

Thurston County Amphibian Migrations and Road Surveys

Fall 2017 – Winter 2018 Stream Team Protocols



This is a working document to support volunteers engaging in the Thurston County and City of Olympia Stream Team(s) Amphibian Migrations and Roads surveys.

Please contact Michelle Stevie, City of Olympia Stream Team for additional information.
Email: mstevie@ci.olympia.wa.us.

Front cover: Migrating amphibians; top left – Pacific Treefrog; top right - Rough-skinned Newt juvenile; Photos *J. Schuett-Hames*. Bottom – Northwest Salamander adult; Photo *B. Blessing-Earle*.

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Thurston County Amphibian Migrations and Road Surveys: Fall 2017 to Winter 2018 Stream Team Protocols

Introduction

Many pond-breeding amphibians (frogs, toads, salamanders, and newts) in Thurston County migrate seasonally between upland forested habitats and ponds where they breed. During migrations they often need to cross roads where they risk being run over by vehicles. Where traffic levels are increasing over time, amphibians and their populations are at a greater risk of being impacted.

In response to citizen reports of large numbers of amphibians found dead on roads in Thurston County, a public-private partnership was formed in 2013 to work in support of safe crossings for amphibians. This partnership “The Thurston County Amphibian Migrations and Roads Collaboration” includes representatives of Thurston County, City of Olympia and Thurston County Stream Teams, Washington Department of Fish and Wildlife, Washington Department of Ecology, independent researchers, and citizens.

The focus is to identify locations where native amphibians are crossing roads where they are vulnerable to vehicle mortality. Areas with sensitive or listed amphibians or high species diversity and abundance are of highest priority. Uses for this information include supporting safe crossing measures, and long-range planning and project review.

Stream Team volunteers are important to this effort.

For 2017-18 we are introducing a new survey app developed by WDFW. Please see “Obtaining and Using the Survey App” for specifics.

Safety While Walking and Surveying the Roads

Your safety is the top priority. To safely conduct these survey follow these guidelines:

- 1. Be aware of traffic at all times and plan an escape route.**
- 2. Reflective clothing, retro-reflective class 2 fluorescent orange vests, and a reflective leg strap must be worn at all times. When working in low light conditions ANSI III garments must be worn.** These are available from Stream Team and local sports stores.

Other safety notes:

- Move far away from the road when a car or other vehicles are passing.
- Typically surveys should be done with two persons, with both watching for traffic.
- Walk along the road shoulder, viewing the half of the road you are closest to. If you see an amphibian on the road, stop and make sure conditions are safe (i.e., no traffic) before going onto the road. If the animal is dead, pick it up and bring it off the road for identification and data collection.

Schedule, Signing Up for Surveys, and Where to Meet

Please refer to the Stream Team website

(<http://www.streamteam.info/getinvolved/calendar/>) for schedule updates and to sign up for surveys. Surveys are expected to take between one to two hours. We heartily encourage your participation; one survey per week is optimum, or at least one survey per month across the October through February/March migration interval.

Cold weather note: surveys will be cancelled if there is snow, or if temperatures are 40° F. or below.

Kaiser and Overhulse Roads Survey Area: Weekend Early Morning Walking Surveys

Meeting Location – WSU Thurston County Extension Office: 5033 Harrison Ave. NW, Olympia (old fire station). This is across from Overhulse Road; we'll meet, organize, and then travel to unit starting locations.

Survey Lead – Joanne Schuett-Hames. We seek additional persons to assist with leading on the scheduled dates, and to add additional survey dates. (Contact Joanne (joanne.schuett_hames@icloud.com) if you would like to assist with leading surveys.)

Dates & Meet Time –

October 14, 28, 2017 (*Saturday*): Meet time 7:15 AM

November 4, 18, 2017 (*Saturday*): Meet time 7:15 AM

December 2, 2017 (*Saturday*): Meet time 7:45 AM

January 27, 2018 (*Saturday*): Meet time 7:45 AM

February 10, 24, 2018 (*Saturday*): Meet time 7:15 AM

Champion Road Survey Area: Night Walking Surveys

Meeting Location – Texaco Station, Case Road and 113th Avenue. We'll meet and then travel to the Champion Drive survey location.

Survey Lead – Bonnie Blessing-Earle.

Dates & Meet Time –

October 18, 2017 (*Wednesday*): Meet time 7:30 PM

November 1, 15, 2017 (*Wednesday*): Meet time 7:30 PM

December 6, 2017 (*Wednesday*): Meet time 7:30 PM

January 3, 17, 2018 (*Wednesday*): Meet time 7:30 PM

February 7, 21, 2018 (*Wednesday*): Meet time 7:30 PM

March 7, 21, 2018 (*Wednesday*): Meet time 7:30 PM

Obtaining and Using the Survey App

- The first step is to visit the Washington Department of Fish and Wildlife website: wdfw.wa.gov/pics/
- “Join” the Thurston County Amphibian Road Survey”
- Then, “Join Selected Groups”
- This will bring you to a web page where you can create an ArcGIS Online account for WDFW surveys. Click “Sign Up”.
- Next, enter your email address and click on Send Invitation.
- You’ll receive an invitation email from “ArcGIS Notification” within a few minutes. In this email, click on the “Sign Up” link to proceed.
- Fill out all the fields on the form that comes up, and click on “Submit”.
- Next, click on “Login”.
- Enter your user name and password for the account you just created, and click “Sign In.
- You are just about there...Now you’ll see the screen where you joined earlier, and you’ll click “Join”.
- For the amphibian and roads survey, you’ll use the password “lemongrass”.
- Finally, go to the Android Playstore or iTunes and obtain a free download of the Survey123 app.
- When you start up the app, you’ll sign in with your ArcGIS Online account credentials, and the amphibian survey will download.
- You are ready to survey!

