Project title: Long-term population monitoring of terrestrial salamanders in southern Vancouver Island.

# of years of monitoring: Since 1992 (~30 years)

Who: Dr. Kristiina Ovaska

Where: Goldstream Provincial Park near Victoria

Focal species: Western Red-backed Salamander, *Plethodon vehiculum;* Wandering Salamander, *Aneides vagrans*

Project support: Volunteer efforts

Description: Goldstream Provincial Park supports an abundant population of Western Red-backed Salamander, *Plethodon vehiculum*, and is ideal for monitoring long-term population trends in relation to environment conditions, including climate change and emerging diseases. Wandering Salamander, *Aneides vagrans*, also occurs in the park. Salamander monitoring with artificial cover boards began in 1992 as part of Ted Davis's dissertation project (University of Victoria). With only a few gaps, monitoring has continued annually with the direction of Dr. Kristiina Ovaska. Volunteers have included Camosun College Environmental Technology Program students, who have also conducted special projects on salamanders at the site. The current set-up consists of a grid of 15 cover boards (12" wide and 6' long baseboard, covered by two top boards) and six stacks of five shorter boards set into the ground. These stacks are intended to examine how salamanders use vertical layers of space. Most surveys have taken place in spring (March to May) when the salamanders are most active. The surveys are expected to continue once deteriorated cover boards are replaced and as pandemic conditions ease.

Contact: Kristiina Ovaska ke.ovaska@gmail.com

Photo description: Left: Western Red-Backed Salamander, *Plethodon vehiculum*; Right: Volunteers checking artificial cover boards for salamanders. **Photo credit:** Left and Right: Kristiina Ovaska.

Project title: Mitigating threats and sustaining amphibian populations on the Vancouver Island.

# of years of monitoring: Since 2001 (21 years)

Who: Association of Wetland Stewards for Clayoquot and Barkley Sounds

Where: Clayoquot and Barkley Sounds on the west coast of Vancouver Island

Focal species: Red-legged Frog, *Rana aurora*, Western Toad, *Anaxyrus boreas*; Northwestern Salamander, *Ambystoma gracile*.

Project support: Habitat Conservation Trust Foundation, Clayoquot Biosphere Trust and B.C. Ministry of Transportation and Infrastructure

Description: This project began when a small group of friends began monitoring amphibian roadkill on Highway 4 in 2001. More volunteers were attracted to the project when it was named "SPLAT - Society for the Prevention of Little Amphibians Tragedies". The results were used to map hotspots for where amphibians crossed the highway between Tofino and Ucluelet to reach their breeding ponds. This information was shared with the BC Ministry of Transportation and Infrastructure; in response, an underpass was installed in 2011 and fencing and camera traps were used to guide amphibians and monitor their movement through the structure. Following this comprehensive work, Parks Canada installed three additional underpasses and fencing in 2020 and they are currently being monitored. We are collecting data to support the installation of more underpasses on the west coast of the island. If you are a graduate student that is interested in this topic please reach out to this group to pursue a graduate research opportunity.

Contact: wetlandstewards@gmail.com

Related information:

- https://splatfrogtunnel.blogspot.com
- https://www.youtube.com/watch?v=5G9Z2_uFvUc
- https://www.facebook.com/wetland.stewards/

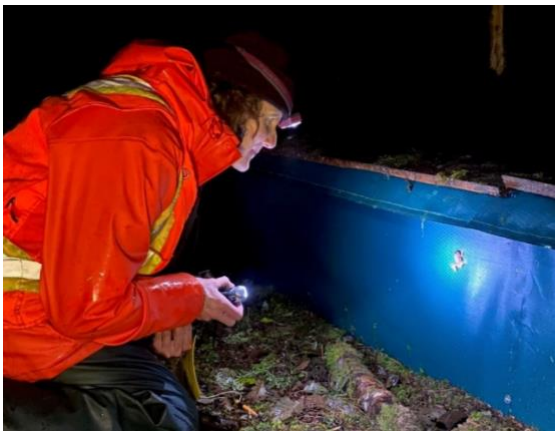

Photo descriptions: Left: Dr. Barb Beasley checking the driftnet fencing for a climbing Pacific treefrog, *Pseudacris regilla*; Right: Volunteer team after completing the installation of directional fencing. **Photo credit:** Left and Right: Barb Beasley.

Project title: Snake coexistence with development in the South Okanagan – monitoring and study.

