BC HERPS AND ROADS WORKSHOP 2018

SCHEDULE

Time	Schedule	Speaker	Topic / Title
7:30-8:15	*Registration*		
8:15-8:30	Welcome, Introduction & Schedule	Manjit Kerr Upal and Purnima Govindarajulu	Welcome (Manjit Kerr-Upal) Introduction and Schedule (Purnima Govindarajulu)
8:30-9:00	Plenary 1	Jason Irwin	Coalitions and Connectivity: Lessons from I-90 Snoqualmie Pass East Project in Washington State
9:00-9:30	Plenary 2	Joe Crowley	Reflections on a decade of amphibian and reptile road ecology research and mitigation in Ontario
9:30-10:00	Plenary 3	Darcy Henderson	Critical habitat identification and application for reptiles and amphibians in British Columbia under the Species At Risk Act
10:00-10:30	*Break*	Poster viewing	
10:30-10:45	Presentation	Elke Wind	Introduction to the Best Management Practises document and the screening tool
10:45-11:15	Panel discussion	Discussion Topic	Mitigation Hierarchy: Avoid before minimize and mitigate
11:15-11:30	Presentation	Stephanie Winton	Evaluation of snake road mortality rates and hot-spot locations in the White Lake basin, B.C.
11:30-11:45	Presentation	Marcy Mahr	Fish/Bear Lakes Western Toad (*Anaxyrus boreas)* ecology and Highway 31A mortality mitigation study
11:45-12:30	Panel discussion	Discussion Topic	Surveys & Mapping: Obtaining data for avoidance and mitigation planning
12:30-1:00	*Lunch*	Poster viewing	
1:00-1:15	Presentation	Kari Gunson	Effectiveness monitoring of the largest reptile road mitigation project in Canada
1:15-1:30	Presentation	Marc Dupuis-Desormeaux	Early results of mitigation efforts to curb herpetofauna mortality along heart lake road, Brampton, ON
1:30-1:45	Presentation	Cindy Paszkowski	Effectiveness of mitigation measures for long-toed salamanders
1:45-2:00	Presentation	Barb Beasley	Overview of mitigation projects in B.C.
2:00-3:00	Panel discussion		What mitigation projects have been tried & did they work?
3:00-3:30	*Break*	Poster session	
3:30-3:45	Presentation	David Lesbarreres	Study designs to plan and assess road mitigation projects for amphibians and reptiles
3:45-4:15	Panel discussion		Effectiveness monitoring
4:15-5:00	Group discussion		Summary of discussions and next steps with best management practise document
5:00 PM	*Social*		Retreat to the pub

BC HERPS AND ROADS WORKSHOP 2018

LIST OF POSTERS

REDUCING AMPHIBIAN ROAD KILL AND MAINTENANCE COST OF ROAD MITIGATION STRUCTURES
Sara L. Ashpole[1], Jonquil Crosby[2] and Brent Persello[3]

DESIGNING EFFECTIVE BARRIERS TO REDUCE ROAD MORTALITY AND GUIDE AMPHIBIANS TO CROSSING STRUCTURES ON HIGHWAY 4 ON THE WEST COAST OF VANCOUVER ISLAND. PART 1: ENCLOSURE TRIALS TO TEST DIFFERENT MATERIALS
Barbara A. Beasley

DESIGNING EFFECTIVE BARRIERS TO REDUCE ROAD MORTALITY AND GUIDE AMPHIBIANS TO CROSSING STRUCTURES. PART 2: BACI STUDY TO TEST ROADSIDE HDPE PUCKBOARD FENCING
Barbara A. Beasley

MODELING THE EFFECTS OF WEATHER, TRAFFIC VOLUME, SEASONAL TIMING AND THE PRESENCE OF CROSSING STRUCTURES ON MOVEMENTS, ROAD MORTALITY, AND POPULATION VIABILITY OF NORTHERN RED-LEGGED FROGS ON HIGHWAY 4, VANCOUVER ISLAND
Barbara A. Beasley[1], Rylee G. Murray[2*], and Wendy J. Palen[2]

RYDER LAKE AMPHIBIAN PROTECTION PROJECT
Sofi Hindmarch*, Kendra Morgan, Joanne Neilson* & Steve Clegg

CARNAGE IN THE CAPITAL: HAT'S AMPHIBIAN ROADKILL PROJECT
Kristiina Ovaska, Christian Engelstoft, and Paige Erickson-McGee