General Survey Approach

Determine Area to Survey

- See Appendix A of this document for maps and aerial imagery of the established survey areas.
- Sign up for a survey area through the [Stream Team website](http://www.streamteam.info) (www.streamteam.info). Survey areas are divided into units. You may sign up for multiple sites and dates.
- Supplemental Survey Areas.
 - If you have identified a location you would like to survey that is not already in this document, email a brief description of what you have observed, why this area should be surveyed, and a map indicating the survey route to Michelle Stevie (mstevie@ci.olympia.wa.us).
 - Please refer to the protocols in this document, and survey on a regular schedule between October and February.
 - Data from supplemental survey areas will become part of the Amphibian Migrations and Roads Database and will help inform future priorities.

Survey Level: Basic vs. Advanced Surveys

Species identification and location is the primary focus for basic-level surveys. More experienced surveyors also gather data to help us understand: when females, males, or juveniles might be moving; direction of movement for live animals (which helps identify

the breeding areas); and other elements such as whether the migratory movement might be before or after breeding. Participants are encouraged to contribute data at either level. The Amphibian Migrations and Roads Survey App is designed to indicate advanced-level data as “optional”.

Logistics/Equipment for Day of Survey

- If you are working as a group, meet at the designated start time and location for your area, and determine which unit you'll be surveying.
- At least one person will need to bring a smart phone with the survey app installed, and survey sheets on rite-in-the rain paper as backup. Appendix B includes a survey form that can be used for hard copy data collection.
- Bring reflective clothing for safety (see page 1, safety procedures must be followed), and be prepared for wet and chilly weather conditions.
- Bring a moist towel or towelettes to clean hands after handling amphibians.
- If surveys are during dark conditions, bring a headlamp and flashlight/spotlight.
- Appendix C provides USGS protocols for safely handling amphibians.
- Fill out a Stream Team waiver for the amphibian migration and roads surveys. This will provide you with L&I accident coverage.

At the Unit

- Put on safety gear (i.e., reflective vest and leg strap).
- Be aware of traffic at all times.
- Walk the full unit length, typically as follows: first walk along the shoulder of one side of the road, and then return to the starting point by walking along the shoulder of the opposite side.
- As you walk, observe the half of the road closest to you for live or dead amphibians.
- When you observe an amphibian(s), if it is safe to do so:
 - Remove dead amphibians from the road as this prevents recounting, and,
 - If you observe a live amphibian moving across the road, pick the animal up and move it to the side of the road it was moving towards.
- For dead amphibians, determine if the animal is largely intact or identifiable, and appears to be a recent (~<24hrs) mortality. If so, include this animal in the survey as a recent mortality.
- Pointers regarding dead amphibians to help determine which ones should be included:
 - If the animal appears very similar to a live animal, this observation will be included.
 - If the animal's condition is such that it has most legs, feet, torso, head, and tail in one piece, or two pieces that clearly came from the same animal, this can be considered largely intact.
 - To be a recent mortality, the skin should still appear fresh, and not be desiccated or appearing to be older than 24 hours. Just make your best guess at this; over time you'll become more comfortable making this call.
 - The animal is likely to be squashed, and therefore while the skin and limbs may be evident, in some cases much of the internal soft organs may not be present.

- It is not required to include older mortalities. However, if you would like to include observations of dead “not fresh” amphibians, you may do so. In the survey question regarding if it is a recent mortality, answer “No”.

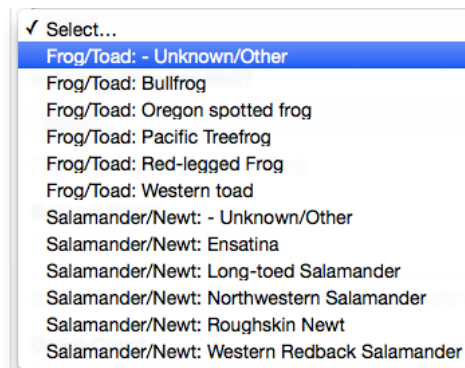
Starting the Survey

- Access the smart phone survey app.
- Fill in the “SURVEY HEADER” as follows:
 - Survey Area.
 - Your initials, and those of other participants.
 - Affiliation.
 - Route Type.
 - Survey Date.
 - Start Time.
 - Notes: this can be used to indicate a survey area different than those in the drop down menu, or other information and observations you would like to share.

