

# Snakes and Amphibians:

## Research and Mitigation Update

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Ministry of FLNRORD

SOSCP Conservation Science Forum

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# Overview



N. American Racer



Northern Rubber  
Boa

- Snakes—research and applications
- Amphibians—research and applications
- Herpetile mitigation update



Western Rattlesnake,  
Gopher Snake,  
Desert Nightsnake



Great Basin Spadefoot



Blotched Tiger Salamander

# Snakes

**7** of BC's **9** snake species occur in the Okanagan.  
Of these, **5** are at risk.

## Status

Species	Provincial	Federal (SARA)	Critical Habitat?
Desert Night Snake	Red	Endangered	Yes
Western Rattlesnake	Blue	Threatened	Yes
Gopher Snake	Blue	Threatened	Yes
North American Racer	Blue	Threatened	No
Rubber Boa	Yellow	Special Concern	No

# Recovery Strategies

- Important and essential guidance documents for EIAs and conservation initiatives
- As biology professionals our job is to aid in recovery of the species



# Biggest Threats:

1. Road mortality
2. Residential and agricultural development
3. Hunting and collecting (persecution)



Photo: Kathy Paige



# Snake biology: important features to consider

## Dens (hibernacula)

- Rock dens for overwintering (Sept. to Mar.)
- Most <800 masl, but up to 1200 masl
- **HOWEVER Gopher Snakes also use soil dens (rodent burrows), and fill**
- Racers—who knows?

## Forage areas

- Grassland, shrub-steppe, **open forest (PP, IDF)**
  - Mostly <1430 m asl, but up to 1800 m asl
  - Gopher Snake up to 1000 masl
  - **Forests –larger individuals!**
    - Less time hiding in shade = more time foraging
    - Can't ignore this habitat.

# Snake biology: important features

- **Retreat sites** (shade and cover):
  - large rocks, rock piles, talus, live and dead shrubs, grass and forbs, live and dead trees, fallen trees, coarse woody debris; **communal and re-used**
- **Shedding sites:**
  - rock piles, other cover
  - **communal and re-used**
  - may also be used by pregnant snakes
- **Egg- laying sites:**
  - warm aspect sandy/loamy slopes, rodent burrows
  - **FILL! Including road edges**



# Movement away from dens

- General: Rattlesnakes in grassland ~1.2 km, forest ~2.3 km, **but up to 4km!**
- **Pregnant (gravid) females go farther than we thought**
  - >50m from dens
- Low reproductive rates, so death of gravid females = big population impact
- Work windows?
  - June-August—may be eggs in soil or gravid females on road



# Road impacts

Winton 2018 thesis: Impacts of road mortality on the Western Rattlesnake (*Crotalus oreganus*) in British Columbia

- Roadkill and population estimates in White Lake Basin
- Out of 1200-2000 rattlesnakes; 400-500/yr killed on roads
- Local extirpation in 100 years (likely less...)

# Are there snakes here?

- More probable than we thought...
- Without intensive surveys at the right time of year, cannot conclude snake absence
- Research says: they are present more than we think
  - E.g. Rattlesnake Populations:
    - Maida 2018 estimated 260-433 in 4.5 km<sup>2</sup> in Osoyoos
    - 1200-2000 in White Lake Basin (Winton 2018)

# In Sum:



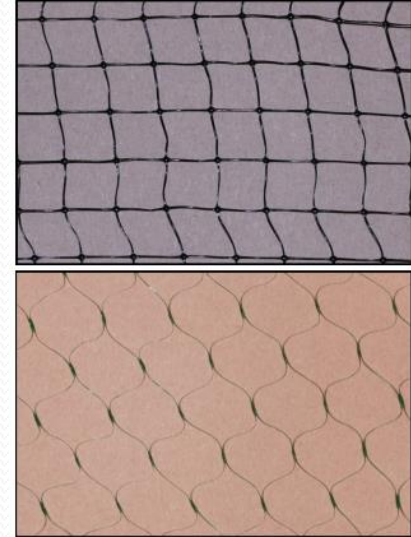
- other habitat is important, not just dens
- disturbed/degraded areas can still provide important habitat
- forest snakes!
- soft road edges as egg-laying sites
- work windows for gravid females and eggs in soils (June-Aug?)
- consider roads and traffic increases

