*AMBYSTOMA MAVORTIUM*) FECUNDITY, SOUTHERN INTERIOR, BRITISH COLUMBIA, CANADA
Sara L. Ashpole* and Marissa R. Nati

CANADIAN IUCN AMPHIBIAN SPECIALIST GROUP
Sara L. Ashpole and Kristiina Ovaska

EMBYRONIC SURVIVORSHIP OF OREGON SPOTTED FROGS (RANA PRETIOSA) IN THE FRASER VALLEY
Christine A. Bishop*, Rene McKibbin

UNDERSTANDING VARIATION IN MALE ADVERTISEMENT CALLS IN SPRING PEEPERS (*Pseudacris crucifer*)
Ying Chen*, Amanda S. Cicchino and Stephen C. Lougheed

WHERE DO RATTLESNAKES (*Crotalus oreganus*) GIVE BIRTH? SITE SELECTION BY GRAVID FEMALE RATTLESNAKES FOR PARTUITION IN OSOYOOS, BRITISH COLUMBIA
Dana M. Eye*, Anna Skurikhina, Christine A. Bishop, Karl W. Larsen

ANALYSIS OF THE RELATIONSHIP BETWEEN BASELINE STRESS AND BODY CONDITION IN THE WESTERN RATTLESNAKE (*Crotalus oreganus*)
Cole R. Hooper*, Mark Rakowbowchuk, Karl W. Larsen

QUANTIFYING ROAD EFFECTS ON PAINTED AND SNAPPING TURTLE POPUATIONS IN ALGONQUIN PARK, CANADA
Steven J. Kell*, Ronald J. Brooks and Jacqueline D. Litzgus

INTEGRATING TRADITIONAL KNOWLEDGE AND WESTERN SCIENCE TO MONITOR THE IMPACTS OF CLIMATE CHANGE ON CULTURALLY SIGNIFICANT AND AT RISK ECOLOGY OF INDIGENOUS LANDS
Cory L. Kozmik*, J. Michael Waddington, Jesse N. Popp, Jacqueline D. Litzgus

INFLUENCE OF ENVIRONMENTAL VARIABLES ON GRAY RATSNAKE (*Pantherophis spiloides*) NEST BOX USE AND SUCCESS
Matthew R. Macpherson*, Jacqueline D. Litzgus, Patrick J. Weatherhead, and Stephen C. Lougheed

ASSESSING AND CREATING BLUE RACER (*Coluber constrictor foxii*) HABITAT ON PELEE ISLAND
Jennifer I. McCarter*, Emma Horrigan, and Tanya Pulfer

FACTORS AFFECTING *Batrachochytrium dendrobatidis* DENSITY IN SOUTHERN ONTARIO WETLAND ENVIRONMENTS
Megan Congram*, Sibelle Villaça, and Dennis Murray

DETERMINING TROPHIC TRANSFER OF MICROPLASTICS IN THE ST. LAWRENCE RIVER SYSTEM
Nathan Pollack, Suna Stone-McMaster, Adam Hill, Sara L. Ashpole*

LARGE RIVER VALLEYS ARE ESSENTIAL FOR LARGE-BODIED SNAKES ON THE CANADIAN GRASSLANDS
Ray G. Poulin, *, Christopher M. Somers

REMOTE CAMERA MONITORING OF POPULATIONS AND BEHAVIOUR OF WESTERN RATTLESNAKE HIBERNACULA
R.L.F. Reudink, Karl W. Larsen, J. Hales

INVESTIGATING WESTERN RATTLESNAKE (*Crotalus oreganus*) POPULATION GENETICS TO INFORM CONSERVATION MANAGEMENT
Danielle Schmidt*, Purnima Govindarajulu, Karl W. Larsen and Michael Russello

A MITIGATION AND MONITORING PLAN TO PROTECT WANDERING GARTER SNAKES (*THAMNOPHIS ELEGANS*) AS PART OF THE BOWMONT WEST FISH COMPENSATION PROJECT, CALGARY, AB
Stephen A. Symes*

HABITAT USE AND MORTALITY RISK OF WOOD TURTLE IN A LANDSCAPE UNDER ACTIVE AGRICULTURE.
Shaylyn D. Wallace*, Graham Forbes and Joseph J. Nocera

USING MARK-RECAPTURE TO EVALUATE POPULATION DEMOGRAPHY OF A MANAGED POPULATION OF BLANDING'S TURTLE IN ONTARIO, CANADA
Tharusha Wijewardena*, Jacqueline D. Litzgus, Nicholas E. Mandrak

A PRELIMINARY EXAMINATION OF THE EFFECTS OF URANIUM MINING ON LONG-LIVED TURTLE SPECIES
Gabriella M. Zagorski*, James J. Trottier, Douglas J. Boreham, Jacqueline D. Litzgus

***Students to be judged for presentation and poster awards, in the following abstracts.**

THE THERMAL ECOLOGY OF EASTERN GARTER SNAKES: WHY HOTTER IS NOT ALWAYS BETTER

Curtis Abney[1]*, Anne Yagi[1], and Glenn Tattersall[1]

[1]Department of Biological Sciences. Brock University. St Catharines, ON. L2S 3A1
ca16at@brocku.ca, anne.yagi@8trees.ca, gtattersall@brocku.ca

Gartersnakes are the most widespread reptile in North America. Despite occupying vastly different biogeoclimatic zones across their range, evidence suggests that the thermal preference (T_{set}) of gartersnakes has not diverged significantly between populations or different *Thamnophis* species. The reason behind gartersnake success could lie in their flexible thermoregulatory behaviours and habitat selection. We aimed to investigate this relationship by first identifying the T_{set} of a common gartersnake species (*Thamnophis sirtalis sirtalis*) via a thermal gradient. We then used this T_{set} parameter as a baseline for calculating the thermal quality of an open, mixed, and forested habitat all used by the species. We measured the thermal profiles of these habitats by installing a series of operative temperature models that mimicked the reflectance and morphology of living gartersnakes and recorded environmental temperatures as living snakes experience them. Lastly, we used coverboards to survey the current habitat usage of *T. s. sirtalis*. Of the three habitats, we found that the open habitat offered the highest thermal quality throughout the snake's active season. In contrast, we recorded the greatest number of snakes using the mixed habitat which had considerably lower thermal quality. Although the open habitat offered the greatest thermal quality on average, environmental temperatures regularly exceeded the upper limits of the animals' thermal tolerance, resulting in increased hours of restriction in which gartersnakes could not continue surface activity. Therefore, the open habitat may be less thermally attractive to *T. s. sirtalis* than the more buffered mixed shrub. Our data shows *T. s. sirtalis* may select more thermally stable habitats over habitats that present them with thermal extremes.

Platform

ASHPOLE

PAEDOMORPHIC BLOTCHED TIGER SALAMANDER (*AMBYSTOMA MAVORTIUM*) FECUNDITY, SOUTHERN INTERIOR, BRITISH COLUMBIA, CANADA

Sara L. Ashpole* and Marissa R. Nati

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Reproductively mature larval morphs, known as a paedogen or often referred to as neotene, are a rare occurrence among the southern interiors population of Blotched Tiger Salamanders (*Ambystoma mavortium*). Federally listed as endangered, and restricted to the south Okanagan river valley, Blotched Tiger Salamanders face increasing pressures from anthropogenic encroachment, predation, roads, and agriculture. In 2017, we examined a subset of archived frozen female paedomorphic Blotched Tiger Salamanders collected in mid-summer 2008 from a regional lake treated with Rotenone for the removal of fish. We assessed nine gravid individuals using blind egg counts to gain insight about their reproductive capacity and fecundity. The total number of eggs averaged 227 (StdDev ± 109; range 28 and 421), with dark larger eggs accounting for 133 (StdDev ± 69) and smaller pale immature looking eggs accounting for 94 (StdDev ± 49). While, animals were collected after the expected egg laying period for the terrestrial form (early spring) we do not know have available information on the reproductive cycle in paedogens. Our study suggests that paedomorphic individuals have fewer eggs than the terrestrial form as reported in the literature (up to 5,000 eggs). While a species recovery plan has been developed for the salamander, it is unclear as to how the terrestrial and aquatic form may require different protection measures. To ensure adequate and appropriate conservation measures can be taken, we recommend further investigation into the life history of paedomorphic forms in comparison to terrestrial morphs of the Blotched Tiger Salamander.

Poster

CANADIAN IUCN AMPHIBIAN SPECIALIST GROUP

Sara L. Ashpole[1] and Kristiina Ovaska[2]

IUCN Canadian ASG Co-Chairs. [1]St. Lawrence University, Canton. NY. 13617. sashpole@stlawu.edu, [2]Biolinx Environmental Research Ltd. 424 Viaduct Avenue, Victoria, BC, Canada V9E2B7. ke.ovaska@gmail.com

The goal of the IUCN Amphibian Specialist Group (ASG) is to support a global strategic plan for amphibian conservation, research, and education (http://www.amphibians.org/). The Canadian ASG can facilitate dissemination of information and has a strong asset in the existing network of Canadian herpetologists. Through collaboration with the Canadian Herpetological Society and the COSEWIC Amphibian and Reptile Species Specialist Subcommittee, the ASG can provide additional support to coordinate national-level amphibian conservation initiatives that contribute to IUCN's strategic plan. ASG's interests include promoting strategies to prevent the introduction and spread of pathogens, monitoring, and filling data gaps. Achieving a coordinated Canadian effort won't be without challenge and the need for great discussion, and it is our hope to engage as many people and organizations as possible in those discussions. ASG seeks individuals and groups that are interested in collaborating with us on these priorities. We hope to connect organizations and individuals with relevant expertise to increase Canadian partnerships and accessibility to information. The ASG membership involvement is wide-ranging, from grassroots project collaboration to being part of a network that provides expert consultation.

Poster

EMBYRONIC SURVIVORSHIP OF OREGON SPOTTED FROGS (RANA PRETIOSA) IN THE FRASER VALLEY

Christine A. Bishop[1], Rene McKibbin[2],

[1]Environment and Climate Change Canada, Science and Technology Branch, Wildlife Research Division, 5421 Robertson Road, Delta, British Columbia V4K 3N2, Canada
[2]Environment and Climate Change Canada, Canadian Widllife Service, Protected Areas Unit, 5421 Roberston Road, Delta, British Columbia V4K 3N2, Canada

The Oregon Spotted Frog is critically endangered in Canada. We monitored the embryonic survivorship of this species at three locations in the Fraser Valley from 2002-2016. Survivorship ranged from 9 % to over 90% depending on location and year. We compared survivorship of sub samples of eggs (n= 15-30 eggs/clutch) monitored in small cages versus survivorship when the entire clutch was caged and monitored. We found consistently higher survival of eggs (approximately 10% higher) that were retained in the egg mass and in large cages when compared to smaller cages and sub samples.