Amphibian Observations

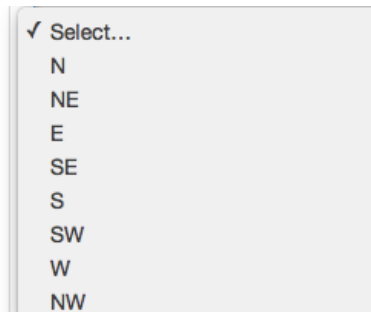
You’ll enter each observation into the “AMPHIBIAN OBSERVATION” portion of the app as follows:

- OBSERVATION LOCATION. Push the icon in the red location box, to access and record the GPS location for your observation.
- LOCATION ACCURACY LEVEL. Choose 0 to 50 yards (unless you know it to be less accurate). Most phone GPS readings will be very close.
- SPECIES. Select the name of the species, or “unknown”. If unknown, please take a photo (*see “Attach a Photo” below*). Appendix D provides a list of Thurston County amphibians, and highlights those most likely to be encountered. Appendix E provides identification information for species, gender, and life stage.



- IS THE ANIMAL ALIVE AND WELL? Choose: “yes” if alive, or “no” if dead.
- If dead, a second drop-down will open. IS THIS A RECENT MORTALITY? Choose: “yes” if ~<24 hrs, or “no” if older than ~1 day.
- SPECIES NOTES. Enter notes and any questions you have, e.g., about the species identification.

- COUNT. This will typically be one. However, if you are encountering large numbers of animals, use this category to indicate the number of amphibians of the same species and condition (i.e., alive or dead), within 25 ft.
- COUNT ACCURACY LEVEL. Go to drop down. Likely this will be “exact”, but there may be situations where this isn’t the case.
- SEX (Gender). Optional. Go to drop down menu. Choose: female, male, unknown, or both.
- LIFE STAGE. Optional. Go to drop down menu. Choose: juvenile, sub-adult, adult, or unknown/other.
- ANIMAL TRAVEL DIRECTION (from). Optional. Go to drop down menu. Only for live animals. What direction did the animal travel from?



- NOTES. Optional. Use to convey additional information.
- SNOUT TO VENT LENGTH (mm). Optional.
- TAIL LENGTH (mm). Optional.
- VOUCHER ID. Optional.
- ATTACH A PHOTO. Optional. This is an opportunity to attach a photo of the amphibian. When you click on the link, you’ll be provided the option of taking a photo or attaching a photo. This can be especially useful where you’d like assistance with, or confirmation of species identification.

This completes the observation. Press the “+” button on the bottom to be ready for the next observation entry.

Ending the Survey

When you’ve completed the survey, go back up to the “SURVEY HEADER”. Enter a “SURVEY END TIME” and any final notes in the “SURVEY AREA NOTES”.

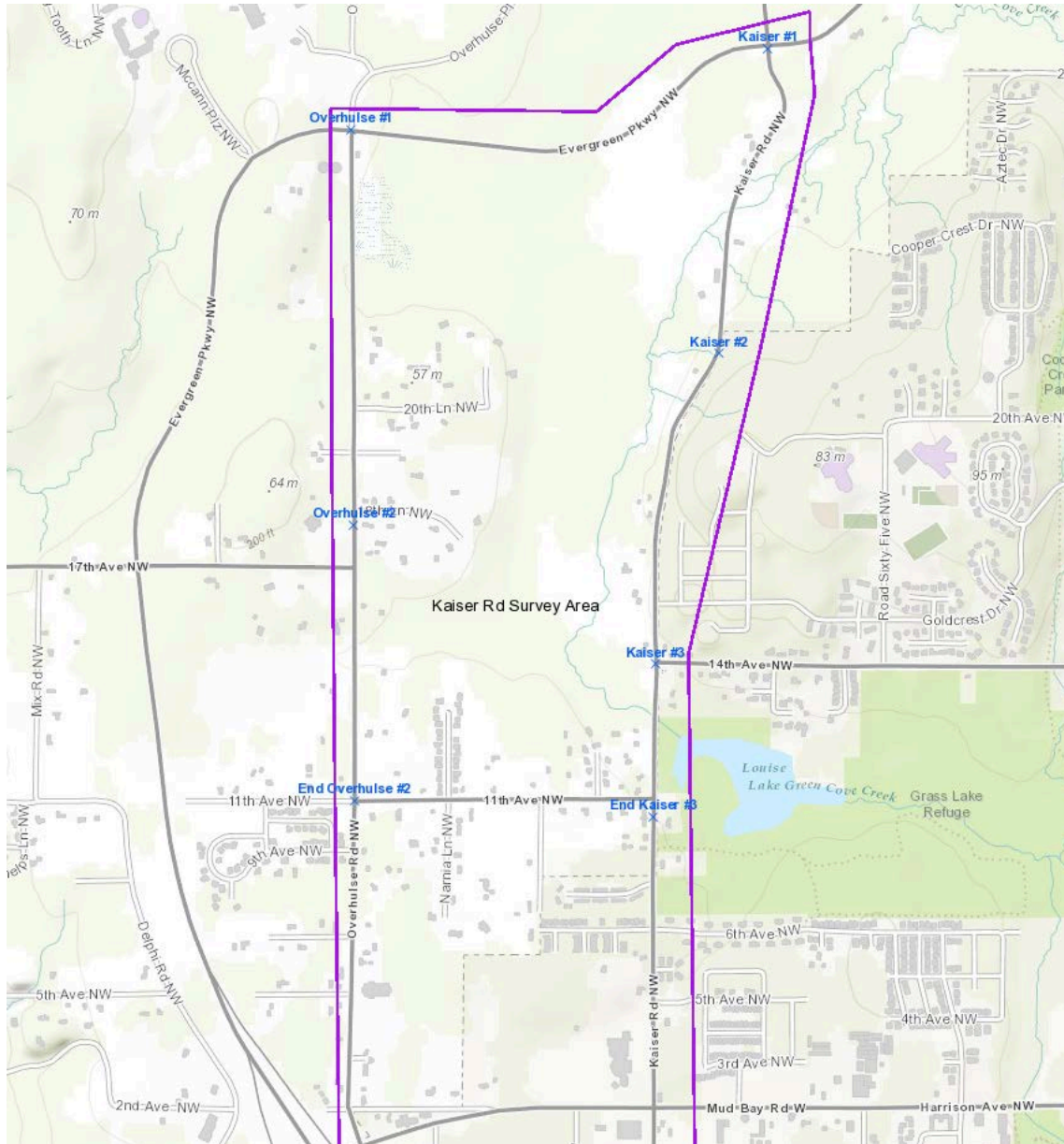
Then, press the  icon at the bottom right of the app to submit your entry. Here you’ll see a note indicating the survey is complete and has been submitted. If you are offline, you’ll see that the survey has been saved in the outbox. If this is the case, when you have a wifi connection, you’ll open the app, and send your survey from the outbox.