# Conclusion: Don't forget the snakes!

- Often not being considered in environmental assessments
- More prevalent and widespread than we thought
  - Travel farther
  - Broader and more varied habitat
  - Consider what is adjacent to development
    - E.g. if a WHA there, value of edge habitat is important
    - i.e. buffer, because snakes WILL be present on property

# Netting kills snakes

- DON'T: use fine, flexible stranded, mesh size 1-3cm
- DO:
  - Use thicker material, mesh at least 5cm or less than 0.5cm
  - Keep mesh taut
  - Keep off the ground
  - Store where snakes can't access it (e.g. not in shed)



ARC 2014

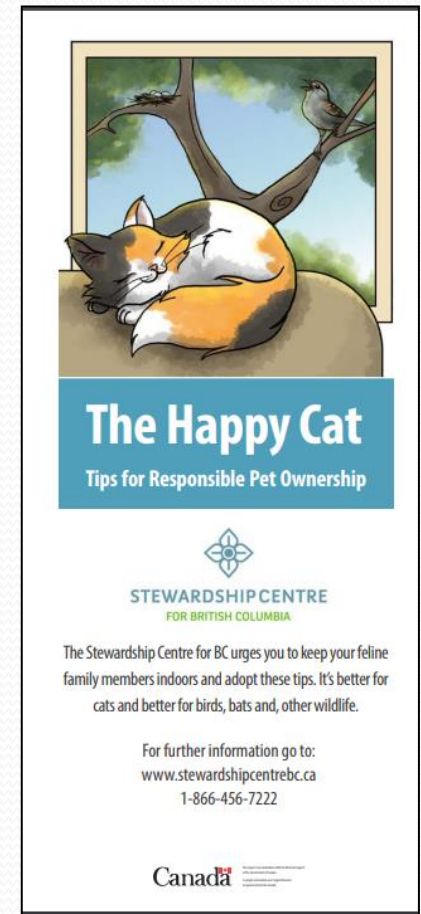


Patricia Hammell Kashtock

# Cats kill snakes and amphibians

- Cats kill small snakes
- Happy Cat brochure from Stewardship Centre for BC about importance of keeping cats indoors:

[https://www.stewardshipcentrebc.ca/PDF\\_docs/CatsBirds/HappyCatBrochure2017.pdf](https://www.stewardshipcentrebc.ca/PDF_docs/CatsBirds/HappyCatBrochure2017.pdf)



# Stewardship

- <http://www.okanagansimilkameenstewardship.ca/p/caring-for-your-space.html>



## Living in Nature Series

### Snake Smart

**In the past, people have indiscriminately killed snakes out of fear or for safety concerns. Government and the public have recognized that snakes are an important part of the natural environment and require protection. The BC Wildlife Act now makes it illegal to capture, harass or kill snakes.**



*The Northern Pacific Rattlesnake (Crotalus) is a timid and elusive animal that avoids conflict whenever possible.*

**In BC, only the Northern Pacific Rattlesnake poses any threat to humans; however, this can be avoided with due care...**

*Who are the Snakes in Your Neighborhood?*

Ten kinds of snakes occur in BC. Seven of these live in the southern interior (see table listing snake species on page 2). The other three are coastal species: the Northwestern Garter Snake, the Pacific Gopher Snake, and the Sharp-tailed Snake.

Whether you are hiking in the hills, working outside, or playing in the dry Southern Interior of BC, snake encounters can be common. It is important to be able to distinguish between different kinds of snakes and to react appropriately. Knowledge of snake biology and behaviour will help you to comfortably co-exist with these misunderstood reptiles.



*Although the Gopher Snake is not venomous, it can be a concerning member of the family. Note that it has a more narrow head than different coloration compared to the rest.*

**Why are Snakes Important?**

Snakes have played a key role in the environment for millions of years. Snakes are important in the continuous cycling of nutrients and help to maintain the interdependence between species. Significant predators of rodents such as mice, voles and pocket gophers. Snakes are important prey for other predators, such as birds of prey, badgers and bears. If their population is threatened, they could face extinction and be gone from this area forever. People who opportunity to better understand snakes find them fascinating animals.

## How to Snake-proof Your House and Yard

It is not unusual for residents of the southern Interior of BC to have the occasional encounter with a snake in their yard. For some, this is a thrilling experience; for others, it is a most unpleasant or dreaded encounter. People's reactions differ largely because of their level of understanding of snakes, early life experiences and/or what they were taught. Fear can be transferred to others, especially impressionable children. Learning about the habits and needs of snakes can help to alleviate fear.