Poster

INVESTIGATING THE THREAT OF ANGLING ON TURTLE POPULATIONS IN AN URBAN PARK IN NEW BRUNSWICK

Constance L. Browne* and Andrew Sullivan

New Brunswick Museum, 277 Douglas Avenue, Saint John, New Brunswick, Canada, E2K 1E5, cbrowne@unb.ca, Andrew.Sullivan@nbm-mnb.ca;

Rockwood Park is a large urban park (~8 km^2) located in the city of Saint John, NB. Three species of turtles occur in Rockwood: Eastern Painted Turtle (*Chrysemys picta picta*), Snapping Turtle (*Chelydra serpentina*), and occasionally exotic Red-eared Sliders (*Trachemys scripta elegans*). Urban turtle populations faces many threats. Our goal was to investigate the threat of angling by-catch. Little is known about the frequency or survival rates of angling by-catch. However, Parga (2012. Bulletin of Marine Science 88:731-741) describes different hooking locations and the risks associated with each. We interviewed anglers encountered along lakes in Rockwood in 2016. We conducted 57 interviews encompassing 75 adults and 20 children. Among these, five anglers had caught eight turtles in Rockwood Park. Two turtles (one Snapping and one Slider) were not hooked but reeled in while they held onto the bait. The other six (one Snapping and five Sliders) had swallowed the hook and the anglers cut the line and freed the turtles with hook ingested; we assume these turtles did not survive because this scenario is considered to be very high risk. We also requested turtle observations using the New Brunswick Fishing forum and documented three additional observations of turtle by-catch outside the park (1 Painted and 2 Wood Turtles, *Glyptemys insculpta*); these individuals were hooked in low risk locations, hooks were removed, and turtles released. We concluded that angling is a threat to turtle populations in Rockwood Park because the turtle populations are small and angling by-catch appears to be relatively frequent. However, angling by-catch does not appear to be as frequent elsewhere in New Brunswick. We will discuss possible reasons why angling by-catch may be higher in Rockwood than other New Brunswick lakes and also our angler awareness program that we implemented to reduce mortality rates for turtles accidentally caught.

Platform

UNDERSTANDING VARIATION IN MALE ADVERTISEMENT CALLS IN SPRING PEEPERS (*Pseudacris crucifer*)

Ying Chen[1]*, Amanda S. Cicchino[2] and Stephen C. Lougheed[1]

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The mate recognition system is the foundation of biological speciation in anurans. Sexual selection has been suggested to cause males call evolution. It is generally assumed that a significant fraction of variation in male call has an underlying genetic basis and that there is some link between call attributes and fitness, yet there are largely unproved assertions with many other factors contributing to diversity of calls within a male chorus. Anurans advertisement calls are important in studies in sexual selection, speciation as well as phenological studies. In all of these understanding, heritability is prerequisite to understanding evolutionary patterns and potential responses to selection. However, very few studies have examined the heritability of advertisement calls in anurans. In general, we know that key aspects of anuran calls, including both temporal and spatial attributes, vary with morphology such as body size, ontogeny such as age, abiotic factors such as temperature and habitat types, as well as biotic interactions like inter-male competition. In this study, I hope to quantify the genetic-basis of anuran call variation within a calling assemblage of a temperate treefrog, *Pseudacris crucifer,* and disentangle the relative contributions of different factors: body size, age, calling temperature and genetics. I hope to use single nucleotide polymorphisms (SNPs) to estimate the relatedness of calling males and use animal model to incorporate influential factors. By investigating the genetic basis as well as environmental components of advertisement call attributes, we will gain a better understanding of call evolution and the potential for sexual selection to drive divergence.

Poster

CHECKLIST AND STATUS OF THE AMPHIBIANS AND REPTILES OF ESSEX COUNTY, ONTARIO: A 35 YEAR UPDATE

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Essex County, Ontario, supports a diverse assemblage of Canadian herpetofauna. It is home to the only Canadian populations of some species/subspecies and contains two of Canada's 11 Important Amphibian and Reptile Areas. The last complete checklist and status assessment of the herpetofauna of Essex County was compiled in 1983. Changes to natural habitats and an increase in monitoring efforts (e.g., citizen science) over the past 35 years warrant an updated assessment of herpetofaunal status. The county was subdivided using a 10x10km grid overlay, and recent observations (1997 – 2016) submitted to provincial databases were tabulated for each grid square. We compared current status' of herpetofauna in Essex County to those of the 1983 study using a similar classification scheme of 'extirpated from Essex' (EE; no recent observations) and 'rare in Essex' (RE; distribution ≤ 5 squares or 15%). We found that eleven species have declined in status. Indeed, the majority of reptiles and amphibians (62%) that historically occurred in Essex County are now either EE (31%) or RE (31%), and almost half (45%) of the 29 extant species/subspecies are considered RE. Amount of natural area was a significant positive predictor of herpetofaunal species/subspecies richness per square. Species/subspecies richness was highest in squares along the western and southern edges of the mainland (16 to 19 species). Salamanders and squamates appear to be the least tolerant to broad-scale intensive land modification, with 86% and 65% of species/subspecies being classified as EE or RE, respectively. If future extirpations are to be prevented, recovery efforts in Essex County must also include provincially "common" species and target multiple locations.

Platform

EARLY SPRING AND EARLY VANISHING WETLANDS AS HARBRINGERS OF THE FUTURE? THE CLIMATE CHANGE TRAP FOR EPHEMERAL POND-BREDING RANA AURORA.

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The decline of the northern red-legged frog, Rana aurora, in the Pacific Northwest has been attributed to predation by invasive species, habitat loss, and climate change. R. aurora frogs lay eggs on emergent vegetation, and larval development occurs in shallow, often ephemeral wetlands. In the years of our study, 2015 and 2016, early season temperatures in southwestern British Columbia were warmer than in the previous two decades and egg laying occurred much earlier than normal, allowing us to evaluate survival and development of R. aurora under unusual climate regimes. We monitored egg masses and water quality in 43 wetlands in the Little Campbell River Watershed and nearby areas in British Columbia in 2015 and selected 6 high population sites to monitor tadpole metamorphosis in 2015 and 2016. Phosphate concentrations were negatively correlated with egg mass abundance. Although earlier egg laying facilitated earlier development, we also observed some egg mortality due to frost events later. Sites with warmer water had earlier peak egg mass abundance dates and earlier peak metamorph dates. In 2015, a section of one of the six ponds dried up before tadpoles completed metamorphosis. Our results show that the frog's reproductive cycle may adapt to warmer temperatures to some degree but erratic precipitation or frost events throughout the breeding season could reduce R. aurora survivorship beyond recovery. The disruption of normal larval development we observed under unusually warm spring conditions provides a useful vantage point for predicting future impacts of climate change on R. aurora.

Platform

CONGRAM*

FACTORS AFFECTING *Batrachochytrium dendrobatidis* DENSITY IN SOUTHERN ONTARIO WETLAND ENVIRONMENTS

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In the decades since its discovery in 1999, *Batrachochytrium dendrobatidis* (Bd) has been linked to population declines in over 120 species, and is often cited as one of the major contributors to amphibian extinctions in the Anthropocene. While Bd has a broad distribution in Canada, having been detected in seven provinces and one territory, relatively little is known about its habitat associations in Canadian wetlands despite being implicated in the declines of several Canadian species. Our study sampled 95 wetlands in the Peterborough area for Bd over two seasons using a novel eDNA-like method, and examined the connection between the density of the fungus detected in these wetlands and a number of water quality and habitat variables. We found that water temperature had a positive effect on the prevalence of the fungus, with warmer wetlands being more likely to test positive for Bd, and that canopy cover had a negative effect on density, with less canopy cover leading to higher detections of Bd in a wetland. These results have implications for amphibian conservation in southern Ontario and potentially the country as a whole, and may offer a means of mitigating the impact of this fungus on vulnerable Canadian species.

Poster

THE EFFECTS OF ROADS ON CANADA'S AMPHIBIANS AND REPTILES: UNCERTAINTIES AND ROADBLOCKS TO CONSERVATION

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There is a growing body of literature on the effects of roads on amphibians and reptiles, and it is well established that roads and associated vehicular traffic can result in a wide range of negative effects to amphibian and reptile populations, most notably local population declines. However, few studies have quantified the effects of road mortality on local population abundance, trends of viability, and those that have generally rely on complex model predictions rather than long-term field data collection. Further complicating the issue, the majority of road ecology research tends be associated with major roads, known road mortality hotspots, or high road densities – areas where road-effects are most likely to occur and be detected. However, there remains little information on the effects of smaller roads, such as forestry roads and small rural roads, on amphibian and reptile populations. This makes it difficult to accurately assess the effects of roads on amphibian and reptile populations across much of Canada, where road density, traffic volume and traffic speed tend to be several magnitudes lower than in the highly developed regions where most road ecology research has been carried out. Additional research is urgently required to provide quantitative assessments of the effects of roads on Canada's amphibian and reptile species across their range, and this information is essential to inform and support effective policy development pertaining to road planning and mitigation within amphibian and reptile habitat.

Platform

TWO CAMERA SYSTEMS FOR USE IN HERPETOLOGICAL RESEARCH

Jakob A. Dulisse

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I have been testing two camera systems for amphibian and reptile research. The first is a camera trap I have designed to monitor two western toad (*Anaxyrus boreas*) highway underpasses at Summit Lake, B.C. The camera is triggered by a broken beam setup with an infrared emitter and sensor placed at ground level across the floor of the tunnel. A digital SLR camera is fixed to the ceiling of the tunnels and the built-in flash is used to obtain high quality, colour JPEG images of animals passing through the infrared beam. The system has been used in use since 2016 and has recorded at total of 15 vertebrate species using the underpasses, including western toads. This system provides an alternative to game cameras, which do not always work well with amphibians and reptiles (because game cameras are triggered by movement and body heat). The second camera system I have been evaluating is an inspection camera. Inspection cameras consist of a handheld screen (sometimes cast to a mobile device) and a lighted camera at the end of a flexible, articulated cable which can be manipulated into narrow underground cavities. These relatively inexpensive cameras can capture still images or video files. I have been using inspection cameras to monitor underground western toad and North American racer (*Coluber constrictor*) rest and hibernation sites in southeastern B.C. since 2014. Both camera systems have proven very valuable for herpetological applications.

Platform

EYE*

WHERE DO RATTLESNAKES (*Crotalus oreganus*) GIVE BIRTH? SITE SELECTION BY GRAVID FEMALE RATTLESNAKES FOR PARTUITION IN OSOYOOS, BRITISH COLUMBIA

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Female reproductive success, habitat selection and behaviour are all important elements in the ecology of rattlesnake populations. In Canada, a large portion of research on the Western Rattlesnake (*Crotalus oreganus*) has focused heavily on male behaviour (including migration), leaving a large knowledge gap and biasing the development of effective recovery plans. Our study in Osoyoos, BC, is focusing on site selection and behaviour by female rattlesnakes during partuition. We are using radio telemetry to track gravid female rattlesnakes (n=16 to date) to their 'rookery sites', identified by the cessation of long-distance movements and the adoption of sedentary behaviour. These sites are being compared to random habitat plots using a matched case-control study design. Vegetation cover, temperature data, and additional features are being assessed at three different spatial scales (1m, 3m, 10m radius plots). To date, the average distance travelled by gravid females from their hibernacula to their rookery sites is 84.7 m (range 7.4 m to 233.2 m, *n= 16*). Additionally, variation exists in whether female rattlesnakes choose rookery sites that are simultaneously used by other gravid females (16 rookeries: 12 singular, 4 communal). Following this year, we are planning on expanding this work into other locations to broaden the geographic scope of our study. Information from this ongoing study will shed insight into a critical phase of the life history of female rattlesnakes in this region, including our ability to maintain these crucial habitat features on the landscape.