For hard copy data: within 1 – 2 days if possible, please enter your data into the survey app from your computer. The entry steps are the same as above.

Appendix A. Survey Areas Unit Maps and Aerial Imagery

Kaiser and Overhulse Roads Survey Area

There are three survey units on Kaiser Road and two on Overhulse Road. Parking is as follows: for Kaiser #1 and #2 there are large pull-off areas along the road; for Kaiser #3 park at Grass Lake Park entrance (814 Kaiser Rd NW) or along Kaiser Road if needed; for Overhulse #1 and #2 park at St. Michael's Church (1835 Overhulse Rd). Note: Kaiser Unit #1 ends at Kaiser Unit #2, etc.



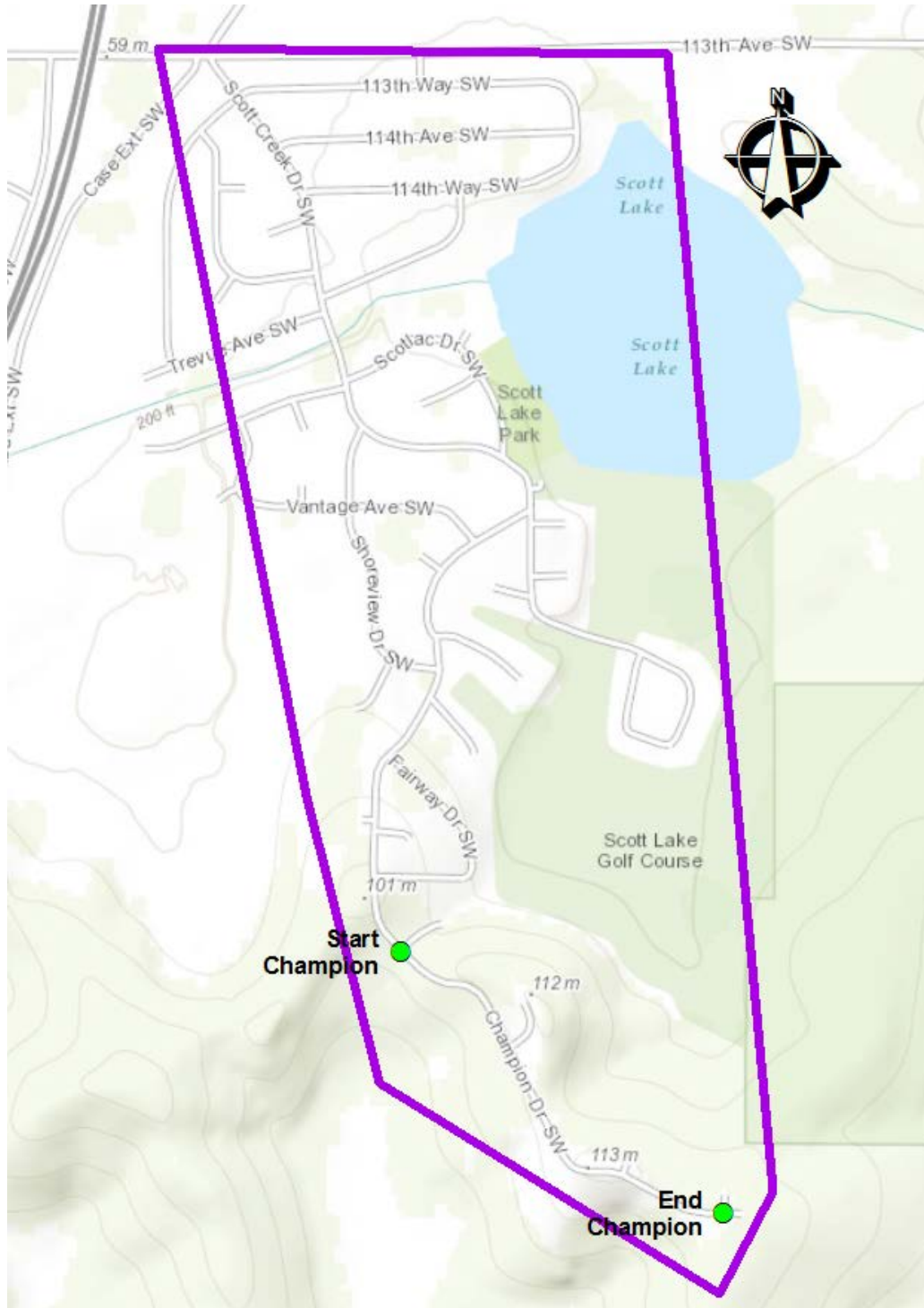
Kaiser and Overhulse Roads Survey Area – Aerial Images