WESTERN TOAD UNDERPASS: PROTECTING MIGRATING TOADS
Kristiina Ovaska[1], Lennart Sopuck[1], Christian Engelstoft[1], Andrea Lawrence[2], and Alan Burger[2]

HOT SPOTS VS HOT SPECIES: LESSONS FROM 1000 ROADKILLED TURTLES
David C. Seburn*, Hannah McCurdy-Adams

AN INTRODUCTION TO GIS SPATIAL STATISTICS TO STUDY AMPHIBIAN HOTSPOTS AND AN OVERVIEW OF AMPHIBIAN ROAD SURVEYS IN NORTHERN BC
Mark D. Thompson, MSc, RPBio

PUBLIC ENGAGEMENT IN AMPHIBIAN ROAD SURVEYS ON VANCOUVER ISLAND
Elke Wind

ABSTRACTS

*** Note: Several abstracts were unavailable when we compiled the workshop program. A complete proceedings document will be sent to all participants after the workshop.**




ASHPOLE

REDUCING AMPHIBIAN ROAD KILL AND MAINTENANCE COST OF ROAD MITIGATION STRUCTURES

Sara L. Ashpole[1], Jonquil Crosby[2] and Brent Persello[3].

[1]Environmental Studies. St. Lawrence University. Canton, NY. 13617 USA, sashpole@stlawu.edu; [2]Department of Environment and Resource Studies, University of Waterloo, Waterloo, ON, N2L 3G1 Canada, jonquil.crosby@gmail.com; [3]British Columbia Ministry of Transportation and Infrastructure, Southern Interior Regional Office, Kamloops, BC, V2C 2T3.

Within British Columbia's south Okanagan river valley there is concern that the Nationally listed amphibian species are vulnerable to road effects, notably during annual breeding migrations of listed Blotched Tiger Salamanders (*Ambystoma mavortium*) and Great Basin Spadefoots (*Spea intermontana*). We conducted a Before After Control Impact study installing mitigation tunnels and fencing, with annual fence maintenance and annual road monitoring. Our project was a collaboration with the Ministry of Transportation and Infrastructure and academic research.
The ecological benefits of a mitigation fence constructed after a 3-km highway expansion project in 2010, and open to traffic use in 2011, significantly reduced amphibian mortalities (x_{2010}= 13.2 ± 32.5, x_{2011}= 4.7 ± 12.8, x_{2012}= 2.3 ± 7.3; 2010 vs. 2012: W= 1535.5, $p < 0.001$). Roadkill mitigation structures proved effective in reducing observed amphibian road occurrence of the entire passing lanes transect as well as at distances 100 m and 200 m from examined culverts. Fenced areas covering both sides of the highway resulted in a 94% reduction in amphibian road occurrence. Since 2003, data collected from adjacent wetlands on species detection and reproductive success demonstrate significant variability. Sustaining the management and maintenance of the fencing has proven challenging with expenditures for fencing upkeep and repair ranging from $2000 to 10,000 CDN dollars annually since installation. Greatest challenges have included the fences integrity (snapping screws, photodegrading, shifting), invasive vegetation, and vehicular crashes). Almost every panel has required new screws and patches between panels to hold together, supportive bracing, and redesign around culvert openings. The longevity and maintenance of the fencing was grossly underestimated in the original planning and makes for continued challenges when determining road mitigation structures.

Poster

DESIGNING EFFECTIVE BARRIERS TO REDUCE ROAD MORTALITY AND GUIDE AMPHIBIANS TO CROSSING STRUCTURES ON HIGHWAY 4 ON THE WEST COAST OF VANCOUVER ISLAND. PART 1: ENCLOSURE TRIALS TO TEST DIFFERENT MATERIALS

Barbara A. Beasley

Association of Wetland Stewards for Clayoquot and Barkley Sounds, Ucluelet, BC, V0R 3A0, wetlandstewards@gmail.com