Poster

FILLING KNOWLEDGE GAPS OF THE GRAY RATSNAKE (Pantherophis spiloides) CAROLINIAN POPULATION: HABITAT USE AND MOVEMENT PATTERNS

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Two genetically distinct populations of Gray Ratsnake (Pantherophis spiloides) exist in Ontario including the Frontenac Axis population of eastern Ontario, and the Carolinian population located in southwestern Ontario north of the Lake Erie shoreline. Significant knowledge gaps exist with respect to the Carolinian population, which in comparison to the Frontenac Axis population, has received relatively little study to understand its habitat requirements, movement patterns and other aspects of its life history traits that may differ from the Frontenac Axis population. This information is required to inform conservation priorities, land management planning and stewardship initiatives to contribute toward species recovery. In 2017, we conducted a radio-telemetry study in which we monitored the habitat use and movement patterns of three Gray Ratsnake individuals from the Carolinian population (Big Creek subpopulation). Preliminary findings suggest similarities in behaviour and habitat use between the Carolinian and Frontenac Axis populations such as an observed preference for edge habitats. However, differences between the two populations were also noted such as the distance travelled between summer and overwintering habitats. The work completed in 2017 represents the pilot year of a three-year study intended to improve our knowledge of the Carolinian population and provide a baseline for future recovery activities for the species.

Platform

FOWLER'S TOAD UPS AND DOWNS AT 30.

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Over 30 consecutive years of intensive survey of the breeding population of Fowler's toads (*Anaxyrus fowleri*) at the base of Long Point, Ontario, the numbers of adult toads rose and fell several times before settling into a long period of decline followed by a regime of relative stability at low abundance. The period of fluctuating abundance appears to have been driven mainly by density-dependent dynamics whereas the period of decline can be ascribed to diminishing recruitment due to loss of breeding sites. The relatively small numbers of toads persisting over the past decade, however, may owe their existence to immigration and attempts at mitigation. Rebound of the population may be hampered by persistent lack of quality breeding habitat, Allee effects, and competition with co-occurring American toads. However, the condition of the Lake Erie shoreline is now changing rapidly. High water and strong storms have drastically eroded shoreline dunes and threaten to breach the dunes altogether. This is highly likely to herald yet more changes to the population dynamics of these toads. Thirty years may seem like a long time, but the toads and their environment continue to generate surprises.

Platform

GEOGRAPHIC VARIATION IN LITTER SIZE AMONG BRITISH COLUMBIA POPULATIONS OF CANADA'S MOST INTERESTING SNAKE, *THAMNOPHIS ELEGANS*

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The gartersnake, *Thamnophis elegans*, is a widespread species in western North America, ranging well north into Canada. Throughout its range, it occupies a variety of habitats and feeds on a wide diversity of prey. Thus, like some of its congeners, it can be fairly described as a generalist species. Other generalists in the genus also exhibit significant variation in life-history traits. For example, litter size in *T. sirtalis* varies geographically both in absolute terms and in relation to maternal body size. Here, I add more recent data to a previously analyzed data set to compare litter size among four widely separated populations of *T. elegans* in British Columbia. As in *T. sirtalis*, average litter size was significantly different among populations, but, unlike *T. sirtalis*, these differences disappeared when litter size was adjusted for differences in maternal body size among populations. Maternal body size accounted for 65% of the variance in littter size in the pooled sample. Surprisingly, none of the residual variation was accounted for by additional differences among locations or by differences among years. Thus, the main questions that arise from this analysis are: (1) Why does body size vary among sites? and (2) What factors other than body size affect litter size?

Platform

CURRENT STATE OF PRACTICE FOR HERPETOFAUNA ROAD-MITIGATION SOLUTIONS AND RECOMMENDATIONS FOR IMPLEMENTATION

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In Canada, the kilometres of roads per person exceed that of any other country on earth. By far Ontario carries the bulk of these road kilometres and traffic volumes are comparable to other heavily populated regions in Europe, e.g. Switzerland. For example, historical trends have shown that Ontario's road network has increased fivefold between 1935 and 1995, and this trend will continue to meet the demands of an estimated 30% population growth increase by 2031. This presentation will focus on a synthesis of effective road-mitigation solutions for amphibians and reptiles across a broad range of applications. The presentation will draw from several key Best Management Practices (BMPs) documents in North America and Europe: Primarily, the Ontario Ministry of Natural Resources and Forestry BMP guidelines (2016); and the National Cooperative Highway Research Program – Highway Passages for Small Terrestrial Wildlife (http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4337; in prep). As well as a recently compiled handbook titled "Wildlife on Roads" (https://eco-kare.com/) and numerous effectiveness monitoring papers submitted to the Ontario Ministry of Transportation from 2015 onwards (https://eco-kare.com/publications-conferences/#t). The presentation will include a summary of existing practices, including supplementary short-term measures, as well as permanent measures (e.g. crossing structures and exclusion fencing). Ongoing challenges such as implementation of effective measures across vast landscapes inundated with roads, as well as implementation and maintenance of measures in a road-environment will be discussed. The presentation will then conclude with a discussion of the knowledge gaps and strategies that can provide direction for decision-makers promoting the integration of road ecology measures into mainstream road planning processes.

Platform (Plenary)

DESCRIPTION OF A NOVEL SEXUAL DIMORPHISM AND WEAPON IN A WELL-STUDIED FRESHWATER TURTLE (*Chrysemys picta*)

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Sexually coercive reproductive tactics are widespread among vertebrate animals. Males may employ specialized structures, called sexual weapons, to harass, intimidate, and/or physically force females to mate. Despite a great breadth of research on the natural history of the Painted Turtle (*Chrysemys picta*) over the last century, an alternative, coercive mating strategy was recently described for the first time in this species. Field observations from a long-term study of Painted Turtles in Algonquin Provincial Park, Ontario, suggest a sexual dimorphism exists in anterior carapacial morphology with males having more serrated anterior marginal scutes than females. We hypothesized that this dimorphism is a weapon used by males in coercive mating. Using morphological data and digital photographs of Painted Turtles from Algonquin Provincial Park and several museum collections, we quantified anterior carapacial morphology and putative dimorphism. Average anterior carapace shape was significantly different between the sexes with males having an overall more serrated and projecting morphology compared to females, consistent with the sexual weapon hypothesis. In addition, males had a particularly strong allometric relationship between anterior carapacial (weapon) shape and body size relative to females. We discuss morphological, ontogenetic and behavioural contexts for these sexual weapons in Testudines. The sexually size dimorphic tomiodonts, tooth-like cusps of the beak, and jagged anterior carapace of male Painted Turtles form an apparent arsenal of sexual weapons used in mate coercion. This study underlines the poorly understood reproductive biology of turtles: our results suggest that one of the most widely-studied freshwater turtle species in the world has a hitherto unrecognized dimorphism that may be formative to its mating system. This dimorphism, along with associated reproductive behaviour, provides new and exciting avenues of research in a model species.

Platform

CRITICAL HABITAT IDENTIFICATION AND APPLICATION FOR REPTILES AND AMPHIBIANS IN BRITISH COLUMBIA UNDER THE SPECIES AT RISK ACT

Darcy C. Henderson

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The federal *Species At Risk Act* prohibits harm or destruction of individuals, residences, and critical habitat. In the case of reptiles and amphibians, prohibitions for individuals and residences immediately apply on federal lands, but those prohibitions on non-federal lands or for critical habitat anywhere require that an additional Order be passed by the federal cabinet. Identification of critical habitat is both a technical and legal process that integrates biological knowledge about the species, biophysical knowledge of the landscape, and advice about how to reasonably avoid destruction. Critical habitat for any species includes a geospatial boundary, within which biophysical attributes must be present, and examples of activities likely to destroy that habitat. Constructing a new road or widening an existing road where attributes occur within a boundary is an example of destruction. This permits us to use smooth boundaries that generalize the location of those attributes where a species will most likely need and use it, and flags activities that should receive careful consideration before proceeding. The law also requires these biophysical attributes be written and described such that any Canadian could reasonably expect to recognize them and avoid causing harm or destruction in order to comply with the law. Overly technical or vague wording make it difficult to apply the law when reviewing permits and environmental assessments, or investigating complaints for enforcement action. Similarly, the activities likely to result in destruction cannot be comprehensive of every conceivable activity, but the list should help any reasonable person identify whether their activities may contravene the prohibition. What critical habitat cannot legally do is require people to reverse past destruction (like roads) or implement improvements to existing problem locations (like road crossings). Instead, critical habitat identification can be used to more effectively target funds and efforts to improve or restore habitats and populations.

Platform

HOW DIET, PREDATION-RISK, AND THEIR INTERACTIONS AFFECT MULTIPLE RESPONSES TO RISK IN LARVAL SPOTTED SALAMANDERS (*Ambystoma maculatum*)

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There has been a growing body of literature using empirical research to test hypotheses related to indirect predator-prey interactions, which are inherently defined by foraging-risk tradeoffs. Specifically, the control of risk (COR) hypothesis states that for predictable predation risks, antipredator responses should be associated with behavioural costs, while unpredictable risks should incur a stress response. This hypothesis, however, has only been applied to terrestrial systems. In aquatic systems, anuran tadpoles have long since been a model species for investigating these indirect interactions, with hundreds of studies published. Salamander larvae, however, are relatively understudied and their responses to perceived predation risk (PPR) are not well known. Furthermore, little is known about how risk responses differ when food is limiting, as diet is typically invariable in such experiments, thus its effects remain unknown. We ran an experiment, exposing 11-day old spotted salamander larvae to PPR using chemical cues while restricting diet for, 63 days, to investigate how these 2 factors interact to affect behaviour, morphology, and physiology throughout ontogeny. We analyzed activity, background substrate colour matching, growth, lateral and dorsal morphology, and whole-body corticosterone levels. We found that salamander larvae seemed to habituate to regular predation risk treatments, and therefore responded in terms of reducing activity, but not morphologically or physiologically. Larvae that were food-restricted, on the other hand, exhibited increased corticosterone levels, and notable morphological changes including smaller size and relatively wider heads compared to satiated counterparts. These effects may have been metabolically driven, and worked tandemly with reduced activity to produce the aforementioned responses. Our work provides empirical evidence for the COR hypothesis in an aquatic system and sets the stage for future experiments that both alter food levels and vary risk treatments in a less predictable way.

Platform

THE ROLES OF WATER QUALITY, NUTRITION, AND TRACE ELEMENTS IN THE OCCURRENCE OF SPINDLY LEG SYNDROME IN GEMINIS' DART FROG (*ANDINOBATES GEMINISAE*) TADPOLES

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Threatened by habitat loss, non-native species introductions, pollution, and disease, amphibians have the highest extinction risk of any terrestrial vertebrate. Assurance population captive breeding is one important management component, but diseases associated with captivity often limit the success of amphibian captive breeding programmes. Spindly Leg Syndrome (SLS) is a poorly understood disease characterized by the malformation or underdevelopment of limbs in late stage tadpoles or early stage post-metamorphs. Over 50% of post-metamorphs produced by *Andinobates geminisae* (a critically endangered species of Dendrobatid) were lost to SLS during 2016 and early 2017 at the Panama Amphibian Rescue and Conservation Project (PARCP). I studied the effects of water quality, water trace elements, nutrients, and water filtration method on the occurrence of SLS in *A. geminisae* tadpoles by means of two experiments carried out at the PARCP's captive breeding centre in Gamboa, Panama. During my work at the PARCP, SLS prevalence dropped to just 3%. Along with my experimental findings, this drop in prevalence led me to find strong observational evidence for calcium deficiency as the cause of SLS. My experimental findings provide complimentary evidence for this new hypothesis and clarify several anecdotal claims about the cause of SLS.