Overhulse Unit #1	Overhulse Unit #2
	

Champion Drive Survey Area

There is one survey unit on Champion Drive. Parking is available on the small side street at the survey start point.

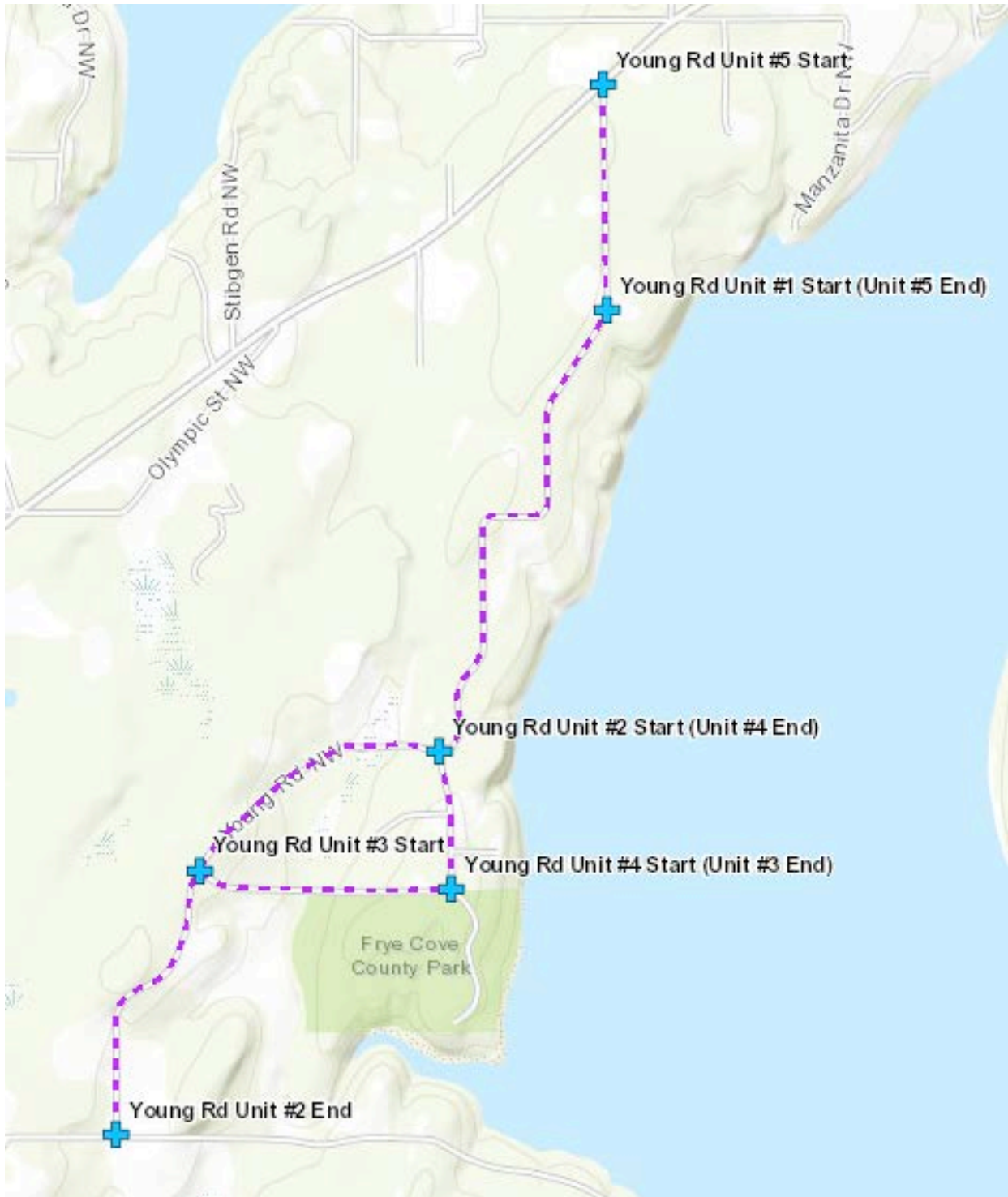


Champion Drive Survey Area – Aerial Imagery



Young Road Survey Area

There are two primary survey units on Young Road (units 1 & 2), and three supplementary units on or intersecting Young Road (units 3, 4, & 5).