In any event, snake encounters around your house and yard can be reduced with appropriate snake management techniques. These techniques, in combination with knowledge of the different species of snakes, their importance in the environment, and suitable behaviour in snake habitat, will help us co-exist with snakes.

*The Provincial Wildlife Act and the Federal Species at Risk Act prohibit the harassment, killing, or capturing of listed snakes.*



A home with snake exclusion fencing



## Living in Nature Series

### Snake Barrier Fencing

#### Unwanted Snakes

Most snake species in British Columbia are harmless. Even the venomous Northern Pacific Rattlesnake is a timid creature unless threatened. Nonetheless, many people feel uncomfortable about sharing their workspace or yards with snakes. Furthermore, snakes can be at risk from human activities, as they are often killed by traffic, agricultural activities, and domestic pets.

Snake barrier fencing is one management tool for improving public and worker safety, as well as reducing risks that snakes face in agricultural properties. This factsheet provides basic information about planning and installing snake barrier fencing, as well as associated safety and environmental concerns.



*The Northern Pacific Rattlesnake (Crotalus) is the only venomous snake in the area. It is similar in appearance to the non-venomous Gopher (Bull) Snake.*

#### Fence Layout

The layout of the fence needs to be carefully thought out to ensure that the fencing is effective and cost-efficient. Fences can either deflect snakes away from a property (drift fences) or enclose a property or workspace (exclusion fencing). Care should be taken not to block the main migration corridors for other small animals.

Drift fencing can be effective if one knows the migration patterns of snakes as they move to and from the dens where they hibernate in the winter (hibernacula). A snake biologist can help identify likely movement patterns.

The best fence layout should be determined based on terrain, erosion potential, soil types, migration corridors, and the needs of the landowner. The prototype fencing at Tinhorn Creek Vineyards was designed to deflect snakes away from the vineyard and onto adjacent natural lands. It is also intended to prevent snakes from entering public roads and the irrigation canal.



*The snake fence, depicted in red, deflects snakes as they travel downwind to the vineyard on the west, and contains them on the east from entering other agricultural areas and roadways.*



## Living in Nature Series

## Working in Snake Country

A guide for agricultural workers

Snakes are generally unwanted in agricultural settings because they are disliked or feared, even though they do not damage crops and rarely impact livestock. This attitude has been a large factor in the significant declines in snake populations worldwide. Snakes play an important role in the environment, being major predators of rodents and, in turn, providing food for other predators, higher up the food chain. Each species of snake fills its own specific niche.

There are seven species of snakes in the southern interior of British Columbia. Many of these snake species are encountered in agricultural areas, especially where there are rocky terrain. As in other places in the world, snakes are often perceived as threats, and in some cases their lives are not valued.

Although snakes can greatly reduce rodent populations that damage crops, they may affect agricultural productivity by disrupting work. This is especially true of the Northern Pacific Rattlesnake that is venomous and can be a safety concern. Because many people are unfamiliar with the different snake species, they may not be able to distinguish rattlesnakes from harmless snakes. Methods to deal with the situation often include killing the snake to provide a safer working environment. Non-lethal management of snakes is required to reduce continuing declines in their populations, yet provide a safe work place.



*A harmless Gopher (Bull) Snake caught in bird netting in a garden.*

*A Northern Pacific Rattlesnake in a defensive posture.*



*Photo by M. L. Lavelle*

*The Wildlife Act prohibits the harassment, killing, or capturing of snakes, unless it is to protect human life, domestic animals, or property. The ease of relocating a snake makes it unnecessary to take severe measures.*