Platform

HOOPER*

ANALYSIS OF THE RELATIONSHIP BETWEEN BASELINE STRESS AND BODY CONDITION IN THE WESTERN RATTLESNAKE (*Crotalus oreganus*)

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Western rattlesnakes (*Crotalus oreganus*), a threatened species, have been found to persist in highly disturbed areas in British Columbia; however, the persistence of this species in these areas may be obscuring the actual health of individuals within these populations. Previous research in the south Okanagan has shown that snakes living in these disturbed habitats exhibit reduced body condition, when compared to those in undisturbed areas. Our research describes one of the possible mechanisms responsible for this reduction in body condition, namely chronic stress, a factor already shown to play a role in lowering body condition in other species. However, the link between stress and body condition has not yet been effectively explored in herpetiles. We will be using ELISA™ kits to determine the concentration of stress hormone (corticosterone) in the collected blood samples and relating this back to habitat disturbance and body condition. During the field season of 2018, we drew blood samples from Western Rattlesnakes in a variety of habitat types and disturbance levels, within the same south Okanagan study site. Only blood samples that were obtained within five minutes of the initial encounter with each snake were used to represent an assay of baseline stress (i.e. not an acute response to handling). Blood samples were subsequently centrifuged and separated, thereafter the blood plasma was frozen for later analysis. This research will allow us to describe one of the specific physiological pathways by which the health of the snakes may be impacted by habitat disturbance.

Poster

KELL*

QUANTIFYING ROAD EFFECTS ON PAINTED AND SNAPPING TURTLE POPUATIONS IN ALGONQUIN PARK, CANADA

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Road mortality is a significant threat to turtle populations and has contributed to potentially deleterious changes in population demography. Road mortality can occur during annual nesting migrations of females, dispersal of juveniles, movements to escape unfavorable habitat conditions, or to find suitable habitat and mates. Although studies have investigated mortality rates of turtles caused by vehicle collisions, our study is unique because it examines effects of road mortality on population characteristics that may cause population instability. We hypothesize that proximity to roads will decrease the health and fitness of turtle populations due to an increase in mortality from vehicle collisions, leading to changes in demography. We surveyed turtle populations in 8 impact sites (wetlands along the major highway corridor) and 8 non-impact sites (wetlands >4 km from roads) in Algonquin Park. We will compare body sizes and conditions, injury rates, population density, population age structure and sex ratio between impacted and non-impacted sites. We predict that non-impact sites will contain populations with larger body sizes, fewer injuries, older aged individuals, and an equal sex ratio. Snapping Turtles and Painted Turtles from wetlands will be captured in spring by canoe and dip net, and in late summer by trapping. From the 16 wetlands, 148 Painted Turtles and 94 Snapping Turtles were captured. Preliminary analyses indicate that non-impact sites have, on average, larger body sizes and more female-biased sex ratios. Roads cause direct mortality of turtles; our study will quantitatively determine whether roads negatively influence turtle populations in more subtle indirect ways.

Poster

NESTING IN CLOSE QUARTERS: CAUSES AND BENEFITS OF HIGH DENSITY NESTING IN PAINTED TURTLES

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Nesting is a costly time for female turtles, both energetically and from threat of predation. Although predation rates of eggs and juveniles are often high, ensuring maximum survival of offspring is crucial for population stability and individual fitness. Past observations from our long-term study site in Algonquin Park, Ontario indicate that female Painted Turtles (*Chrysemys picta*) may be nesting together, suggesting this clumping may have a benefit to themselves or offspring. Our goals were to determine if females are choosing to nest at high nest densities, what cues they use to locate nest sites, and what benefits the offspring might accrue from incubating at high nest densities. Using ArcGIS, we found that females nested in clusters, the location of clusters varied among years, and that nest site selection was not strongly determined by abiotic characteristics (overstory density, slope, soil temperature). Female turtle models were placed on the nesting embankment in three different densities and rotated among three locations, and we found that females nested most often with the highest density of models. In ~20% of cases, nests were so clustered that eggs were deposited directly into existing nests or directly beside existing nests. Survivorship of clustered nests (49%) was higher than solitary nests (39%). These lines of observational and experimental evidence strongly suggest that female Painted Turtles choose to nest in close proximity to conspecifics, and that this clustering results in a fitness benefit through increased nest survival.

Platform

ASSESSING EFFECTIVENESS OF HEAD-STARTING AND CAPTIVE BREEDING PROGRAMS FOR THE RECOVERY OF THE ENDANGERED OREGON SPOTTED FROG IN BRITISH COLUMBIA, CANADA

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The Oregon Spotted Frog (*Rana pretiosa*) is one of Canada's most imperilled amphibians and exists only in small pockets in the Fraser Valley, British Columbia (BC). The species was listed as "Endangered" under the Canadian Species at Risk Act (SARA) in 1999. The 10-year extinction risk for each of the extant populations is estimated to be greater than 20%, which is considered critically endangered under International Union for the Conservation of Nature (IUCN) criteria. The recovery goal for the species is to "restore, maintain and, where feasible, expand extant Oregon Spotted Frog populations, and establish six or more additional self-sustaining populations". Population modeling shows that supplementation through head-starting or captive breeding may reduce the short term extinction risk. Our efforts show that Oregon Spotted Frogs can be raised in captivity and can successfully breed and lay eggs. However, egg mass sizes and egg hatching rates are much lower in captivity compared to wild populations. Not all females in the captive breeding program lay eggs each year. The probability of egg laying and egg mass size was correlated with increasing female size and/or age. During the larval stage we found no difference in growth or survival between head-started and captive bred individuals, and survival during the larval stage is typically higher in captivity than in the wild. When larvae were reared at higher densities in captivity survival, growth, time to metamorphosis, and size at metamorphosis were all negatively affected for both head-started and captive bred larvae. Even with intensive head-start and captive breeding efforts, output is currently below levels necessary to reduce extinction risk and important questions remain about the long-term sustainability of such efforts. This retrospective analysis is useful in highlighting areas for improvements in the husbandry program and field monitoring programs to assess population level effectiveness of supplementation efforts.

Platform

USING SPATIAL ECOLOGY AND CIRCUIT THEORY TO INFORM AGE-CLASS APPROPRIATE ROAD MORTALITY MITIGATION FOR TURTLES

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Habitat fragmentation and destruction of wetlands have contributed to declines in Species At Risk (SAR) reptile populations. Magnetawan First Nation (MFN) in Eastern Georgian Bay, Ontario is home to several reptile SAR and is fragmented by two highways, including Trans-Canada Hwy 69 planned to expand within MFN and the surrounding area. This relatively pristine landscape includes several contiguous habitat matrices consisting of upland rock barrens, forest, marsh, swamp, fen, bog, and peatlands, many of which occur adjacent to Hwy 69 which is a documented mortality “hotspot” for reptiles. The main focus of road ecology studies has been on adult turtles and many knowledge gaps remain regarding the dispersal patterns of younger age-classes in relation to highway infrastructure, and the impacts of highways on recruitment. The goal of our project is to predict the best locations for connectivity corridors to allow reptiles to access contiguous habitats adjacent to Hwy 69 through MFN, and to ensure that mitigation in future highway development is conducive to the spatial movements of all age classes of turtles. In 2018, we outfitted 10 juvenile turtles with radio transmitters, 3 of which have already been killed on Hwy 69 (30% mortality rate) with 7 confirmed highway crossings. Road surveys conducted from 2012 to 2018 yielded 562 turtles (alive and dead) on the 6 km stretch of Hwy 69 through MFN; 36% of these turtles were juveniles, 33% were adults, and 31% whose age classes were not identifiable, clearly indicating that juvenile turtles are commonly interacting with roads. Using Circuitscape, we will model age-class-specific movements to better understand the spatial needs of all life history stages. Our research will fill knowledge gaps about the effects of anthropogenic linear features on reptiles and their critical habitats, providing data to inform cost effective mitigation design in other locations.

Platform

INTEGRATING TRADITIONAL KNOWLEDGE AND WESTERN SCIENCE TO MONITOR THE IMPACTS OF CLIMATE CHANGE ON CULTURALLY SIGNIFICANT AND AT RISK ECOLOGY OF INDIGENOUS LANDS

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There is an immediate need to monitor the impacts of climate change on many species, including species at risk (SAR), herpetofauna, moose and culturally significant environments. As such, we are initiating a comprehensive co-developed climate change monitoring program that integrates Traditional Ecological Knowledge (TEK) and community engagement with state-of-the-science micro-meteorological and ecological approaches. To monitor various weather variables on a temporal scale, we will continuously collect climate data using a 30 ft open path Eddy Covariance system and associated micro-meteorological equipment from Campbell Scientific. This will identify key climate indicators, such as CO_2, precipitation (rainfall and snow depth), temperatures (soil, water and air), wind speed, relative humidity, and radiation in targeted wetlands and critical habitats. Animal (bird and anuran) phenology that is reliant on wetland health and microhabitat characteristics, such as vegetation, temperature and hydrology, will be monitored using SM4 Song Meters, temperature loggers, and various field survey techniques. We will incorporate TEK from First Nation communities of the Great Lakes water-shed region, gathering centuries of land-based knowledge that reflect environmental change over time and impacts to the environmental and human communities. This research will foster collaborations and engagement between the Indigenous and academic community, as we build the capacity to identify risks to Indigenous people and lands vulnerable to climate change. Moreover, this project will contribute to climate change action plans by developing novel protocols for integrating TEK into future research projects. This research will allow us to re-define how we view contemporary scientific methodology and elaborate on existing techniques that measure the impacts of climate change that is integral to strengthening future management practices.

Poster

LACROIX

NOVEL SURVEY METHODS USED FOR MARK-RECAPTURE OF COASTAL GIANT SALAMANDERS (*Dicamptodon tenebrosus*): IMPLICATIONS FOR SURVEY PROTOCOLS AND POPULATION STUDIES

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Coastal Giant Salamanders (*Dicamptodon tenebrosus*), which occur at the northern limit of their range in the Chilliwack River watershed in British Columbia, are federally threatened and provincially blue-listed due to small range, specialized stream habitat, life history characteristics that impart vulnerability (e.g., limited dispersal ability, low reproductive rate), and apparent declines. However, insufficient information exists to conduct a population viability analysis. In addition, standard survey methodology recommended by provincial protocols (hand-collection method) can be ineffective for a species that is nocturnal and may prefer large systems or deep water habitat (e.g., pools). With the intent of improving survey methodology and our understanding of population dynamics, our study had two main objectives: 1) to test a novel survey approach for a nocturnally active stream-dwelling amphibian potentially present in large systems; and 2) to evaluate the potential of a mark-recapture study for generating population parameter estimates. We conducted three consecutive surveys within four 25-m long survey sites using a novel night snorkelling methodology and an area-constrained approach. Survey results confirmed night snorkelling as a highly effective survey method: many individuals were captured in deep pools that could not have been detected using standard methods, and captures substantially exceeded those from previous hand-collection surveys. Mark-recapture results from PIT or VIE tagged individuals, which were used to generate abundance/density estimates, demonstrated high capture efficiencies: from ~25 to 50% for small individuals (<55 mm) and ~50 to 60% for large individuals (≥55 mm). Study results have implications for inventory and monitoring methods for Coastal Giant Salamanders and other stream-dwelling amphibians and for estimation of population parameters that can help to fill knowledge gaps for population viability analysis. High capture efficiency and low among site variability resulting from the new night snorkelling method increases estimator precision and the potential for detecting trends over time.