Young Road Survey Area – Aerial Imagery



Appendix B. Amphibian Migrations and Roads Hard Copy Data Sheet

Enter data on this sheet using the web form protocols. Document amphibian locations on a survey area map, or as a GPS reading.
After surveying please enter your data into the web form at: <http://arcg.is/1LCwISL>. (Or send to Michelle Stevie by mail at 601 E 4th Ave Olympia 98501; drop off at City Hall; or scan/email to mstevie@ci.olympia.wa.us.)

Survey area:			Survey unit:		Was full unit surveyed? (Y or N)	
Observer name(s)			Survey date:		Start time:	End time:
Observation #	Species	Count	Alive? (Y or N)	Species notes	GPS location (WGS 84 NAD 83 Decimal Degree) (or hard copy map location)	Photo (Y (#)/ N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

Appendix C. USGS Procedures: Restraint and Handling of Live Amphibians

STANDARD OPERATING PROCEDURE; ARMI SOP No. 100

Revised, 16 February 2001

I. PURPOSE: Provide guidelines for humane handling of amphibians so that injury and distress to the amphibian are minimized.

II. SCOPE: These guidelines apply to larvae and tadpoles, as well as adult frogs, toads, salamanders and neotenes. Because of their anatomically different and very delicate skin, tadpoles and larvae must be handled differently than post-metamorphic amphibians.

III. EQUIPMENT and SUPPLIES.

A. Standard capture equipment (seine nets, dip nets, minnow traps)

B. Clear plastic bags (half liter or full liter size)

IV. BACKGROUND: There are three main hazards associated with handling live amphibians: two to the amphibian and one to the handler. To amphibians, the main dangers of being handled are skin damage that could result in secondary skin infections, and bone and muscle injuries caused by struggling when being held. For the handler, the main danger comes from toxic skin secretions produced by some amphibians (in the USA, this is mostly newts and the introduced giant/marine toad).

Tadpoles and larvae have thin delicate skin that is very easily damaged by the slightest handling. The skin of larvae lacks keratin and has fewer cell layers than adult amphibian skin. Therefore, direct contact handling of tadpoles and larvae is to be avoided; instead, these amphibian stages are examined through clear flexible plastic bags containing water. Although the skin of adult (post- metamorphic) amphibians has keratin and is less delicate than larval skin, their skin is still much more delicate than the skin of reptiles, birds and mammals. Rough handling of adult amphibians can easily result in skin abrasions, small tears, punctures, erosions and ulcers; normally, minor skin wounds heal quickly, but if contaminants, sewage or high levels of microorganisms are present in the pond or other environment, then wound infections are possible.

Frogs and Toads. All amphibians can be expected to struggle following capture. For anurans, there is a danger that vigorous kicking with the hindlimbs can cause joint dislocations or a broken (fractured) back; broken backs are a well-documented and major problem in another species that moves by hopping---rabbits. Therefore, proper restraint of anurans, first and foremost involves inhibiting their ability to kick.

Salamanders. For salamanders, there are three major dangers associated with handling: 1) loss (automizing) of the tail, 2) damage to the very delicate external gills (in neotenes), and 3) back injury during whip-like thrashing movements.

V. METHODS OF PHYSICAL RESTRAINT:

A. Anurans. Medium and large size frogs and toads (those about 5 grams and larger) should be grasped around the waist with the hindlimbs fully extended. The animal should not be allowed to bend (flex) its hip and knee joints, since this would allow it to kick.

B. Caudates. Medium and large size salamanders (those about 5 grams and larger) should be grasped in the middle of the body between the forelimbs and hindlimbs. Larval and neotenic salamanders should never be grasped around the head or neck, because the gills can be easily damaged. Under no circumstances should salamanders be grasped by the tail or picked up by the tail.

C. Larvae. All larvae (including tadpoles) should be handled with nets or scoops. For examinations, the larvae should be placed in a clear plastic bag with a mild amount of water. Alternatively, larvae may be sedated with an anesthetic and examined in a dish or bowl of water. As much as possible, larvae should be examined only while they are in water. Larvae should not be grasped with bare hands.

VI. MISHAPS.

A. Skin wounds: If an amphibian suffers a skin wound during handling, it is recommended that the wound be sprayed with the over-the-counter product, Bactine® (See the SOP on Toe Clipping of Frogs and Toads, NWHC ACUC Protocol 2001-004). All other topical antiseptics and disinfectants (sprays and ointments) are CONTRAINDICATED in amphibians. If possible, the animal should then be released on land rather than into water, since the antiseptic spray would be quickly washed off in water.

B. Broken back: If a frog or toads suffers a broken back during capture or handling, it should be promptly euthanized. It would be inhumane to release such a crippled animal. An animal with a broken back will have serious damage to the spinal cord and should show almost immediate paralysis of the hindlimbs and tail. Recommended methods of humane euthanasia include (see NWHC ACUC Protocol 1999-009, Methods of Euthanasia):

1. Pithing
2. Overdosing in anesthetic solutions of MS222 or benzocaine
3. Application of a benzocaine-based topical ointment (as used by humans to relieve tooth-aches) to the top of the head and dorsum of the body.