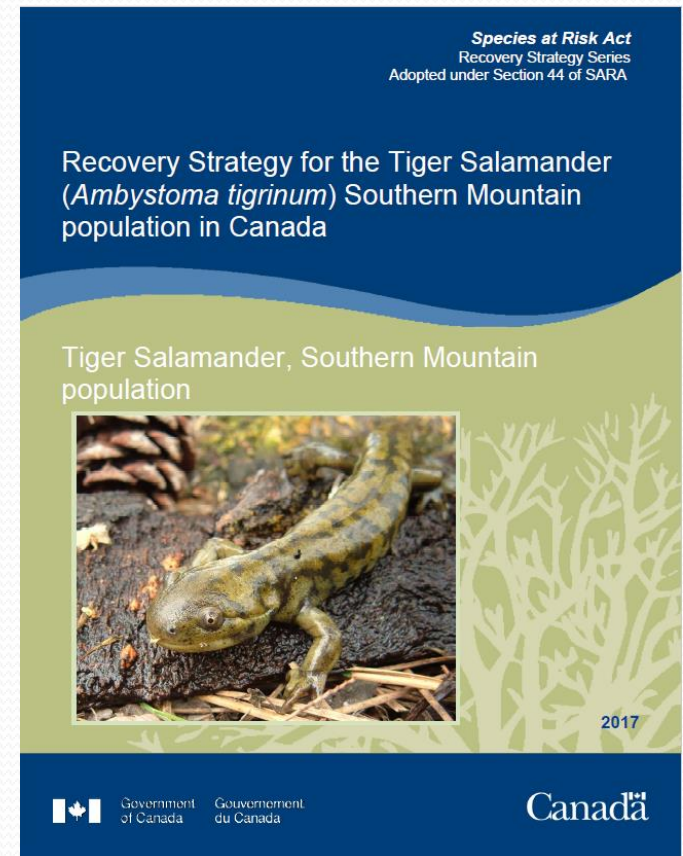
# Amphibians

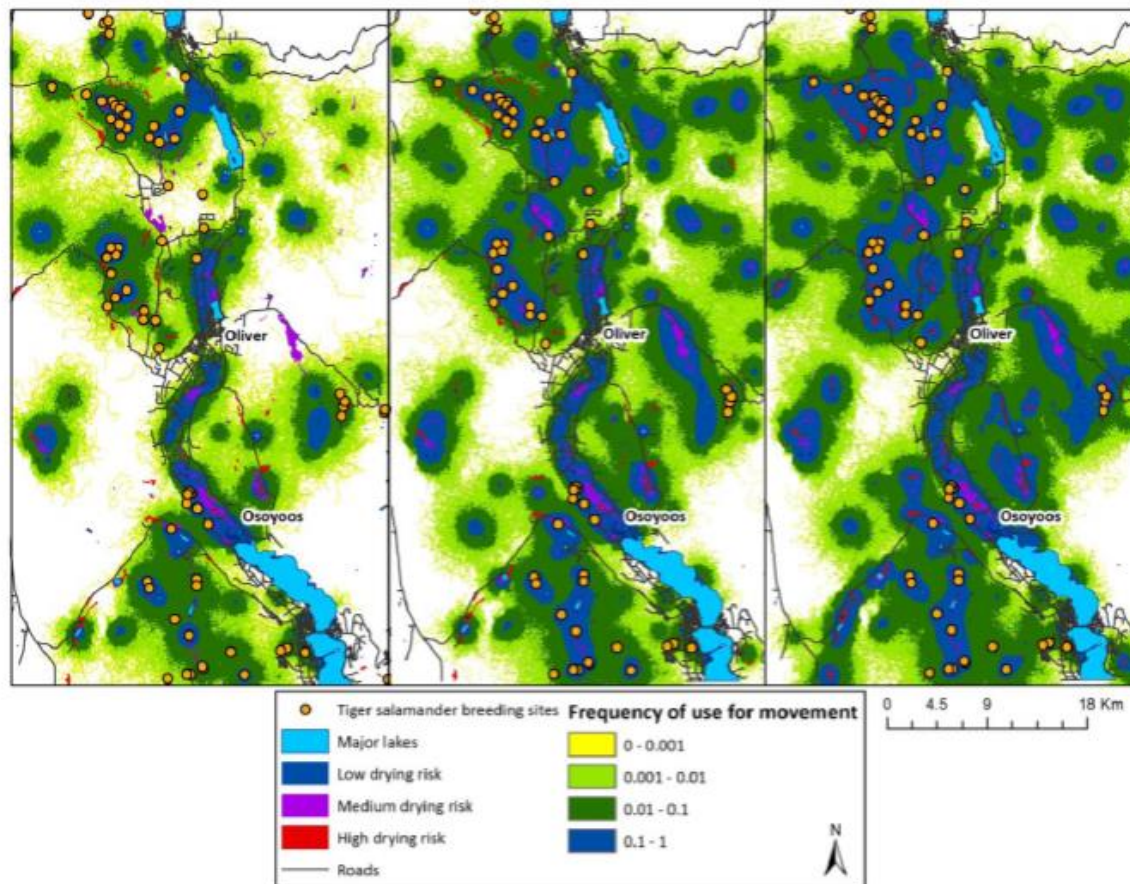


- Blotched Tiger Salamander
- Great Basin Spadefoot

# TIGER SALAMANDER (SARA ENDANGERED)

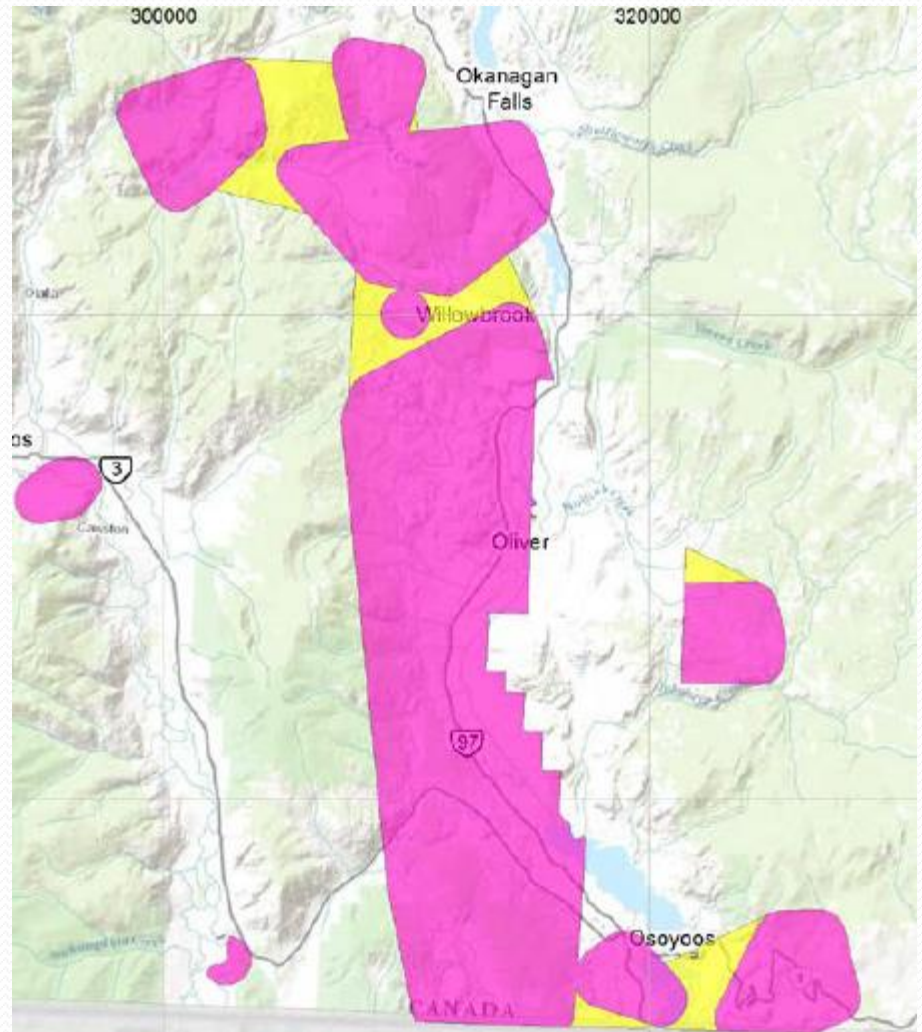