# of years of monitoring: Since 2002 (~19 years)

Who: Dr. Karl Larsen, Thompson Rivers University; Dr. Christine Bishop, Environment and Climate Change Canada; Nk'Mip Desert Cultural Centre, Osoyoos Indian Band; and, Dr. Ron Brooks, University of Guelph 2002-2004

Where: Osoyoos Indian Band lands, Osoyoos, BC

Focal species: Western Rattlesnake (*Crotalus oreganus*), Great Basin Gopher Snake (*Pituophis catenifer*), Western Racer (*Coluber constrictor*); other notable species: Desert Night Snake (*Hypsiglena chlorophaea*)

Project support: ECCC (base funding), Aboriginal Fund for Species At Risk, Interdepartmental Recovery Fund, Bellstar Resorts, Mission Hill Winery, NSERC, Nk'mip Desert and Cultural Centre and the Osoyoos Indian Band.

Description: This research and collaborative Indigenous outreach program has (a) examined the long-term changes in snake populations in this southern region, particularly in response to land-use (b) determined critical habitat features such as den and rookery and shedding sites; habitat use by adult and juvenile rattlesnakes (c) examined impacts of rattlesnake management such as response of snakes to being 're homed' from campsites, (d) identified impacts of snake fencing and condo development on snake health and movements, (e) developed novel methods to provide habitat for snakes in disturbed areas (e.g. snake refugia), (f) employed and or trained indigenous adults and youth, (g) conducted workshops, outreach infographics and interpretive events on snake identification and conservation for the public, farmers, campsite operators, and (h) contributed significantly to the development of an ongoing ecotourism program on snake and grassland habitat conservation through the Nk'Mip Desert Centre.

Contact: Karl Larsen, klarsen@tru.ca; Christine Bishop, Christine.bishop@ec.gc.ca

Related Content: Work has been primarily conducted by a series of graduate students, generating the following thesis and their associated peer-reviewed publications.

- Brown, Jeff. 2006. Management of rattlesnake-human interaction: the effects of short-distance translocation on *Crotalus o. oreganus*. MSc thesis, University of Guelph, Guelph, Canada
- Lomas, Emily. 2013. Effects of disturbance on the Northern Pacific Rattlesnake (*Crotalus oreganus oreganus*) in British Columbia. MSc thesis, Thompson Rivers University, Kamloops, BC, Canada.
- Maida, Jared. 2014. Impacts of fencing and development on Western Rattlesnake (*Crotalus oreganus*) spring movements in British Columbia. MSc thesis, Thompson Rivers University, Kamloops, BC, Canada
- Eye, Dana. 2022. *Tentative title:* Reproductive ecology of female Western Rattlesnakes (*Crotalus oreganus*). MSc thesis, Thompson Rivers University, Kamloops, BC, Canada
- Howarth, Chloe. In preparation. *Tentative title:* Migratory movements of rattlesnakes. MSc thesis, Thompson Rivers University, Kamloops, BC, Canada

Photo description: Left: One type of artificial snake refugia; and Right: its occupants. **Photo credit:** Left: Karl Larsen; Right: remote field camera (Bushnell Natureview).

Project title: Using science and public engagement to conserve an important population of Western toad in southern B.C.

# of years of monitoring: Since 2010 (~11 years)

Who: Irene Manley, Kat McGlynn and Jakob Dulisse

Where: Summit Lake, southeast of Nakusp on Highway 6

Focal species: Western Toad, *Anaxyrus boreas*

Project support: Fish & Wildlife Compensation, Ministry of Forest, Lands, Natural Resource Operations and Rural Development, Ministry of Transportation and Infrastructure, Columbia Basin Trust, Nakusp and Area Community Forest, BC Parks

Description: This project, managed by the Ministry of Forest, Lands, Natural Resource Operations and Rural Development, assesses the timing, severity, and location of toad mortality, with the goal of designing permanent mitigation strategies such as fencing and highway underpass structures. Monitoring has been in place since 2010 using adult mark-recapture and radiotelemetry to determine hibernacula locations and hot-spots for highway mortality. In 2014, a new, large (1.8 m x 1.2 m) concrete tunnel was constructed for the toads and fitted with a camera trap. An additional 1.6 km of wildlife fencing has been installed to connect the tunnel and two other existing culverts, which has been very effective in reducing toad mortality. More tunnels are due to be installed by the Ministry of Transportation and Infrastructure in 2022.
The Fish & Wildlife Compensation Program (FWCP) started organizing Toadfest, also in 2010, at Summit Lake Provincial Park. The annual event, held in August to coincide with the toadlet migration, is designed to raise awareness about the species and its habitat, as well as share results of the monitoring and mitigation work. The positive community engagement has helped bring attention to the importance of Summit Lake as a breeding site and has been a catalyst for bringing stakeholders together to help with the local long-term conservation of the western toad population.