C. Broken leg: If a major bone of a limb is broken during capture or handling, the animal should be euthanized or taken to a wildlife rehabilitation center or veterinarian for treatment. A broken leg bone typically is recognized as an abnormal bend in the leg where there is no joint; other signs of a broken leg bone are protrusion of a bone fragment through the skin, inability of the animal to move a limb or position a leg in its normal resting posture. After treatment, amphibians with broken bones might be given to a zoo or placed in a captive breeding program. Only if the injured amphibian is kept isolated from all other fish, amphibians and reptiles (eg, in a separate cage) during treatment, can it later be considered for release at the point of capture. Injuries to digits (toes and

fingers) generally are not life-threatening; if the skin of the injured toe also is wounded, then treatment with Bactine® prior to immediate release is acceptable. If a toe bone is broken and protruding through the skin, the affected toe may be amputated just proximal to the site of the fracture, the stump should be sprayed with Bactine®, and the animal may be released.

D. Automized tail: If a salamander automizes (detaches) its tail during capture or handling, the stump should be treated (sprayed) with Bactine®; the salamander can then be promptly released.

E. Crushing injuries to head and body. Amphibians that have serious injuries to skin, muscles and bones should be promptly euthanized. Crushing injuries that are limited to a limb or tail will require treatment at a wildlife rehabilitation center or a veterinary clinic; alternatively, the animal may be euthanized, but it would be inhumane to release a seriously injured amphibian.

F. Snout abrasions. Amphibians that are held in glass or clear plastic containers may jump head-first into the glass, or may rub their snout against the container in attempts to burrow out. If amphibians are held for more than an hour in a clear container (bottle, aquarium, etc), they should be examined for evidence of skin injury at the tip of the snout and elsewhere around the head prior to release. If abrasions are detected, they should be sprayed with Bactine® prior to release.

G. Toxic skin secretions. All amphibians have glands in their skin that secrete a vast number of chemicals; some of which are merely noxious and repellant-like, while others may cause skin or eye irritation, and some may actually kill. The poison-dart frogs of Central America are an example of a frog with toxic secretions that can kill a human. Among the native amphibians of the United States, the two amphibians of greatest concern are giant toads (also called cane toads, marine toads, aka toads; *Bufo marinus*) and western newts of the genus, *Taricha*.

Giant toads secrete a potent white mucoid substance from their parotid glands (large warts just behind the eyes) that affects the heart, but it is not absorbed through the intact human skin; however, the toxin is readily absorbed through the eyes and mouth. Hence, the best way to prevent poisoning is to carefully avoid rubbing the eyes or putting fingers in the mouth after handling a giant toad. If skin secretions of giant toads contact the eye or mouth, then flush promptly with generous amounts of clean fresh water or contact lens wetting solution, and then seek emergency care at a clinic or hospital if stinging or numbness of the eye or mouth develops.

Newts of the genus, *Taricha*, also secrete toxins from their skin; it is presumed that the entire body of these newts secretes toxins (newts and other salamanders do not have parotid glands). Their skin secretions are very irritating to the eyes and mouth. Temporary blindness (lasting about 24 hrs) has been reported by field biologists that handled newts and then rubbed their eyes. If sensations of blurred vision, or burning or stinging of the eyes occur after handling any genus or species of newt, wash the eyes with copious amounts of fresh clean water (or contact lens wetting solutions) and promptly seek medical care. Persons with newt skin secretions in their eyes are advised not to drive a vehicle or operate other dangerous or heavy equipment.

Finally, it is possible that other amphibian species in the USA besides giant toads and newts, could produce skin secretions that are irritants to the eyes. Furthermore, amphibians may carry some bacteria in their intestines and feces that are human pathogens, such as the bacteria, Salmonella and Leptospira. Hence, it is always best to practice good personal hygiene after handling any amphibian (namely, thoroughly wash your hands with soap and water).

VII. CITED LITERATURE:

1. MARTIN, D., and H. HONG. 1991. The use of Bactine® in the treatment of open wounds and other lesions in captive anurans. *Herpetol Rev* 22: 21.

Appendix D. Thurston County Amphibian Species List

Those species most likely to be found while surveying the Kaiser, Overhulse, Champion Drive, and Young roads are shaded in green.

Common and Scientific Name	Aquatic-breeding?	Native?	Conservation Status
Frogs and Toads			
Coastal Tailed Frog (<i>Ascaphus truei</i>)	Yes, stream	Yes	State Monitor
Western Toad (<i>Anaxyrus boreas</i>)	Yes, pond and stream	Yes	State Candidate
Pacific Treefrog (<i>Hyla regilla</i>)	Yes, pond	Yes	--
Red-legged Frog (<i>Rana aurora</i>)	Yes, pond	Yes	--
Bullfrog (<i>Rana catesbeiana</i>)	Yes, pond	No	--
Oregon Spotted Frog (<i>Rana pretiosa</i>)	Yes, pond	Yes	State Endangered, Federal Threatened
Salamanders			
Northwestern Salamander (<i>Ambystoma gracile</i>)	Yes, pond	Yes	--
Long-toed Salamander (<i>Ambystoma macrodactylum</i>)	Yes, pond	Yes	--
Coastal Giant Salamander (<i>Dicamptodon tenebrosus</i>)	Yes, pond and stream	Yes	--
Cascade Torrent Salamander (<i>Rhyacotriton cascadae</i>)	Yes, stream	Yes	--
Rough-skinned Newt (<i>Taricha granulosa</i>)	Yes, pond	Yes	--
Ensatina (<i>Ensatina eschscholtzii</i>)	No, terrestrial	Yes	--
Van Dyke's Salamander (<i>Plethodon vandykei</i>)	No, terrestrial	Yes	--
Western Red-backed Salamander (<i>Plethodon vehiculum</i>)	No, terrestrial	Yes	--