Platform

DESIGN AND USE OF SNAKE REFUGIA IN VINEYARDS IN THE OKANAGAN VALLEY, BC

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Reptiles in the Okanagan valley have lost access to high quality habitat due to agricultural conversion of grasslands in the Okanagan valley. To mitigate these impacts, we developed a snake refugia design and installed it in vineyards in 2015 in areas known to be used by several species of snakes. Radio telemetry had previously identified areas of snake use in the vineyard and surveys confirmed snakes were using irrigation boxes in the vineyards to hunt rodents that presumably were attracted to the source of water. These rodents consequently chew wires in the system, therefore making vineyard operators interested in snakes as rodent control. Refugia were mainly installed in frost pockets in vineyards. Irrigation systems in the vineyard watered the native vegetation planted on the refugia. Refugia consisted of PVC piping that allowed snakes to hide and hunt underground. Wildlife cameras revealed early use of the subterranean chambers by racers, and western skinks, and later rattlesnakes and gophersnakes.

Platform

MY #SCICOMM LIFE: SNAKES, ALIENS AND OTHER TALES OF SCIENCE COMMUNCIATION

Leslie Anthony Lowcock

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As scientists we are all de facto communicators, whether with colleagues, funding agencies or students. But when it comes to the public, the group most in need of being informed of our work and its importance, we're often less effective, in some cases shying away from it. Yet, communication to both scientific and public audiences is crucial to successful research and conservation, particularly when it comes to garnering interest and funding. Thus, communication remains an essential, potentially helpful tool that—in an age of "knowledge by headline"—is more important than ever. I'll review elements of successful SciComm, survey the current landscape in print and online, and touch on my own path through this milieu from childhood to my most recent book on invasive species. The new science of invasion biology is a perfect microcosm in which to identify big-picture science communication issues like tracking a growing science, choosing topics, architecture and execution, using the media, and addressing the bugbear of "denialism."

Platform (Plenary)

POTENTIAL CLIMATE CHANGE EFFECTS ON INTRODUCED AND INVASIVE HERPETOFAUNA IN CANADA: A REVIEW

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With the world's second-largest land area but relatively low herpetofaunal diversity, Canada seems an unlikely place for introduced reptiles and amphibians that are unadapted to northern climes to gain foothold, let alone become problematic. And yet, not only has this occurred, but it has involved both non-native and transplanted native forms. Warmer areas of the country such as southern British Columbia and southwestern Ontario—both of which are experiencing shorter winters and earlier springs—would be most vulnerable to alien species introduced from warmer climates, as the establishment/naturalization of exotic red-eared slider in both locations, and a burgeoning invasion of European wall lizard on Vancouver Island illustrate. Yet native species have also been successfully introduced to previously uninhabited areas: Pacific chorus frog and red-legged frog in the Haida Gwaii archipelago; American bullfrog and northern green frog in the lower B.C. mainland and on Vancouver Island; mink frog on Anticosti Island in the Gulf of St. Lawrence; and American toad, mink frog, northern green frog, wood frog and Maritime gartersnake on Newfoundland. With invasive species second only to habitat loss as a force of extinction in the Anthropocene, we review successful introductions and current problems, using existing information for various introduced taxa from Canada and other jurisdictions to consider whether climate warming might catalyze further invasiveness of introduced herpetofauna in this country.

Platform

TESTING EFFICACY OF MITIGATION FENCING DESIGNS AT PREVENTING ROAD ACCESS BY SNAKES IN THE FRONTENAC AXIS, ONTARIO

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Several snake populations around the globe are currently in decline as a result of anthropogenic threats such as road mortality. To reduce road mortality, wildlife barrier fencing is often used, albeit with different levels of success. In this experiment, the exclusion potential and behavioural response of various snake species to different types of barrier fencing will be assessed. Given how adept some species, such as gray ratsnakes (Pantherophis spiloides), are at climbing, we expect fencing material, height, and/or shape to determine a snake's success in climbing over it. Furthermore, snake behavioural responses and abilities to climb over the fencing are expected to differ among species and individuals based on variation in natural history and morphometrics. Five different snake species (gray ratsnake, eastern milksnake, eastern ribbonsnake, eastern gartersnake, and northern watersnake) will be tested in circular testing arenas, 2m in diameter, and constructed of different combinations of fencing materials, heights, and shapes in accordance with the recommendations of the OMNRF's best management practices for reptiles and amphibians. The behavioural responses, such as whether or not snakes attempt to climb the fencing, and success in climbing over the fencing, will be recorded for each snake. Morphometrics and environmental temperature will also be recorded, as these can affect a snake's ability to climb. Preliminary results will be presented. Our study will provide data to inform the use of barrier fencing to reduce snake road mortality, thus conserving snake populations at risk, and to inform decisions about the use of already limited resources for conservation strategies.

Platform

INFLUENCE OF ENVIRONMENTAL VARIABLES ON GRAY RATSNAKE (*Pantherophis spiloides*) NEST BOX USE AND SUCCESS

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Many reptile populations around the globe are currently in decline as a result of the effects of increasing anthropogenic activity that destroys critical habitat, including nesting sites. To combat this decline, various conservation strategies have been employed, such as the use of artificial nesting sites to increase recruitment into at-risk populations. However, the use and success of these artificial nest sites is highly variable and quantitative assessments of their efficacy are limited. The purpose of our study is to test the effectiveness of nest boxes for a threatened population of gray ratsnakes (*Pantherophis spiloides*). Ratsnakes select nest sites based on environmental variables, therefore we expect nest box use and success to depend on factors such as temperature, humidity, and surrounding habitat features. We deployed 16 nest boxes in early summer 2018 across a portion of the Frontenac Axis, Ontario, distributed evenly within field, edge, and forest habitats. The boxes were built in accordance with the plan developed by the Leeds-Grenville Stewardship Council and filled with a mixture of straw/hay, leaf litter, and woodchips. Environmental variables including nest temperature, nest humidity, canopy cover, and wind speed are being monitored regularly throughout the ratsnake nesting and egg incubation periods. Once all eggs should have hatched (late October), nest boxes will be searched for eggshells and unhatched eggs to determine nest box use and success. Our study will identify the characteristics that define the use and success of nest boxes, thus improving their efficacy as a conservation tool for large, oviparous snake species at risk.

Poster

MIGRATION AND DISTURBANCE: IMPACT OF FENCING AND DEVELOPMENT ON RATTLESNAKE SPRING MOVEMENTS

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Due to increasing anthropogenic pressures, the process of natural animal migration is undergoing alterations across many different taxa. Small-scale migrants provide useful systems to investigate the influence of disturbance and landscape barriers on natural movement patterns and migrations. The Northern Pacific Rattlesnake (*Crotalus o. oreganus*) in British Columbia (B.C.) is a small, migratory predator that undertakes seasonal spring movements from communal hibernaculum to summer hunting grounds. We examined spring migration movements in 27 male rattlesnakes encountering both mitigative fencing barriers and disturbed habitats from 2011–2016. Individuals moving through disturbed habitats or intercepted by fencing contained shorter spring migration distances and reduced migration path sinuosity (more crooked routes) compared to individuals migrating in undisturbed habitats. Specifically, individuals encountering a fence during spring movements contained shorter total migration path lengths and smaller home ranges. Regardless, spring migration distance was strongly associated with the distance individuals travelled until they first encountered human disturbance. Despite the difference in spring migration lengths, duration of migration did not differ between rattlesnakes encountering a fence, other forms of disturbance or migrating through undisturbed habitats. This is the first study assessing the spatial and behavioural implications mitigative fencing has on rattlesnakes and the first to intensively examine spring migration metrics on rattlesnakes in B.C. The results presented herein can act as a reference for conservation-based approaches for this species, specifically when implementing barrier-fencing structures. This study outlines the importance of looking closely at seasonal movement patterns, including migration, of smaller-scale migrants in response to abrupt and long-term landscape changes and barriers. Small-scale migrants are an important indicator of landscape and community connectivity and can be used as an important system of managing ecosystem functions and health on a changing, anthropocentric landscape.

Platform

POPULATION ESTIMATE, SURVIVORSHIP AND GENERATION TIME OF THE NORTHERN PACIFIC RATTLESNAKE (*CROTALUS O. OREGANUS*) AT ITS NORTHERN-MOST RANGE LIMITS

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The Northern Pacific Rattlesnake (*Crotalus o. oreganus*) is restricted in its occurrence in Canada to British Columbia and is listed nationally as a species-at-risk, yet there is a lack of demographic information, including baseline information on density, survivorship, generation time and distribution necessary for evaluating the impacts of threats on the population. Here we report the first population and demographic parameters for rattlesnakes in over 30 years at this latitude, which is also the northern-most limit of the global range for this species. We used capture-mark-recapture (CMR) results from an 11-year study (2002–2012) to determine a density estimate for the Northern Pacific Rattlesnake on a 4.5 km^2 area within the Okanagan valley of B.C., Canada. The adult population had an 11-year mean density of 58.2/km^2 (mean population size= 262; upper 95% Highest Density Interval (HDI) = 433; lower 95% HDI = 149) and a mean annual survivorship of 0.85. The smallest sexually mature female was 540 mm SVL and the estimated age at maturity for female rattlesnakes was 4.9–8.5 years, with a mean generation time of 13.7 years.

Platform

MCALLISTER*

NATURAL HISTORY OF COMMON GARTERSNAKES (*Thamnophis sirtalis*) IN EAST-CENTRAL BRITISH COLUMBIA

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Widely distributed species typically exhibit variation in various aspects of their ecology throughout their range. Such variation offers opportunities for fundamental studies in evolution, including local adaptation, biogeographic rules, distributional limits, and speciation. Geographic variation also limits our ability to extrapolate from one population to another, making site-specific knowledge of ecology essential for wildlife management and conservation. I studied the natural history of Common Gartersnakes (*Thamnophis sirtalis*) at two sites in east-central British Columbia, where active seasons are short and cool. I used opportunistic sampling of snakes to study general features of their ecology and radiotelemetry to study movements and habitat selection, including hibernating sites. In September, snakes moved from summer habitats to hibernating sites and then emerged from hibernation in April or May. Adult female *T. sirtalis* overwintered with 0 to 16 other adults in inconspicuous underground hollows, typically in forested habitats, near water and/or coarse woody debris; this is distinct from the large-scale communal hibernation seen in other northern populations. Under the assumption that snakes exhibit site fidelity to hibernacula in consecutive years, I estimated the cumulative distance moved over the entire active season to be 7011 ± 3756 m SD (n = 9, range = 3510-15015 m). Gravid female snakes moved at significantly lower rates, followed more tortuous paths, and inhabited areas that were more open-canopied than their nongravid counterparts (n = 13). Nongravid snakes used locations with a higher percentage of ground cover than gravid snakes. Through the identification of migratory routes, relevant summer and winter habitat characteristics, and hibernation sites, my study contributes to the protection and conservation of northern reptiles, which are particularly vulnerable to population declines compared to southern populations due to the restrictive cold climate.