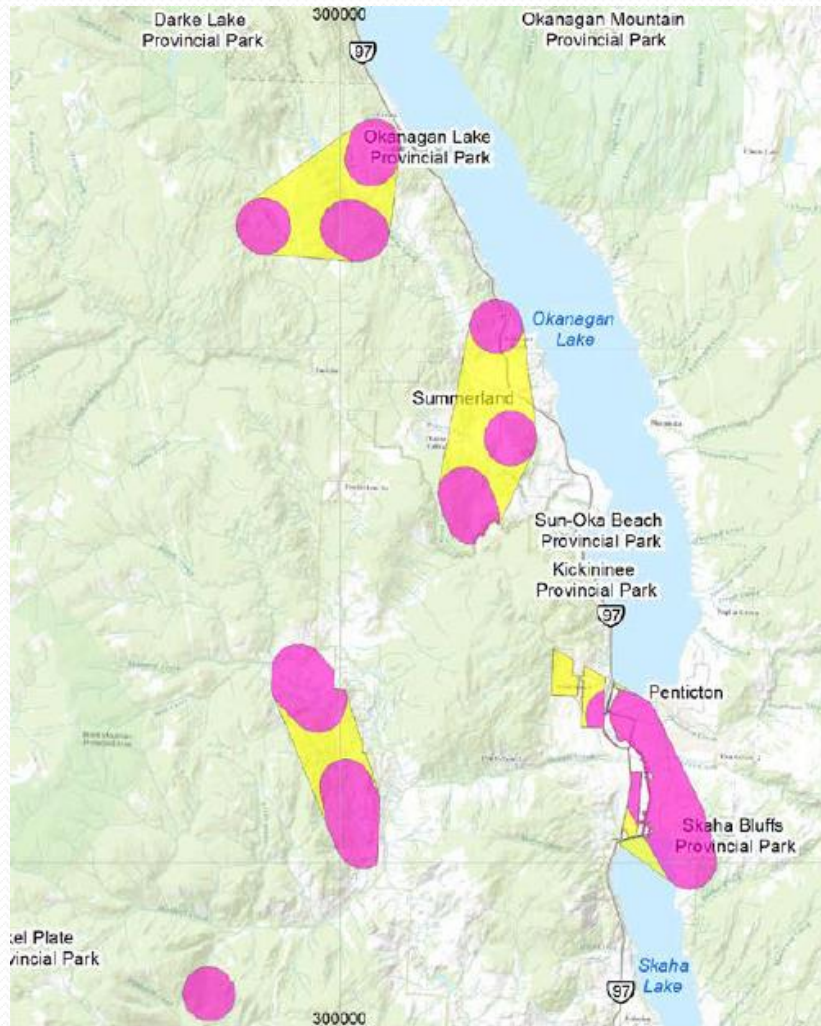
- Critical Habitat is identified
- Movement distance
- Long distance dispersal
- Disturbed habitat is used
- Pocket Gophers/ other rodents
- Roads
- Importance of connectivity, especially with climate change