Amphibian road mortality can be reduced and habitat connectivity increased if appropriate fencing is installed to prevent amphibians from accessing road surfaces while providing a structure that guides them to crossing structures. We tested the effectiveness of four types of fencing materials: Baycor® polypropylene woven fabric, Aquamesh® plastic mesh, ACO® recycled solid plastic wildlife fencing, and UV-stabilized HDPE "puckboard", as barriers and guiding structures for the Northern Red-legged Frog (*Rana aurora*), Pacific Chorus Frog (*Pseudacris regilla*), Northwestern Salamander (*Ambystoma gracile*) and Rough-skinned Newt (*Taricha granulosa*). We constructed five-sided enclosures with each type of material, measuring 5 m in perimeter, walls at least 32 cm high (average > 40cm), and 10 cm of material buried under ground. The top edges of the walls of each type of material were folded or curved to create an overhanging lip. We placed individuals of each species inside the enclosures over night and used remote cameras to observe whether animals were successful at climbing the walls and/or whether they moved along the base of the walls. Pacific Chorus Frogs escaped from the plastic mesh enclosure in 43% of the trials, much more often than the other types of enclosures (X^2=13.48, df=1, N=35, P=0.0002). Red-legged Frogs, Northwestern Salamanders and Rough-skinned Newts were able to climb further up the walls of the plastic mesh than the other materials but were rarely able to maneuver around the overhanging lip. Our findings indicate fabric or solid fencing were more effective than mesh as barriers and guiding structures for amphibians. Subsequent installations of HDPE “puckboard” and fabric fences along two different sections of Highway 4 have been effective at reducing road mortality. The fabric fence, installed on an angle from the road across uneven forest terrain, has also been effective in guiding amphibians to crossing structures.

Poster

DESIGNING EFFECTIVE BARRIERS TO REDUCE ROAD MORTALITY AND GUIDE AMPHIBIANS TO CROSSING STRUCTURES ON HIGHWAY 4 ON THE WEST COAST OF VANCOUVER ISLAND. PART 2: BACI STUDY TO TEST ROADSIDE HDPE PUCKBOARD FENCING.

Barbara A. Beasley

Association of Wetland Stewards for Clayoquot and Barkley Sounds, Ucluelet, BC, V0R 3A0, wetlandstewards@gmail.com

Amphibian road mortality can be reduced and habitat connectivity increased if appropriate fencing is installed to prevent amphibians from accessing road surfaces while providing a structure that guides them to crossing structures. We tested the effectiveness of a custom-designed HDPE "puckboard" barrier fence that was installed along Highway 4 near Ucluelet, British Columbia. The fence height was 45 cm and the top edge was bent twice to create an overhanging lip (6 cm across and 4 cm down). The purpose of the lip was to make it difficult for amphibians, especially Pacific Treefrogs (*Pseudacris regilla*) to climb over the fence onto the highway. We surveyed for dead amphibians on the surface of the road in the morning after rainy nights in the autumn of 2012 and 2013. We compared the amount of road mortality before and after the fence was installed at both fenced (150 m) and unfenced sections (200 m) of the highway. The total number of amphibians killed in the fenced section was reduced by 80% after it was installed. Mortality in unfenced areas changed by only 1%. We also surveyed amphibians on the highway and within a 1-m swath on the inside of the fences on 4 nights in 2013. Over all nights, we observed a total of 40 live amphibians along the inside of the fences compared to only 3 live and dead on the surface of the road in the fenced section of the highway. The unfenced section had 28 amphibians on the road surface. The species most often killed at the site prior to fence installation were Northern Red-legged Frogs (*Rana aurora*) and Pacific Treefrogs, followed by Northwestern Salamanders (*Ambystoma gracile*), and Rough-skinned Newts (*Taricha granulosa*). The "puckboard" fence significantly reduced the road mortality of each of these species. Too few Western Red-backed Salamanders (*Plethodon vehiculum*) and Wandering Salamanders (*Aneides vagrans*) were killed on the highway before the fencing was installed to notice a reduction.

Poster

BEASLEY

MODELING THE EFFECTS OF WEATHER, TRAFFIC VOLUME, SEASONAL TIMING AND THE PRESENCE OF CROSSING STRUCTURES ON MOVEMENTS, ROAD MORTALITY, AND POPULATION VIABILITY OF NORTHERN RED-LEGGED FROGS ON HIGHWAY 4, VANCOUVER ISLAND.

Barbara A. Beasley[1], **Rylee G. Murray[2*]**, and Wendy J. Palen[2]

[1]Association of Wetland Stewards for Clayoquot and Barkley Sounds, Ucluelet, BC, V0R 3A0, wetlandstewards@gmail.com, [2]Earth to Ocean Research Group, Department of Biological Sciences, Simon Fraser University, Burnaby, BC, V5A 1S6, ryleem@sfu.ca, wpalen@sfu.ca

Modeling is a valuable tool for forecasting the effects of road mortality on populations of amphibians especially as it takes decades to detect declines in their regularly fluctuating population sizes. As such, models can be helpful in determining whether to install crossing structures. We counted the number of Northern Red-legged Frogs (by age and sex classes) crossing and being killed on Highway 4 near a 4-ha wetland on the west coast of Vancouver Island before and after installing a tunnel crossing structure and fencing during a six year study. We modeled the effects of weather, traffic volume, detectability, and seasonal timing on road mortality. We then used the model to obtain estimates of road mortality under three different scenarios: increased traffic volumes, warmer temperatures in the fall, and an increased number of crossing structures. Our final goal will be to use the survival rates of juvenile and adult frogs under the three scenarios to assess population viability in a deterministic stage-based population model. We will outline our approach, describe the results of our modeling to-date, and discuss the issues we have faced in analyzing the data. We will also discuss whether we think the approach has value in determining whether to increase the number of crossing structures at the Highway 4 site.