Platform

ASSESSING AND CREATING BLUE RACER (*Coluber constrictor foxii*) HABITAT ON PELEE ISLAND

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Habitat protection, restoration and creation are key aspects of species at risk recovery. The Blue Racer (*Coluber constrictor foxii*) is listed as endangered in Ontario and Canada, and now occurs only on Pelee Island in southern Ontario, where it is threatened by habitat loss, fragmentation and degradation. Managing vegetation succession on the island through prescribed burns, and the creation of limiting hibernation, nesting and shelter habitats will be important for supporting the recovery of Blue Racers in Canada. In the fall of 2018, Ontario Nature is conducting a prescribed burn to manage habitat succession on their Stone Road Alvar property on Pelee Island. A three-year snake monitoring program has been implemented to evaluate the use of this habitat by Blue Racers before and after the prescribed burn. NRSI is also working with partners to assess the current quantity and quality of suitable habitat, use of artificial hibernacula, and availability and characteristics of hibernacula and nesting habitats. Information gathered from these assessments of habitat use and availability will also be used to inform the creation of artificial hibernacula and nesting/shelter sites for Blue Racers on the Stone Road Alvar.

Poster

BEYOND THE FENCE: ENGAGING LANDOWNERS TO FIND SPECIES AT RISK

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We have all seen “No Trespassing” signs or heard stories describing difficulties in gaining access to private land. As a result many Species at Risk locations on private land remain undocumented. In Ontario, observations of the threatened Blanding’s Turtle (*Emydoidea blandingii*) triggers wetland habitat protection when a sighting is reported, but gaps in wetland protection persist unless sightings are reported from private land. Therefore, gaining access to private land is an important priority for Species at Risk surveys. The Canadian Wildlife Federation completed 2 years of wetland surveys for Blanding’s Turtles to extend wetland protection into areas with gaps around Ottawa, Ontario. In 2017, with limited landowner contact and one survey team, 9 surveys were conducted on public land and 1 on private land. Blanding’s Turtles were found at only 1 public site. In the spring of 2018, we used multiple methods to contact landowners: emails to conservation organizations, newsletter articles, and a web form. We received ~50 responses from interested land owners, largely through emails and could prioritize our private land surveys in areas with gaps. This summer, with two survey teams, 11 surveys were conducted on public land and 17 on private land. We found Blanding’s Turtles during roughly half of both types of our surveys. We were also able to acquire past sightings from some landowners, eliminating our need to dedicate survey time to their properties. Efficiently engaging landowners allowed us to protect new wetlands on private land and increase awareness of turtle conservation.

Platform

EVALUATING THE EFFECTIVENESS OF HEADSTARTING FOR WOOD TURTLE (*Glyptemys insculpta*) RECOVERY FROM A SUSPECTED POACHING EVENT

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A population of endangered Wood Turtles (*Glyptemys insculpta*) was studied extensively beginning in 1988. By the mid 1990s, a suspected poaching event resulted in the removal of approximately 70% of the population. A population viability analysis determined that extirpation was inevitable if no intervention was undertaken and so a headstarting project was initiated in 2003 and the first cohort was released in 2005. Our objective is to quantitatively assess the effectiveness of the 14-year headstarting program by modeling population demographic parameters to evaluate recovery efforts to date, and determine the next phase of recovery. To date, a total of 537 headstarted turtles have been released back into their maternal streams. At present, the population bears the hallmarks of a heavily managed system: headstarted turtles constitute a larger proportion of the population than non-headstarted wild turtles (149:25), and sexually immature juveniles outnumber sexually mature adults (139:35). The persistence of the population will likely require a demographic shift to a more natural situation in which the population is made up mostly of reproducing adults. Headstarted turtles from the first release groups are just now beginning to reproduce, indicating that the population may become self-sustaining. Modeling suggests population recovery has been slow, even with intensive management. Modeling population recovery scenarios with comprehensive long-term data is essential for evaluating the effectiveness of headstarting projects, while continuously improving recovery efforts.

Platform

WHERE DO AMPHIBIANS LAY THEIR EGGS?

Andrea Paetow

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Assessing restoration success for pond-breeding amphibians frequently focuses on hydrology, water quality and vegetation, while neglecting the requirements of amphibians that use the restored areas for breeding. This study examines how vegetation structure and abiotic variables affect oviposition-site selection by amphibians. The goal of my study was to better understand the requirements of pond-breeding amphibians. In 2017, I surveyed egg masses in four ponds at the Sunshine Coast Botanical Garden in Sechelt, B.C. I identified 667 egg masses of four native amphibian species that varied in abundance and species richness among ponds. I recorded five biotic variables (i.e., vegetation cover, vegetation type, stem density, stem diameter, and canopy closure) and two abiotic variables (i.e., water depth and solar radiation) at egg-mass sites and random sites where no egg masses were detected. Logistic regression analysis with backward elimination revealed that stem count ($p = 0.008$) and water depth ($p = 0.0001$) significantly influenced oviposition-site selection. The results also showed that higher stem density and shallower water depth increased the likelihood of egg masses being present. My study indicated that quantifying stems in the water column characterized vegetation density better than estimating percent cover of vegetation. Shallow areas that have structurally complex vegetation might provide an advantage for the offspring by increasing refuge, food resources, and favourable thermal conditions for egg development. Hence, restoration projects could incorporate vegetation structure and shallow areas in their pond designs to potentially increase the abundance and diversity of amphibian communities, thereby contributing to successful restoration projects.

Platform

THE INDIRECT EFFECTS OF ROADS ON SPECIES-AT-RISK REPTILES: ROAD AVOIDANCE AND ENERGETIC CONSEQUENCES

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Road mortality is a major threat to long-lived reptiles, including turtles and snakes. The demographic consequences of road mortality are well established, but possible indirect effects of roads through avoidance behaviour are unclear. We pooled individual tracking data on Blanding's Turtles (*Emydoidea blandingii*) and Massasauga (*Sistrurus catenatus*) to test the hypothesis that roads exert significant indirect effects on these species, for example through road avoidance behaviour having energetic consequences that may decrease fitness. Blanding's Turtles (9793 relocations of 243 turtles) crossed roads less often than expected based on simulations using correlated random walk models, and turtles spent most of their time further away from roads than expected based on simulations. Turtles without roads in their home ranges travelled less than turtles with roads in their home ranges, but the predicted energetic cost was less than the cost of producing a single egg. Massasaugas (3852 relocations of 75 snakes) crossed roads less often than expected based on simulations. There was no evidence that snakes were further from roads than predicted with simulations, and snakes with roads in their home range did not travel further per day than snakes without roads in their home range. We did not detect an increase in predicted energetic costs from roads on Massasauga movement. We present evidence that turtles and snakes avoid roads, but that this avoidance behaviour is not likely to have significant energetic consequences.

Platform

DETERMINING TROPHIC TRANSFER OF MICROPLASTICS IN THE ST. LAWRENCE RIVER SYSTEM

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While plastic pollution in aquatic environments has been an environmental problem for more than half a century, only in recent years has it gained more public awareness. Microplastics (> 5 mm) are a less well-known form of plastic pollution. Microplastics cause significant environmental harm due to abundance and ability to transfer through the trophic system. Ingested microplastics have the potentially to be lethal to organisms by causing internal blockages, as well as exposure to toxins. To determine the presence of microplastics, we assessed sediment, zebra mussel (*Dreissena polymorpha*), round goby fish (*Neogobius melaanostromus),* and anurans samples from sites along the St. Lawrence River. Sediment samples were sieved and residual materials were separated. The gastrointestinal tracts of organisms were removed, dried, and digested by protease enzyme. Particles were isolated by sediment and animal samples via vacuum filtration. Possible microplastics were isolated from filters using a microscope and tungsten needle. Percentage of condensation polymers was measured using attenuated total reflectance Fourier-transform infrared spectroscopy (ATR-FTIR). Preliminary findings inform further sampling locations and future findings should also consider examining microplastic ingestion by other benthic feeding organisms.

Poster

LARGE RIVER VALLEYS ARE ESSENTIAL FOR LARGE-BODIED SNAKES ON THE CANADIAN GRASSLANDS

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The population persistence of large-bodied snakes in Saskatchewan appears to be dependent on major river valleys. Since 2007, our research group has been studying habitat use and movements of Bullsnakes, Prairie Rattlesnakes, and Eastern Yellow-bellied Racers. In that time, we have not discovered or received a single report of a hibernaculum located outside a river valley system. Furthermore, records of all large snake sightings in the province show that nearly all observations have been within proximity to a valley system. Of the 35 Bullsnakes we radio-tracked among 3 large river valley systems, none spent time in the upland areas outside the valley. Moreover, using 10 microstellite loci to examine population structure of the Bullsnakes from the same 3 river valleys, we found that snakes from each valley were genetically differentiated. Thus, it appears that these snakes are so strongly linked to valleys that upland habitat may serve as a barrier to dispersal and gene flow. The only exception to this apparent dependence on valleys is in extreme southwestern Saskatchewan. There, Bullsnakes inhabit an area not associated with any major valley system, and in 2019, we will begin to study this unique population.

Poster

REMOTE CAMERA MONITORING OF POPULATIONS AND BEHAVIOUR OF WESTERN RATTLESNAKE HIBERNACULA

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Monitoring populations of species at risk is central to determining a species status and if recovery actions are successful. Northern reptile populations that den communally theoretically allow a way to assess population numbers and understand important seasonal movement patterns. In British Columbia the Western Rattlesnake (*Crotalus oreganus*), listed as threatened under the Species at Risk Act, dens communally and populations estimates range widely due to the inherent difficulty and time and effort required to obtain reliable counts of snakes at dens. Remote trail cameras are increasingly used for both population and behavioural studies across a diversity of animal taxa. Our study used remote trail cameras to test if trail cameras could be used as a method to obtain population counts at rattlesnake dens. We tested motion sensor and time-lapse camera settings and different length time-lapse intervals during the spring and fall denning periods at one rattlesnake den near Kamloops BC in 2016. We also investigated the use of computer software for picking out photos with the target species and for identifying individuals. The results suggest, as expected, that time-lapse settings are needed for accurate monitoring of reptiles with trail cameras. Initial results showed some success with using software for photo processing, but background, camera positioning and camera resolution must be planned properly for these methods to be successfully relied upon. In addition, the results of this pilot project are used to design a study using trail cameras to monitor daily and seasonal movement patterns around den sites and how these may relate to temperature and future climate change.

Poster

CONNECTING THE PUBLIC WITH BLANDING'S TURTLE (*EMYDOIDEA BLANDINGII*) RECOVERY IN ONTARIO

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The position of the Adopt-A-Pond Wetland Conservation Program within a zoo environment has contributed to the success of many conservation initiatives, including the head-starting of Blanding's turtles (*Emydoidea blandingii*), by increasing public exposure to the species and providing internal access to various expertise. Since the head-start program started in 2012, 165 young turtles have been released into Rouge National Urban Park. 2018 marked the opening of a new exhibit showcasing the project and hatchling turtles in their first of two years living in a protected zoo-environment before release. This exhibit brings one of the zoo's many behind-the-scenes conservation programs directly to the 1.3 million annual visitors, reinforcing the passion of those who have contributed to the project, inspiring others to help wildlife, and demonstrating the role of zoos in conservation. The exhibit space has also allowed the program's yearly capacity for young turtles to increase, which facilitates a faster achievement of the target numbers for a sustainable wild turtle population. The display further provides opportunity for enhanced community engagement and answers the question "What can I do to help?". It does so by, for example, encouraging the public to submit turtle sightings to our Ontario Turtle Tally citizen science program. The Adopt-A-Pond app was launched in 2018 as an alternative means for the public to submit sightings to our citizen science programs and a means to increase the total number of yearly submissions. As of mid-July, the total number of submissions from last year was surpassed. Connecting the public with wildlife and allowing them to contribute to its recovery is providing a positive and lasting impression that we hope will continue to improve the outlook for urban turtles.