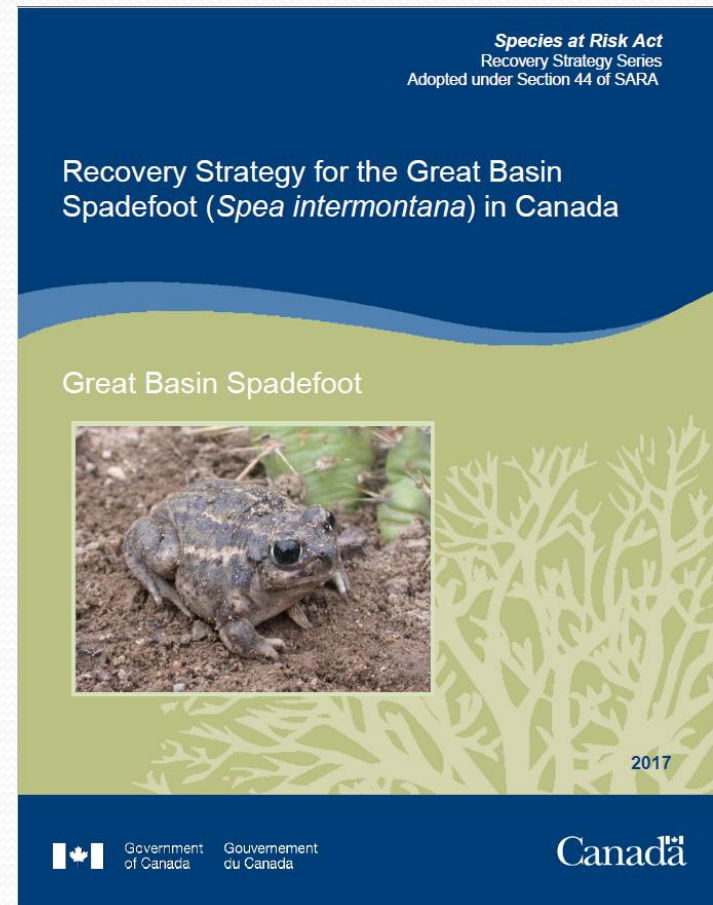
Allen 2016  
 Figure 3.6 Frequency of use for movement by tiger salamanders in a simulated dry year (left panel), average year (middle panel), and wet year (right panel). The simulated dry year only considered wetlands that were identified as having a low risk of drying (always contain water); the average year considered wetlands that have a low and medium risk of drying (always or sometimes contain water); and the wet year considers all wetlands on the landscape. Data and Cartography by C. Allen. Data sources: BC Ministry of Forests, Lands and Natural Resource Operations, RDCO/Ecoscape Consultants Ltd., BC Geographic Warehouse. Map compiled in ESRI ArcMap 10.2.