Poster

CROWLEY

REFLECTIONS ON A DECADE OF AMPHIBIAN AND REPTILE ROAD ECOLOGY RESEARCH AND MITIGATION IN ONTARIO

Joe Crowley

Species Conservation Policy Branch, Ontario Ministry of Natural Resources and Forestry, Peterborough, ON, K9J 8M5; Joe.Crowley@ontario.ca

Southern Ontario is home to the highest diversity of herpetofauna in Canada, but it is also one of the most heavily developed landscapes in the country. Mass mortality on roadways, coupled with significant habitat loss and fragmentation, has contributed to the widespread decline of southern Ontario's herpetofauna, with over half (27 of 51) of the species and subspecies in that region listed as species at risk (SAR) under Ontario's Endangered Species Act, 2007 (ESA). However, since 2008, the Ontario ESA has provided a powerful tool for addressing the threat of roads to Ontario's amphibian and reptile SAR. The ESA requires extensive mitigation and, in the majority of cases, "overall benefit activities" to accompany new road development or improvements in the habitat of amphibian and reptile SAR in Ontario. Further to this, the SAR Stewardship Fund was also introduced under the Act, which has made funding available to municipalities, NGOs, and other organizations to undertake road mitigation projects for amphibian and reptile SAR. Together, these requirements and opportunities have resulted in a flurry of amphibian and reptile road ecology research and mitigation in Ontario over the past decade. These projects have included the identification of existing road mortality hotspots at local and provincial scales, the installation of mitigation structures (e.g. ecopassages and fences) at many sites across Ontario, and research on the effects of road mortality and the effectiveness of road mitigation approaches. This presentation will highlight some of the successes, challenges and lessons learned from a variety of these initiatives, with a focus on both biological and policy considerations. Some key recommendations from the 2016 "Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario" will also be discussed.

Plenary

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EARLY RESULTS OF MITIGATION EFFORTS TO CURB HERPETOFAUNA MORTALITY ALONG HEART LAKE ROAD, BRAMPTON, ON

Marc Dupuis-Desormeaux[1*], Vince D'Elia[2], Tisha Tan[2], Suzanne E. MacDonald[3]

[1]York University, Biology Department, Toronto, ON; [2]Toronto and Region Conservation Authority, Toronto, ON; [3]York University, Psychology Department, Toronto, ON

We conducted road mortality surveys (2011-2018) along the Heart Lake road in Brampton, Ontario. The road bisects a provincially significant wetland complex rich in biodiversity. Over the study years, we have documented cumulative fatalities of 350+ turtles, 4000+ amphibians and 80+ snakes (as well as 250+ mammals and 200+ birds). The municipality of Brampton, in partnership with the Toronto and Region Conservation Authority has put in place a number of mitigation measures, including road signage, wildlife tunnel, artificial nesting beaches and exclusionary fencing. We discuss the preliminary results of these various mitigation strategies. We found that road signage had little or no effect on traffic speed or mortality. What appeared to be successful were the wildlife tunnel, the exclusionary fencing and the nesting beaches. We will discuss usage and the relative success of these measures. However, despite these efforts we continue to witness road mortality. We also suggest possible solutions to enhance the effectiveness of the measures. We also conducted a turtle population survey of the wetlands along the road and inside the protected conservation area to gauge the health of the local turtle population. We captured 233 painted, 134 snapping, 11 exotic red-eared sliders and 1 gravid map turtle. Turtles were abundant inside the conservation area as well as in the surrounding remnant wetlands. Sex ratios for painted turtles were even inside the protected area but were male-skewed in the wetlands bisected by the road. Sex ratios for snapping turtles were even in both locations.