Platform

INFLUENCE OF WETLAND SIZE AND FOREST CANOPY ON THE BREEDING SUITABILITY OF SMALL EPHEMERAL WETLANDS FOR WOOD FROGS (*Lithobates sylvaticus*) IN ALBERTA'S BOREAL MIXEDWOOD

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Understanding factors that influence habitat suitability is important for maintaining healthy wildlife populations in human-disturbed environments. Ephemeral wetlands are small, temporary wetlands characterized by seasonal cycles of filling and drying. These wetlands are a common feature in Alberta's boreal mixedwood and are known breeding habitat for several native amphibian species. Hydroperiod – the length of time a wetland retains surface water – is a key determinant of amphibian reproductive success. Further, forest canopy surrounding wetlands can influence within-pool conditions important for larval growth and development. Despite their prevalence in Alberta's boreal forest, small ephemeral wetlands receive no legal protection during timber harvesting operations. In this study, we examined the influence of wetland size and forest canopy on wetland hydroperiod and the performance of wood frog (*Lithobates sylvaticus*) tadpoles. We monitored 15 ephemeral breeding wetlands from May to August 2015 and documented drying dates to assess relationships between wetland size, canopy cover, and hydroperiod. We assessed larval performance by sampling tadpoles over repeated sampling sessions until tadpoles completed metamorphosis or until wetlands dried. We also measured physiochemical parameters and primary productivity to compare within-pool conditions between open- and closed-canopy wetlands. Among breeding wetlands, hydroperiod was related to wetland size, but not forest canopy cover. Depth was most related to hydroperiod and may therefore serve as a useful criterion for prioritizing protection of ephemeral breeding wetlands during forest harvesting. Growth and development of wood frog tadpoles was faster in wetlands with less surrounding canopy cover. Water temperature was higher in open-canopy wetlands relative to closed-canopy wetlands, which may help explain observed differences in performance. There was, however, were no significant difference in primary productivity between open- and closed-canopy wetlands. Information from this study will help guide future protection and management of ephemeral breeding wetlands and help conserve amphibian populations in Alberta's boreal region.

Platform

GIS-BASED MODELS TO INFER SUITABLE HABITAT FOR A DISJUNCT NORTHERN PRAIRIE SKINK (*PLESTIODON SEPTENTRIONALIS*) POPULATION IN MANITOBA

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The Northern Prairie Skink (*Plestiodon septentrionalis*) is the only lizard found in Manitoba, Canada and is of conservation concern. This lizards appears to be limited to sandy habitats in the southwestern portion of the province. We used coarse-scale environmental features (soil characteristics and temperature) to predict habitat suitability. We used historical records from 1919-2004 (Manitoba Conservation Data Centre), field captures from 2006-07, and literature reports on their habitat requirements. Using ArcMap 9.2 and data available from the Manitoba Land Initiative (MLI), we classified habitat according to three soil characteristics (soil texture, soil type and soil drainage) and temperature. Our model identified suitable habitat centred around the Carberry and Lauder Sandhills; both areas are within the known distribution. In addition, the model predicted suitable habitat in the Portage Sandhills and in the southeastern portion of Manitoba, neither of which have known populations. We used field surveys from 2008-18 to test the accuracy of the model. Significantly more of the new captures were found in high soil suitability (91%). Only 38% of the no-capture sites had high soil suitability, although the combined total of high and moderate soil suitability for these sites was 94%. All surveys (captures and no captures) were found significantly more in suitable temperature locations (100% and 94%). The model appears relatively accurate for soil and temperature suitability, although there are likely other factors (e.g. land use) that impact their habitat preference. Further exploration of how land use affects their habitat preference will assist conservation efforts for the Northern Prairie Skink.

Platform

INVESTIGATING WESTERN RATTLESNAKE (*Crotalus oreganus*) POPULATION GENETICS TO INFORM CONSERVATION MANAGEMENT

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The Western Rattlesnake (*Crotalus oreganus*) is classified as threatened by COSEWIC in British Columbia, where it is known to occur in five distinct geographic regions. Despite inhabiting multiple locations across the province, this species faces several threats to survival such as road mortality, persecution, and habitat loss due to agricultural development and urbanization. At present, there is no known genetic information on Western Rattlesnakes in BC, precluding effective conservation. To help fill this knowledge gap, our study aims to reconstruct patterns of genetic variation, as well as examine population structure and infer potential barriers to gene flow across multiple spatial scales, from networks of hibernacula to the entire species range in BC. We used restriction site-associated DNA sequencing (RADseq) to genotype 55 geographically-representative blood samples at 8281 single nucleotide polymorphisms (SNPs). From these data, we are developing a targeted genotyping-in-thousands sequencing (GTseq) panel containing 300-400 SNPs for use with our large sample of minimally invasive cloacal swabs and opportunistically collected roadkill tissue (n = 700) from across the Canadian distribution in BC and in northern Washington (USA). Resulting data will provide insight on the genetic connectivity of rattlesnakes across the landscape that can help define designatable units for conservation. Overall, this information will aid in the development of appropriate management strategies for Western Rattlesnakes in BC, as well as the prioritization of conservation resources.

Poster

SINERVO

EXTINCTION AND RANGE EXPANSIONS OF NORTH AMERICAN HERPETOFAUNA UNDER CONTEMPORARY AND FUTURE CLIMATE

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Ongoing extinctions due to climate warming since 1975 and projections of future extinctions of reptiles and amphibians due to climate change now present a biodiversity crisis for North American herpetofauna. We develop new ecophysiological models to predict phenology and extinction risk under changing climates. Standard species distribution models (SDM) use climate layers to determine a "species' climate niche" and then project SDMs to future time points as climate warms or dries, but such models do not take into account evolved physiology, phenology or ecology among species that might impact resistance to warm spells and/or long-term droughts. We will describe relationships between climate and ecophysiological limits based on operative thermal and hydric environments for reptiles and amphibians, as well as their phenology, the timing of life cycle events. We have derived general models that can be used in SDMs, which allow for evolved changes in physiology and phenology to be built into modeling. Models have been applied to North American reptiles and amphibians and we will discuss extinctions at the southern and low elevation margins of species' ranges in Mexico and the US, and new potential range expansions into Canada using examples from a viviparous snake (*Thamnophis sirtalis*), a viviparous lizard (*Phrynosoma hernandesi*), aquatic/terrestrial salamanders (*Ambystoma mavortium*, *A. gracile*) and a direct developing salamander (*Plethodon cinereus*). We will also discuss paleoclimate since the Eocene warming, the warmest period in the last 65 million years. Similar conditions are expected under future global warming scenarios, thus potentially allowing herps to expand as far as the Arctic. Given the biodiversity crisis, we will need to coordinate among conservation NGOs and government agencies of all three nations of North America to ensure adequate protections are in place under ongoing and future warming. In this regard, Canada will provide refugia for diverse taxa under future scenarios.

Platform

A MITIGATION AND MONITORING PLAN TO PROTECT WANDERING GARTER SNAKES (*THAMNOPHIS ELEGANS*) AS PART OF THE BOWMONT WEST FISH COMPENSATION PROJECT, CALGARY, AB

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Sensitive wildlife features (e.g. hibernacula) are often protected by establishing setbacks. Protecting these features is critical; however, in some cases, recommended setbacks are large and could impede development. Moreover, it is often not clear how setbacks distances were derived. Wandering garter snake (WGS; *Thamnophis elegans*) hibernacula are protected under Alberta's Wildlife Act and the recommended setback is between 200 to 500 m, depending on the level of disturbance. A case-study will be presented, in which baseline vibration levels were measured and anticipated levels were calculated in order to determine an alternate setback that, in concert with other avoidance and mitigation measures, is believed will protect snakes, yet not impede construction. Recent works to correct the damage caused by the 2013 flood in Southern Alberta, require the City of Calgary to provide compensation to improve aquatic resources; thereby adhering to the federal Fisheries Act. The Bowmont West Fish Enhancement Program intends to effectively re-establish flow over the long-term to historic channels in the Bow River. A WGS hibernacula exists in proximity to a historic channel proposed for re-activation. Short-term construction activities without mitigation are certain to negatively impact snakes. Such negative impacts would be in addition to current stressors (i.e. an adjacent bicycle path and railway, off-leash dogs). Despite the risk, in the long-term, the program is expected to benefit snakes (and other wildlife) by enhancing the diversity of aquatic and riparian environments (e.g. forage and security habitat). Despite the benefits, following recommended setbacks would have prevented completion of the program. As such, Advisian prepared a snake mitigation and monitoring plan that used both spatial and temporal avoidance measures, as well as other mitigations, such as exclusion fencing, translocation, and vibration monitoring to reduce negative impacts on this population. Our plan for protecting these snakes is presented.

Poster

WETLANDS AND AMPHIBIAN HABITATS IN THE PEACE REGION OF BC: UPDATES FROM A 4-YEAR STUDY.

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An overview of a study initiated in 2014 on wetland and amphibian connectivity along the Williston Reservoir will be presented. Two-person field crews have been conducting aquatic and terrestrial surveys annually in May-June and in July-August. This work has been completed in collaboration with First Nations communities and includes a public outreach campaign to raise awareness about amphibians and their habitats in northern BC. Methods used to investigate the occurrence of amphibians in relation to habitat characteristics will be discussed. The presentation will include stunning photographs of all life stages of the amphibians that are included in the study, including images that document behaviours previously unknown for the species under investigation. The research has included use of Passive Integrated Transponder (PIT) tag marking and a database of digital images of amphibian skin patterns to “fingerprint” individuals to maintain records of recapture. Some of the philosophy of study design and survey techniques as it relates to the conservation and management of amphibians and their habitats will be discussed in relation to the study goals and findings.

Platform

HERPS IN THE WIND: THE ECOLOGY OF HERPETOFAUNA IN WINDFARMS

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Climate change and depleting fossil fuel resources have caused a demand for green energy alternatives. Although green energy alternatives are low in harmful emissions, they are not without their potential problems. Negative impacts of wind turbines on birds and mammals have been widely documented, and recent concerns about herpetofauna near windfarms have created a demand for new research. To fill this knowledge gap, in May 2018 we began conducting community, population and spatial ecology studies on herpetofauna within a Northern Ontario windfarm located close to relatively pristine wetlands. We are studying herpetofaunal communities in wetlands within the established Prince Wind facility, one of the largest wind energy producers in Canada with 126 wind turbines. We are measuring herpetofuanal biodiversity using survey transects, spatial ecology of turtles using radio telemetry, and amphibian calls using automated recorders in 4 wetlands close to wind turbines (<500 m, impact sites) and 4 wetlands far from wind turbines (>1.5 km, control sites). If these animals are negatively impacted by the presence of turbines, then we expect lower diversity, avoidance movements, and changes to frog call metrics to compete with the noise of the turbines in impact sites. Preliminary data indicate that both treatments have similar diversities with 11 different species of herpetofauna observed in both impact and control sites, and preliminary radio telemetry data indicate that Painted Turtles (*Chrysemys picta*) in impact and control sites show similar movements patterns. We discuss the implications of our study with respect to conservation of herpetofauna, including possible impacts from wind turbines and mitigation strategies. Reptiles and amphibians are considered to be some of the most endangered animals on a global scale, so understanding how they interact with green energy developments is essential to their conservation.