# Tiger Salamander Critical Habitat



# GREAT BASIN SPADEFOOT (SARA THREATENED)

- Critical Habitat is identified
- Movement distance
- Long distance dispersal
- Disturbed habitat is used
- Pocket Gophers/ other rodents
- Roads
- Importance of connectivity, especially with climate change



# Mitigation

- New provincial Best Management Practices document for herpetiles and roads is coming :

## **Best Management Practises to Assess, Prevent, and Mitigate the Effects of Roads on Amphibians and Reptiles in British Columbia**



# Wildlife underpasses

- As open (high and wide) as possible--at least 0.5m high
- Open topped/skylighted/grated if possible
- Must be fenced to be effective

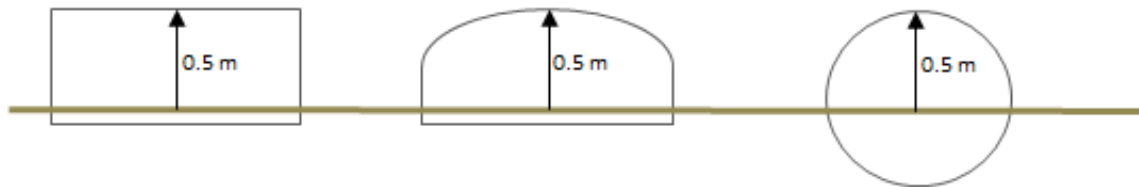


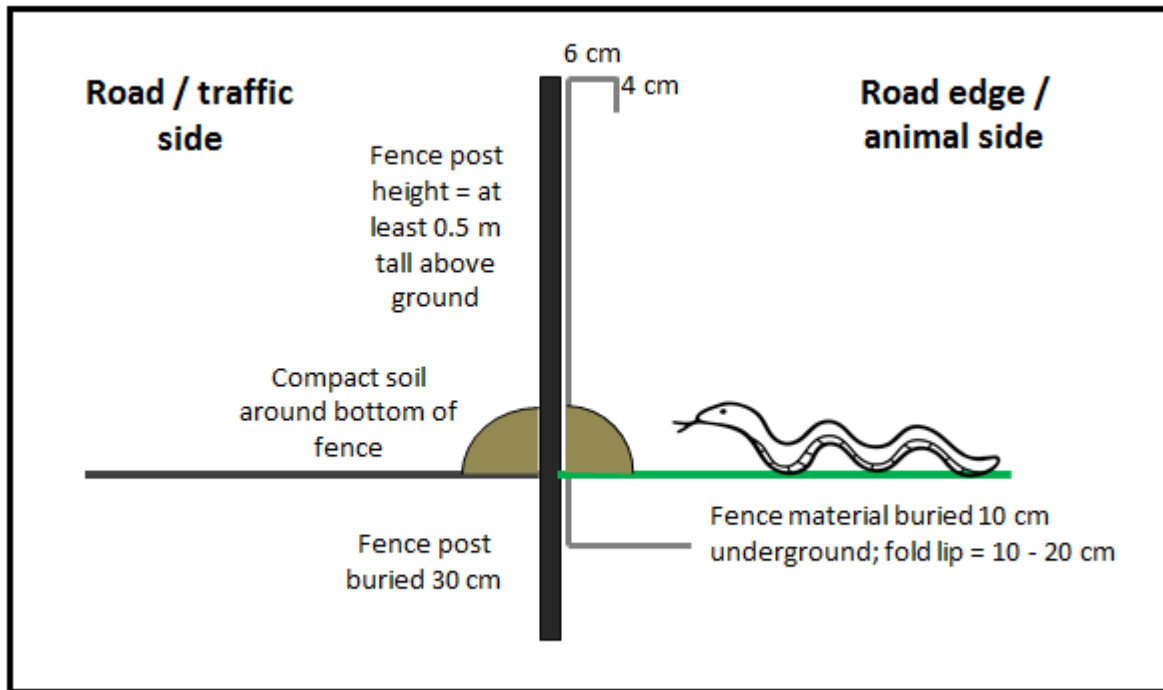
Figure 4. Box, arch, and round tunnels buried into the ground and providing an interior height of at least 0.5 m are recommended for ease of movement of amphibians and reptiles under roadways. Interior width will vary with the tunnel design and species (Section 4.3.5).