Oral Presentation

GUNSON

EFFECTIVENESS MONITORING OF THE LARGEST REPTILE ROAD MITIGATION PROJECT IN CANADA

Authors: Kari E. Gunson*[1], and Terri Rogers[2] (*still need to get permission*)

[1]Road Ecologist, Eco-Kare International, 644 Bethune Street, Peterborough, Ontario, K9H 4A3

[2] Environmental Planner, Ontario Ministry of Transportation, 447 McKeown Ave #301, North Bay, Ontario, P1B 9S9

This presentation will focus on effectiveness monitoring for a variety of 'dedicated' wildlife crossing structures and 'not dedicated' drainage structures as part of an 'overall benefit permit' with the Endangered Species Act on Highway 69 in Ontario. The project spans 150 km of highway that bisects the boreal forest and Georgian Bay Biosphere Reserve, and entails five different mitigation scenarios including three types of reptile exclusion fencing designs and a variety of drainage and terrestrial box and round culverts that range in size from 2.4 m high x 3.3 m wide box culverts to 1.2 m Corrugate Steel Pipes. The intensive monitoring began in May 2015 and will finish in September 2018 and entailed using remote motion-triggered game cameras on time lapse that were positioned to the top of the culvert entrance at one entrance of each structure. The first three years of monitoring has shown that of the 18 culverts monitored, the cameras recorded 71 (83%) passages by turtles (39 Snapping turtles, *Chelydra serpentina*; 27 Painted turtles, *Chrysemys picta*), and 5 Blanding's turtles, *Emydoidea blandingii*; Threatened) and 15 (17%) turned around. There were 44 observations of 5 species of snakes observed at the culverts: Eastern Gartersnake (*Thamnophis sirtalis*); Eastern Hognose (*Heterodon platirhinos*, Threatened), Massasauga Rattlesnake (*Sistrurus catenatus*, Threatened), Eastern Milksnake (*Lampropeltis triangulum*) and Northern Watersnake (*Nerodia sipedon*). Significantly fewer snakes than turtles crossed the structures: 70% (31) snake crossed and 30% (13) turned around. All of the observations were at 12 culverts, of which 2 were dry and never had water in them, and 10 had water flow during the monitoring periods. Wildlife exclusion fencing worked to funnel animals to the culverts but could be improved with annual maintenance and retrofits that extend fence ends away from highways and that span moderate highway cliffs.

Oral Presentation

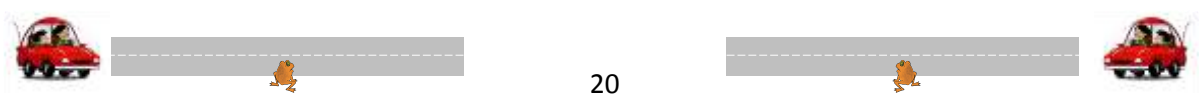
CRITICAL HABITAT IDENTIFICATION AND APPLICATION FOR REPTILES AND AMPHIBIANS IN BRITISH COLUMBIA UNDER THE SPECIES AT RISK ACT

Darcy C. Henderson

Environment and Climate Change Canada, Canadian Wildlife Service, 1238 Discovery Avenue, Kelowna, BC, V1V 1V9, darcy.henderson@canada.ca

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.

Plenary



RYDER LAKE AMPHIBIAN PROTECTION PROJECT

Sofi Hindmarch*, Kendra Morgan, Joanne Neilson* & Steve Clegg

Fraser Valley Conservancy, PO Box 2026, Abbotsford BC, V2T 3T8, sofi@fraservalleyconservancy.ca, joanne@fraservalleyconservancy.ca

Since 2008, in collaboration with the Ryder Lake community, we have monitored the amphibian migration patterns and associated road-usage annually. The breeding pond in Ryder Lake supports large numbers of Western toads, Red-legged frogs, Northern Pacific Tree frogs as well as several salamander species. This shallow open water wetland has a low presence of invasive species but is completely surrounded by a rural road network; the amphibians must cross a road to get from the forest habitat to the breeding pond. Thousands of sub-adult Western toads (aka toadlets) migrate en mass from the wetland to the forest, typically in July. Over the years, the FVC has tried various mitigation measures to reduce the road mortality. This included toadlet bucket brigades as well as selective road closures and voluntary detours. In June 2015, an amphibian crossing structure was installed in partnership with Lafarge Canada and The Langley Concrete Group. This “Toad Tunnel” is a dry box culvert with three daylighting openings in the road surface. Fencing to guide the amphibians to the crossing structure was constructed; it is temporary in some locations (due to land-use) and semi-permanent in others. We have implemented a formal pre- and post- construction monitoring protocol to assess the effectiveness of the crossing structure and for adaptive management purposes. The monitoring includes night-time road surveys for adult amphibians moving to (spring) and from (fall) the breeding pond, as well as summer toadlet migration road surveys. Preliminary data suggests that the directional fencing in combination with the crossing structure has significantly reduced toadlet road mortality. The annual installation and ongoing maintenance of the directional fencing remains the most challenging aspect to the long-term sustainability of this project. Preliminary results comparing pre-construction (2014) and post-construction (2015-2018) data will be presented.