Platform

QUANTIFYING THE DETECTION PROBABILITY OF MASSASAUGAS AND EASTERN FOXSNAKES USING ONTARIO'S SNAKE SURVEY PROTOCOL

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Starting in 2016, Blazing Star Environmental and its partners have been conducting a study to measure the range-wide detection probability of eastern foxsnakes (*Pantherophis gloydi*), massasaugas (*Sistrurus catenatus*) and eastern gartersnakes (*Thamnophis sirtalis sirtalis*). We conducted range-wide surveys for 2 years at randomly selected sites along Eastern Georgian Bay, the Bruce Peninsula, and in the Carolinian Region. To conduct these presence-absence surveys, we have been following the Government of Ontario's 'Survey Protocol for Ontario's Species at Risk Snakes'. We measured several cofactors such as observer experience, weather conditions, air temperature, and season. Occupancy model selection was used to estimate detection probability and the influence of cofactors. Detection probabilities of 0.144 +/- 0.071 for Eastern Foxsnake, 0.235 +/- 0.051 for Massasauga and 0.365 +/- 0.041 for Eastern Gartersnake translate to a need for 12-40 (19), 9-15 (11), and 6-8 (7) surveys in appropriate conditions, respectively, to be confident ($\alpha = 0.05$) the target species is absent. Finally, we present the search effort required to determine absence for a survey team with typical experience. We recommend improvements to the protocol that will minimize the likelihood of a false negative that could lead to alteration of SAR habitat without authorization under the Endangered Species Act.

Platform

HABITAT USE AND MORTALITY RISK OF WOOD TURTLE IN A LANDSCAPE UNDER ACTIVE AGRICULTURE.

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Agricultural land and improved agricultural machinery presents an ecological trap for some species. The threatened wood turtle (*Glyptemys insculpta*) inhabits riparian buffers and forests but will use agricultural fields if close to nesting habitat, as these fields can provide adequate basking temperatures and feeding grounds. In actively farmed fields, agricultural machinery can present a mortality risk for the species. Mitigation of this risk is difficult, as there is limited information on the effects of agricultural practices on wood turtles. We sought to quantify how different agricultural practices affect wood turtles at levels ranging from individual movement behaviour to population demographics. Since May 2017, we have studied wood turtles in central New Brunswick along a second-order meandering stream surrounded by hay fields and forest. We located 48 wood turtles along a 2-km section and radio-tagged 23 to monitor their habitat use and relative risk to agricultural practices. We tracked turtles almost daily during April to October, and measured habitat characteristics at relocations and random points. In July-August of 2017 and 2018, we monitored response of wood turtles to approaching machinery, direction of movement from field to water (i.e., safety), and used canteloupes as proxies for turtle in tests on efficacy of raising blade height as a mortality mitigation measure. Analysis is ongoing but preliminary results suggest that wood turtle are selecting hay fields and that response to machinery is likely inadequate to offset long-term mortality rates. This information will assist several critical knowledge gaps for this species-at-risk and provide management recommendations to land managers attempting to mitigate agricultural impacts.

Poster

USING MARK-RECAPTURE TO EVALUATE POPULATION DEMOGRAPHY OF A MANAGED POPULATION OF BLANDING'S TURTLE IN ONTARIO, CANADA

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Head-starting is a conservation tool used to facilitate population recovery through increased survival and recruitment of vulnerable life stages. For most reptile species, eggs and hatchlings experience highest vulnerability. One common method of head-starting involves the rearing of hatchlings in captivity, typically for 1-2 years, after which they are released into the wild at a size less vulnerable to natural mortality. Although head-starting has been utilized as a management tool for turtles, its usefulness has been challenged. Our study will evaluate the success of head-starting by measuring the population ecology of head-started and naturally occurring Blanding's Turtles (*Emydoidea blandingii*) in the Rouge National Urban Park (RNUP) in Toronto, ON. A mark-recapture study will be conducted to measure 1) population size, 2) age distribution, and 3) sex ratio, and individual health parameters such as 1) somatic growth rates of the released Blanding's Turtles from each head-started cohort, 2) body condition (mass vs. body length), and 3) survivorship. Community ecology and biodiversity assessments (species relative abundance) will be conducted for Painted Turtles (*Chrysemis picta*) and Snapping Turtles (*Chelydra serpentina)*, which co-exist with Blanding's Turtles, to understand how the community structure may affect the managed population of the Blanding's Turtle. In the 2018 field season, using baited hoop traps and walking transects, we captured 10 Blanding's (1 wild female, 9 head-start juveniles, 0 recaptures), 147 Painted (47 males, 44 females, 26 juveniles, 30 recaptures), and 33 Snapping Turtles (7 males, 16 females, 3 juveniles, 7 recaptures). The findings from our study will provide insight on the success of a long-term head-start program, provide new information on the population demographics of Blanding's Turtles, and provide a community-level assessment of the turtle populations at the RNUP.

Poster

IMPACTS OF ROAD MORTALITY ON POPULATION PERSISTENCE OF THE WESTERN RATTLESNAKE (*CROTALUS OREGANUS*) IN BRITISH COLUMBIA

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The direct consequences of wildlife-vehicle collisions are quite evident. However, effects of road mortality on wildlife populations over time are relatively difficult to discern and a fundamental understanding of these impacts is particularly critical for the conservation of species-at-risk. Using population viability analysis (PVA) we evaluated the persistence of a Western Rattlesnake (*Crotalus oreganus*) population threatened by road mortality in the dry interior of British Columbia, Canada. We quantified road mortality through methodical road surveys and assessments of scavenging rates and observer detection probability using planted snake carcasses. Our calculation of the road mortality rate (0.06/km/day), which accounts for scavenger-removal and observer error during walking surveys, showed that the estimated number of rattlesnake deaths was 2.7x the number of carcasses detected through unadjusted surveys and incidental observations. Additionally, we conducted intensive mark-recapture and radio-telemetry to estimate population density, size, and home range. Overall, an estimated 6.6% of the population was killed on the road annually. The PVA indicated the population was declining under this observed road mortality rate while any simulated road mortality rates of >6% put the population at risk of extinction over 100 years. Our results also suggest that improving adult female survival as well as overall longevity of rattlesnakes, in theory, would significantly increase the population growth rate. This detailed PVA using refined road mortality estimates provides strong evidence that road mortality is a significant contributor to population decline, and it is possible that large populations of long-lived species will face extirpation due to low levels of road mortality even in the absence of other sources of disturbance. Conservation priorities should focus on reducing road mortality and improving critical habitat availability away from roads.

Platform

MANAGING AN ECOLOGICAL TRAP ON AN ENDANGERED SPECIES MASSASAUGA (*Sistrurus catenatus*) **BY USING FORCED HIBERNATION**

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Reptiles use temperature, and moisture cues to locate suitable habitats to complete their annual life cycle. Anthropogenic habitats mimic these cues and attract animals. However when habitat quality is not maintained, animals die. Ecological trap theory suggests that the continued presence of a trap will drive populations to extinction. Using an isolated population of Massasaugas located in a partially mined peatland in a case study, declining numbers of neonates and gravid females followed a cycle of flooding. This lends support to the notion that the peatland functions as an ecological trap on the population. “Forced hibernation” is a technique tested during the last four winters and refers to the method of placing neonatal snakes into artificial burrows within ideal subterranean habitat for their first hibernation. This prime habitat must meet the criteria of maintaining an annual “Life Zone”, which is a subterranean space that does not freeze or flood completely. The purpose of this experiment is to test whether ‘forced hibernation’ is a suitable strategy for headstarting neonatal Massasaugas. Preliminary results are favorable with 100% survival of neonatal Eastern gartersnakes (n=23) and 90% survival of neonatal Massasaugas (n=10). The experiment was repeated in the winter of 2017-18 (n=40) and 60% survival of massasauga rattlesnakes. Model selection analysis of biological and habitat factors suggests that body condition is the main factor in overall survival. Forced hibernation will directly manage the ecological trap by eliminating a neonate’s naïve selection of a potentially lethal burrow and ensure overwinter survival where the life zone is maintained. Hibernation site fidelity will then ensure winter survivors return to good hibernation sites and the population should increase.

Platform

EXAMINING POPULATION AND SPATIAL ECOLOGIES OF BLANDING'S TURTLES *Emydoidea blandingii* TO INFORM MITIGATION PLANS FOR QUARRY DEVELOPMENT

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Habitat destruction is one of the leading causes of reptile and amphibian declines worldwide. The Great Lakes population of Blanding's turtles was recently up-listed to Endangered in Canada due to many threats; including habitat alteration and destruction. A trap-rock quarry is proposed in known Blanding's turtle habitat in central Ontario, and under the provincial Endangered Species Act, an Overall Benefit Permit and Mitigation Workplan are required for development to proceed. The purpose of our study is to provide data to inform the mitigation plans, and to provide baseline data that can serve as the "before" sampling period in a long-term Before-After-Control-Impact (BACI) study. Mark recapture surveys are being conducted to gather population ecology data, and radio telemetry and GPS tracking are being used to quantify the spatial ecology of turtles at impact and control sites. Movements, habitat use, and temperature selection will be quantified, and nesting and overwintering sites will be identified. In the 2017 field season, we captured 29 individual turtles within a 2 km radius of the impact site. One nesting site and 9 overwintering sites (i.e., critical habitats) were identified, and turtles moved a maximum of 83 m (straight-line distance) from active season wetlands to overwintering sites. Our study is significant because not only will it provide data to inform mitigation at our study site, but will serve as a model for other BACI studies that should be used during development projects in order to assess the risks of extreme habitat alterations to species at risk.

Platform

A Preliminary Examination of the Effects of Uranium Mining on Long-Lived Turtle Species

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The aim of our research is to understand the effects on turtle species exposed to mine tailings during embryological development and at maturity. We will study of the impacts of living in proximity to uranium tailings ponds in Algoma District on turtles, a group of animals well known for their great longevity and slow life history. We will assess potential impacts of uranium tailings on turtles by examining body conditions of individuals living within or near tailings ponds (impact sites) and those living far from tailings ponds (control sites). If turtles are negatively impacted by contaminants in tailings, we postulate poorer body conditions in those living in tailings compared to control sites. Radium is a radioactive isotope found in uranium tailings. Radium and calcium are known to act as analogues in their capacity to accumulate in turtle shells, thus we will be examining whether turtles living in tailings exhibit signs of calcium deficiency. We will also collect turtle shell filings, gathered when 'notching' marginal scutes to mark turtles with individual identification codes, and egg shells from predated turtle nests. These calcium-based tissues will be analyzed using alpha dosimetry in the lab to gather information about presence and abundance of radium. If turtles can accumulate radium in tissues from exposure in tailing ponds, regression analysis should indicate a negative relationship between levels of radium in tissues and distance from tailings ponds. Our preliminary investigation can direct future research about impacts of uranium tailings on biodiversity and abundance, and on individual fitness.

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