# Underpass fencing

- Opaque fence best for snakes and turtles
  - i.e. wire mesh (hardware cloth) not recommended
- Geotextile (landscape or silt cloth) not recommended for long-term use
- Design varies by species group, e.g.:

Species Group	Recommended depth of buried fence, excluding bottom lip (10 - 20 cm; see Fig. 6)	Recommended height of fence, excluding top lip (6 cm + 4 cm; see Fig. 6)
Turtles	10 - 20 cm	60 cm
Frogs and Toads	10 - 20 cm	50 cm
Snakes	10 - 20 cm	100 cm
Lizards	10 - 20 cm	unknown
Salamanders	10 - 20 cm	30 cm

# Underpass fencing



- As open (high and wide) as possible-  
-at least 0.5m high
- open topped/sky-lighted/grated if possible
- Must be fenced to be effective

Design of fencing to exclude amphibians from roadways and / or to guide them towards tunnels.

# More on mitigation:

- **Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia**  
([https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/standards-guidelines/best-management-practices/herptilebmp\\_complete.pdf](https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/standards-guidelines/best-management-practices/herptilebmp_complete.pdf)),
- **Best Management Practices for Amphibian and Reptile Salvages in British Columbia**  
(<http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10351>)

# References

- Maida, Jared & Kirk, David & McKibbin, Owain & R. Row, Jeffrey & Larsen, Karl & Stringam, Charlotte & Bishop, Christine. (2018). Population Estimate, Survivorship, and Generation Time of the Northern Pacific Rattlesnake (*Crotalus o. oregonus*) at its Northern-most Range Limits. *Herpetological Conservation and Biology*. 13. 662-672.  
[https://www.researchgate.net/publication/329715087\\_Population\\_Estimate\\_Survivorship\\_and\\_Generation\\_Time\\_of\\_the\\_Northern\\_Pacific\\_Rattlesnake\\_Crotalus\\_o\\_oregonus\\_at\\_its\\_Northern-most\\_Range\\_Limits](https://www.researchgate.net/publication/329715087_Population_Estimate_Survivorship_and_Generation_Time_of_the_Northern_Pacific_Rattlesnake_Crotalus_o_oregonus_at_its_Northern-most_Range_Limits)
- Recovery Strategy for the Western Rattlesnake (*Crotalus oregonus*), the Great Basin Gophersnake (*Pituophis catenifer deserticola*) and the Desert Nightsnake (*Hypsiglena chlorophaea*) in Canada 2017 <https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=B6D9C7DE-1&offset=3&toc=show>
- Winton, S. 2018. Impacts of road mortality on the Western Rattlesnake (*Crotalus oregonus*) in British Columbia. Thesis. Thompson Rivers University
- Snakes and garden netting (2014) Amphibian and Reptile Conservation, UK.
- [https://www.unine.ch/files/live/sites/karch/files/Doc\\_a\\_telecharger/Foerderung\\_Amphibien\\_Reptilien/Snakes\\_garden\\_netting\\_\(Final\\_050814\).pdf](https://www.unine.ch/files/live/sites/karch/files/Doc_a_telecharger/Foerderung_Amphibien_Reptilien/Snakes_garden_netting_(Final_050814).pdf)
- Tiger Salamander Recovery Strategy: [https://www.registrelep-sararegistry.gc.ca/virtual\\_sara/files/plans/rs\\_tiger\\_salamander\\_smp\\_e\\_final.pdf](https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_tiger_salamander_smp_e_final.pdf)
- Allen 2016 Tiger Salamander Connectivity: <https://open.library.ubc.ca/cIRcle/collections/ubctheses/24/items/1.0340008>
- Spadefoot Recovery Strategy: [https://www.registrelep-sararegistry.gc.ca/virtual\\_sara/files/plans/rs\\_great\\_basin\\_spadefoot\\_e\\_final.pdf](https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_great_basin_spadefoot_e_final.pdf)

# Thank You!

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