Poster

MCRORY

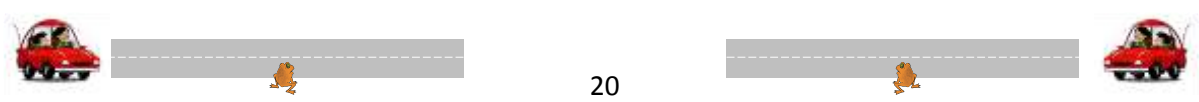
FISH/BEAR LAKES WESTERN TOAD *(Anaxyrus boreas)* ECOLOGY AND HIGHWAY 31A MORTALITY MITIGATION STUDY

Wayne McCrory and Marcy Mahr*

Valhalla Wilderness Society, New Denver, BC V0G 1S0, waynem@vws.org, *marcy@netidea.com

A substantial number of adult and juvenile western toads *(Anaxyrus boreas)* are killed by vehicles every year during their seasonal migrations across a 2km stretch of Highway 31A at Fish/Bear Lakes between New Denver and Kaslo in southeastern BC. Our five-year (2015-2020) study is identifying toad migration routes, timing, direction, and patterns as well as Highway 31A crossing hotspots of this potential regionally significant population. Although traffic use is low for most of the year, even several cars per night kill toads; and toad mortality increases with summer visitor traffic. To monitor adult toads, we divided the highway into 27 segments and conducted twice-weekly night and early morning road surveys from late April to early October to obtain relative abundance of live and dead adult toads. To monitor toadlet migrations and mortality we combined highway segments into four transects that coincided with breeding and emergence/staging areas along the lakeshore. We also monitored 12 segments along an adjacent multi-use recreation trail since summer ATV use coincides with toadlet migrations necessitating trail closures. In 2017, >850 adults toads were safely removed from the highway by researchers and volunteers, of which >250 (approximately 30%) were confirmed females. We also detected 72 dead adult toads, 29 of which were confirmed females including13 (45%) of them egg-bearing (gravid). We identified four adult toad highway crossing hotspots as optimal locations for possible underpasses for mitigating mortality because they coincide with culverts that need replacement. Two of the adult toad hotspots are also heavily used by thousands of migrating toadlets. Experimental fencing at Fish Lake Rest Area directed >3000 migrating toadlets away from Hwy 31A and along a constructed wooden "toad bridge" for safe passage under a highway bridge. Permanent underpasses and fencing are being discussed with the BC Ministry of Transportation and Infrastructure.

Oral Presentation



CARNAGE IN THE CAPITAL: HAT'S AMPHIBIAN ROADKILL PROJECT

KristiinaOvaska, Christian Engelstoft, and Paige Erickson-McGee

Habitat AcquisitionTrust, Victoria, BC, kristiina@hat.bc.ca or paige@hat.ca

Since 2015, Habitat Acquisition Trust (HAT) has been documenting amphibian roadkill and raising awareness of the issue within the Capital Regional District on southern Vancouver Island, an area crisscrossed by a network of roads. Activities included encouraging volunteers to report roadkill and participate in surveys, engaging local governments in mitigation efforts, and conducting outreach that included presentations, news releases, and TV and radio interviews. During surveys along designated routes in 2015 and 2016, HAT biologists and volunteers recorded 1947 individuals of seven species of amphibians (3 species of frogs and 4 of salamanders), 85% of which were dead, and identified several roadkill hot spots by wetlands. Outcomes of the project included documenting patterns of roadkill and identification of problem areas; increased knowledge of distributions of cryptic (terrestrial salamanders) and introduced (bullfrogs) species, and establishment of rapport with decision makers and engaging municipalities in mitigation as roads are retrofitted.