Contact: Angus Glass, FWCP: fwcp@bchydro.com

Related Content:

- https://fwcp.ca/toadfest/

Photo descriptions: Left: Western toadlets migrating through Cement Box Culvert installed in 2014 along Hwy 6, at Summit Lake; Right: Toadfest 2019 (10th Anniversary) Volunteers, Team Photo. **Photo credit:** Left and Right: Katherine McGlynn.

BC Reptiles & Amphibians

Project title: Impact of roads on a community of at-risk herpetofauna: White Lake Basin research and monitoring
# of years of monitoring: Since 2015 (6 years)

Who: Dr. Karl Larsen, Thompson Rivers University, Dr. Christine Bishop, Environment & Climate Change Canada (ECCC)

Where: White Lake Basin, South Okanagan valley

Focal species: Western Rattlesnake (*Crotalus oreganus*), Great Basin Gophersnake (*Pituophis catenifer*), Western Racer (*Coluber constrictor);* other notable species: Tiger Salamander (*Ambystoma tigrinum melanostictum*), Great Basin Spadefoot (*Spea intermontana*), Rubber Boa (*Charina bottae*).

Project support: ECCC (base funding), Interdepartmental Recovery Fund, Aboriginal Fund for Species At Risk, Ministry of Transportation and Infrastructure, Natural Science and Engineering Research Council, Government of British Columbia (Conservation Economic Stimulus Initiative, CESI), South Okanagan Conservation Fund, Brink/McLean Grassland Conservation Fund, National Research Council through the Dominion Radio Astrophysical Observatory, The Nature Trust, and Clifton Ranch.

Description: This collaborative program has examined the impact of road mortality on the community of snakes occupying the White Lake Basin, particularly Western Rattlesnakes, but data on other species of animals, including snakes, have also been monitored. Road mortality rates have been quantified after adjustment accounting for observer and method biases (see Winton publications), along with the tracking of population demographics at communal hibernacula. More recently, the installation of eco-passages under the highways and drift fences has been the subject of study designed to test the efficacy of mitigation techniques. Work at White Lake has now been expanded to examine how snakes are predisposed to road mortality and shifts in defensive behaviour, and how this is influenced by behavioural differences within and between species, in tandem with anthropogenic landscape changes. Work in the White Lake Basin has been primarily conducted by a series of graduate students and research technicians, generating the following theses and associated peer-reviewed publications.

Contact: Karl Larsen, klarsen@tru.ca

Related Content:

- Winton, S. 2018. Impacts of Road Mortality on the Western Rattlesnake (*Crotalus oreganus*) in British Columbia. MSc thesis, Thompson Rivers University, Kamloops, BC.
- Spruyt, J. in preparation. Working title: Post-implementation effects of road ecopassage installations on a community of at-risk snakes. MSc. Thesis, Thompson Rivers University, Kamloops, B.C.
- Macpherson, M. in progress. Tentative title: The relationship between behaviour and anthropogenic risk factors within a community of snakes. PhD Thesis, University of British Columbia – Okanagan. Kelowna, BC



Photo descriptions: Left: Dead rattlesnake killed on White Lake road; Middle: Entrance to one of the ecopassages installed at White Lake by BC Ministry of Transportation and Infrastructure; Right: Gophersnake travelling through one of the ecopassage culverts installed in the White Lake Basin. **Photo credit:** Left: Stephanie Winton, Centre: Jade Spruyt; Right: remote wildlife camera (Bushnell Natureview).

Project title: Fish/Bear Lakes Western Toad Ecology & Mortality Mitigation along Highway 31A

# of years of monitoring: Since 2015 (6 years)

Who: Valhalla Wilderness Society

Where: Fish and Bear Lakes along Highway 31A in the Central Selkirk Mountains

Focal species: Western toad, *Anaxyrus boreas*

Project support: Columbia Basin Trust, Kootenay Lake Local Conservation Fund – Regional District of the Central Kootenay, Fish & Wildlife Compensation Program

Description: Since 2015, research biologists with the Valhalla Wilderness Society (VWS) have been studying Western toads at Fish and Bear lakes located between Kaslo and New Denver. The goal of the project is to enhance the long-term survivability of this regionally significant toad population in the face of increased summer traffic, commercial backcountry recreation tenures, logging on adjacent private and Crown land, and climate change. Through regular field surveys, researchers have documented the extent of road mortality for migrating adults and toadlets as they move between terrestrial and breeding habitats. To date, VWS researchers and volunteers have moved over 5,500 breeding adults and 100,000-130,000 toadlets off the highway to safety. Information on toad breeding behaviour, movements, highway crossing areas, and mortality have informed VWS's recommendations to BC's Ministry of Transportation and Infrastructure which is currently assessing the feasibility of installing two concrete box culvert underpasses at hotspot areas of high toad mortality. VWS maintains an interpretive sign at the Fish Lake Rest Area and regularly enlists help from the local community and visitors through a Toad Ambassador volunteer program that encourages community-based science and conservation.