Poster

WESTERN TOAD UNDERPASS: PROTECTING MIGRATING TOADS

Kristiina Ovaska[1], Lennart Sopuck[1], Christian Engelstoft[1], Andrea Lawrence[2], and Alan Burger[2]

[1]Biolinx Environmental Research Ltd. Sidney, BC, ke.ovaska@gmail.com; [2]Nicola Naturalists Society, Merritt, BC, nicolanaturalists@gmail.com

Western Toads face numerous threats from human activities and are listed as Special Concern in Canada. In Kentucky-Alleyne Provincial Park in the southern interior of BC, the toads breed communally in a pond between the two main lakes and migrate across a seasonally busy park road in late summer. The migration of metamorphs in late July – early August crosses the main access road to the campsites when the park is particularly busy. In spring 2013, BC Parks installed a wildlife underpass to reduce roadkill of migrating juvenile toads. The underpass consisted of a semi-cylindrical "half-culvert"; drift fences lead the toads into the tunnel and then into the forest; the fences were initially constructed of black landscaping cloth but were replaced by a wooden fence constructed of removable sections of wooden planks 20 cm high and with an overhanging ledge. Their migration was subsequently monitored with time-lapse cameras and counts by volunteers. Toadlets entered the tunnel with no apparent hesitation and seemed to use it as a refuge at night. Its large diameter (180 cm), earthen floor, and relatively short length (366 cm), probably contributed to its attractiveness. The wooden fencing was cost-effective and has lasted 5 years with only minor repairs. While extensive use of the underpass resulted in reduced mortality, population effects remain unknown. However, the project functioned as an excellent outreach tool, and the migration route was considered during the redesign of the park in 2017, which includes a planned closure of the park road.

Poster

SEBURN

HOT SPOTS VS HOT SPECIES: LESSONS FROM 1000 ROADKILLED TURTLES

David C. Seburn*, Hannah McCurdy-Adams

Canadian Wildlife Federation, 350 Michael Cowpland Drive, Ottawa, ON, K2M 2W1, davids@cwf-fcf.org, hannahlmcca@gmail.com

Roadkill is a serious threat to many reptile species. Road surveys are often used to determine the location of roadkill aggregations, or hot spots, but these locations may be biased by more common species. The locations where rare species, or hot species, are killed on roads may not coincide with more common species or even others of the same species. We conducted extensive road surveys in the Ottawa area of eastern Ontario, driving ~10,000 km along ~900 km of paved roads during 2017 and 2018. Over 1000 roadkilled turtles were found, but ~75% were the Midland Painted Turtle (*Chrysems picta marginata*), a widespread and common species. The threatened Blanding's Turtle (*Emydoidea blandingii*) made up <15% of the turtles. The median distance between Blanding's Turtle observations on roads in 2017 was 1.6 km (range: 0–33.4 km), emphasizing that individuals are rarely aggregated on roads. Many Blanding's Turtles from road surveys in 2018 did not overlap with 2017 roadkill locations, with some turtles more than 4 km from previous locations. Road survey data from a single year may miss many roadkill locations and even some hotspots. Weather, varying water levels, and other factors may influence movement patterns and roadkill locations. More than one year of survey data is required to determine where these long-lived species may be killed on roads. Although only one individual of a hot species may be killed at a location in a given year, our data also indicate that an individual Blanding's Turtle is often killed at the same site the next year. A single individual killed in all, or most years, can still have significant negative effects on a population. While road mitigation at hotspots is important, locations with hot species should also be considered for road mitigation.

Poster

THOMPSON

AN INTRODUCTION TO GIS SPATIAL STATISTICS TO STUDY AMPHIBIAN HOTSPOTS AND AN OVERVIEW OF AMPHIBIAN ROAD SURVEYS IN NORTHERN BC.

Mark D. Thompson, MSc, RPBio

Senior Research Ecologist – DWB Consulting Services Ltd. and President of the BC Association of Professional Biologists

The first goal of this presentation is to give an overview on GIS and its applications to amphibian road mortality investigations. Geographic Information Science (GIS) is a multi-billion-dollar market that has become freely accessible through the release of QGIS, r-stats, other freeware platforms. Methods and software that are being used in an ongoing study into moose and amphibian collision in northern Alberta will be discussed. Moose were the prime focus in the Alberta study. QGIS can be used to assist in the study of amphibian road mortality including methods for incorporating satellite data into the analysis, classifying habitat, and identifying hotspots. LecoS is a QGIS plugin that was used to obtain multiple spatial metrics on classified landscapes, including data on edges, patches, and density. The amphibian surveys were a smaller focus in the study and insufficient data were collected to include their information into the spatial statistical analysis. However, the second half of this presentation will provide an overview of amphibian road surveys that have been completed since 2015 on forest service roads along the Williston Reservoir, including efforts to estimate density and mortality rates in relation to aquatic and terrestrial surveys in adjacent areas and a discussion on potential GIS applications and research concerning road mortality more generally.

Poster

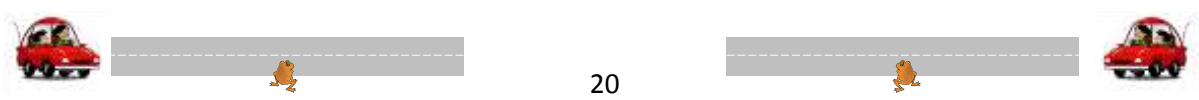
PUBLIC ENGAGEMENT IN AMPHIBIAN ROAD SURVEYS ON VANCOUVER ISLAND

Elke Wind

E. Wind Consulting, Nanaimo, BC V9R 1N2, ewind@telus.net

Amphibian road surveys can serve as an excellent platform to engage the public in citizen science. Road surveys are the only way to identify specific amphibian road crossing hot spots where mitigation measures may be needed (e.g., installation of a small wildlife underpass). Given the large number of roads across BC, the use of volunteer citizen scientists to gather data is invaluable at a provincial scale. In addition, the promotion of such a project can be a useful public awareness campaign. I teamed up with NatureKids BC (formerly known as the Young Naturalists' Club of BC) in 2015 to develop and deliver a program titled ***Salamander X-ing! Engaging Youth to Protect Amphibians by Using Road Surveys.*** The objective was to provide club leaders with the information and tools they needed to use road surveys as an Explorer Day event. We created amphibian road survey kits that included a project description, instructions, datasheets, and survey equipment. Also, we developed online training videos that leaders and participants could view before they conducted their road survey. More than 1000 youth in 35 communities were informed about amphibian road issues via recruitment and outreach in 2015 and 9 NKBC clubs, 38 families, and 58 youth were trained and participated in the amphibian road surveys across BC. Based on our project evaluation, all leaders and youth said that they enjoyed the surveys and would do them again in the future, but leaders found site selection and species identification a challenge. Youth can do this type of citizen science work, they enjoy it, and the project makes them feel that they can make a difference.

Poster



EVALUATION OF SNAKE ROAD MORTALITY RATES AND HOT-SPOT LOCATIONS IN THE WHITE LAKE BASIN, BRITISH COLUMBIA

Stephanie A. Winton[1]*, Richard Taylor[2], Christine A. Bishop[3], and Karl W. Larsen[4]

[1] Environmental Science Program, Thompson Rivers University, Kamloops, BC, V2C 0C8, wintons15@mytru.ca; [2] Department of Mathematics and Statistics, Thompson Rivers University, Kamloops, BC, V2C 0C8, rtaylor@tru.ca; [3]Wildlife Research Division, Science and Technology Branch, Environment and Climate Change Canada, Delta, BC, V4K 3N2, cab.bishop@canada.ca; [4]Department of Natural Resource Sciences, Thompson Rivers University, Kamloops, BC, V2C 0C8, klarsen@tru.ca

Mitigation of adverse effects from wildlife-vehicle collisions benefits from a fundamental understanding of the number of animals killed by traffic, as well as particularly problematic sites for roadkill. We quantified Western Rattlesnake (*Crotalus oreganus*) road mortality and identified roadkill "hot-spot" locations for three at-risk snake species on a two-lane road in the South Okanagan. This region of British Columbia provides habitat for a high diversity of species, but is experiencing tremendous human population growth and development of transportation corridors. In 2015 and 2016 we repeatedly surveyed 11.7 km of road by walking, driving, and cycling. We determined (i) the rate of carcass removal by scavengers and (ii) observer detection probability during walking surveys, using planted snake carcasses. The estimated number of rattlesnake deaths was 2.7x the number of dead rattlesnakes detected through unadjusted surveys and incidental observations of carcasses; these incidental observations also had a very low detection rate per kilometer compared to other surveys methods. We used the mean road mortality rate for rattlesnakes, which accounts for scavenging and observer error, in a related Population Viability Analysis to assess the persistence of the rattlesnake population. We further used snake roadkill and detection data in a sliding window analysis of 100 m road segments to identify locations where high amounts of encounters occur ("hot-spots"). Movement corridors identified from radio-tracking rattlesnakes supplemented this analysis, and showed that rattlesnakes were killed within close proximity to overwinter hibernacula. Based on our findings five culverts were installed at optimal locations to reduce snake road mortality and are being monitored for effectiveness along with existing culverts. Future work includes installation of directional fencing, continued monitoring, and further analysis of "hot-spot" characteristics. The results of this work highlight the magnitude of snake road deaths in our area and the importance of methodical and rigorous assessments of roadkill.

Oral Presentation