Contact: Wayne McCrory, waynem@vws.org and Marcy Mahr, marcy@netidea.com

Related information:

- https://www.vws.org/projects/working-to-conserve-endangered-western-toads-in-west-kootenay/
- https://youtu.be/6QrV3_LLjSk

Photo descriptions: Left: Education sign at the Fish Lake Rest Area; Right: Researcher Marcy Mahr and a volunteer Toad Ambassador moving a toad off the highway. **Photo credit:** Left: Marcy Mahr; Right: Kolibri Drobish.

Project title: Using Western painted turtle ecology to inform threat mitigation

# of years of monitoring: Since 2020 (2 years)

Who: Baynes Lake Community Society

Where: Baynes Lake

Focal species: Western painted turtle (*Chrysemys picta bellii*; Intermountain-Rocky Mountain population)

Project support: Fish & Wildlife Compensation Program, Columbia Basin Trust, Ministry of Environment and Climate Change Strategy, Ministry of Transportation and Infrastructure

Description: Western painted turtles (*Chrysemys picta bellii;* Intermountain-Rocky Mountain population) occur in Baynes Lake, BC; road mortality in key hotspots has been documented by community members. Local residents have observed turtle mortality over at least the last decade; efforts to quantify this threat began in 2020 followed by focused ecological work (population size, turtle movements, road surveys) conducted by Thompson Rivers University in 2021. In partnership with Ministry of Transportation and Infrastructure, a culvert was installed and additional baseline information to inform fencing placement and turtle movements/use is anticipated for 2022 and 2023. By 2024, the Baynes Lake Community Society will be poised to monitor and maintain the wildlife underpass systems (e.g. culvert and directional fencing).

Contact: Kymme Paul, kymmepaul@gmail.com

Related information:

- https://fwcp.ca/project/conserving-at-risk-turtles-in-the-east-kootenay-2/
- https://www.myeastkootenaynow.com/17464/baynes-lake-western-painted-turtle-project/?fbclid=IwAR37fVisl5KUqoRDptibHBHBqLGAihMaNbP5JTrVQ88yLV-oEXxq04ZH3aE

Photo descriptions: Left: Nesting female Western Painted Turtle, *Chrysemys picta bellii*; Right: Turtle research team engaging with local community members. **Photo credits**: Left: Hailey Wynnyk; Right: Kymme Paul.

Project title: Community-based amphibian monitoring program in south-central British Columbia.

# of years of monitoring: 2011-2015 (4 year project duration and ongoing afterwards)

Who: Nicola Naturalist Society and Biolinx Environmental Research Ltd. (K. Ovaska, L. Sopuck, and C. Engelstoft)

Where: Nicola area

Focal species: Great Basin Spadefoot, *Spea intermontana*; Western Toad, *Anaxyrus boreas*; Columbia Spotted Frog, *Rana luteiventris*

Project support: Habitat Conservation Trust Fund, Public Conservation Assistance Fund, Volunteer efforts

Description: This project was initiated to fill in gaps in our knowledge of pond-breeding amphibians in the Nicola area. The objectives were to obtain information on distributions using an atlas approach, to identify important amphibian breeding sites, and to engage community members in surveys, monitoring, and stewardship. From 2011 to 2015, Nicola Naturalist Society collaborated with herpetologists from Biolinx Environmental Research Ltd. to initiate the program through outreach, workshops, and biologist-led field trips. After training in identification and survey methods, club members and other volunteers continued to document observations and to engage in periodic surveys of selected breeding sites to determine changes in their use and condition over time. In addition to wetland surveys, volunteers have carried out call surveys for spadefoots along road transects and participated in the installation of road-crossing structures for migrating toads and their monitoring in Kentucky-Alleyne Provincial Park.

Contacts: Alan Burger, Nicola Naturalist Society, aburger@uvic.ca; Kristiina Ovaska ke.ovaska@gmail.com

Related Content:

- http://www.nicolanaturalists.ca/projects/amphibian-monitoring/

Photo description: Left: Columbia spotted frog, *Rana luteiventris*; Right: Dr. Kristiina Ovaska (second from left) training a group of volunteers. **Photo credit:** Left and Right: Kristiina Ovaska.