Appendix E. Identification: Species, Gender, Life Stage, and Movement Characteristics

There are field guide and web resources to assist with species identification, life history, and habitat information. Here are a few:

Corkran, C.C., and C.R. Thoms. 2006. *Amphibians of Oregon, Washington, and British Columbia; A Field Identification Guide*. Lone Pine Publishing. Renton, WA.

Jones, L.L.C., W.P. Leonard, and D.H. Olson (coordinating editors). 2005. *Amphibians of the Pacific Northwest*. Seattle Audubon Society, Seattle, WA.

Washington Herp Atlas: <http://www1.dnr.wa.gov/nhp/refdesk/herp/speciesmain.html>.

Burke Museum: <http://www.burkemuseum.org/herpetology/amphibians>.

This appendix does not replicate these resources. Instead, our intention is to focus on characteristics that may be most relevant in the context of amphibian migrations and road ecology. References for the information we've included are found at the end of this appendix.

We would like to improve this appendix over time. If you have photographs or specific details that would be useful to include please contact J. Schuett-Hames (joanne.schuett_hames@icloud.com).

Species information follows in this order:

Western Toad (*Anaxyrus boreas*),

Pacific Treefrog (*Hyla regilla*),

Red-legged Frog (*Rana aurora*),

Bullfrog (*Rana catesbeiana*),

Northwestern Salamander (*Ambystoma gracile*),

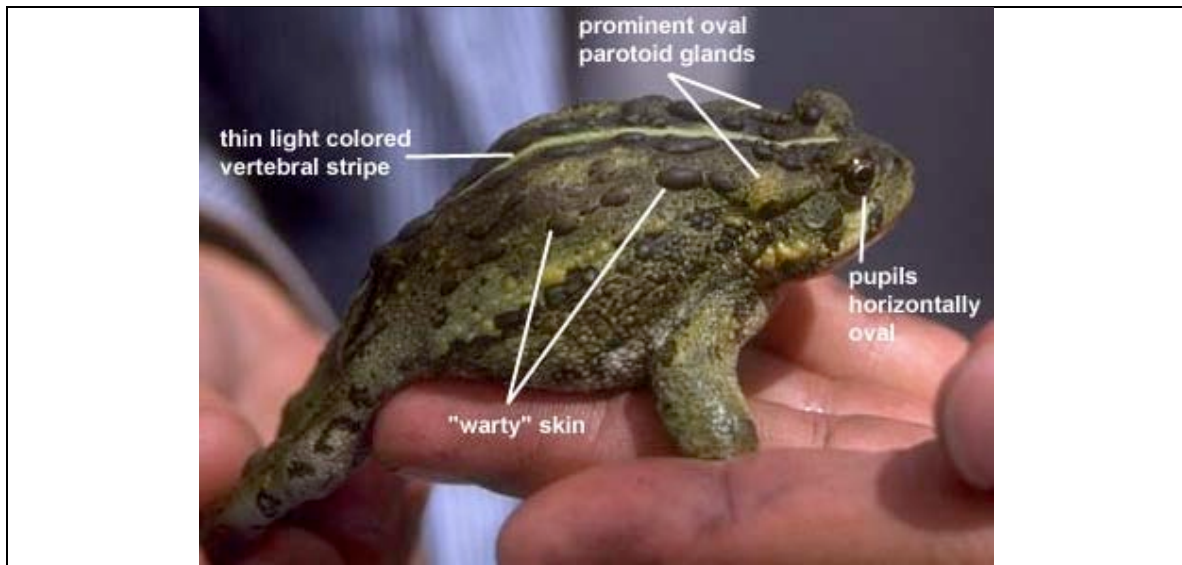
Long-toed Salamander (*Ambystoma macrodactylum*),

Rough-skinned Newt (*Taricha granulosa*),

Ensatina (*Ensatina eschscholtzii*),

Western Red-backed Salamander (*Plethodon vehiculum*).

Western Toad (*Anaxyrus boreas*)



Adult characteristics (Ferry Co.). Credit: WNHP et al. 2009; Photo by L. Hallock.



Adult (Mason Co.). Photo: J. Schuett-Hames.



Sub-adult (Mason Co.). Photo: D. Schuett-Hames.

- Western Toad adults are relatively large and stout bodied, with thick, dry, lumpy skin. Their dorsal coloration ranges from pale green, to gray, dark brown, and red. They typically have a thin pale green or cream stripe down their back. Underneath, they are light colored and mottled with dark blotches. Heels of their hind feet have two large, rubbery knobs (tubercles) that are used for digging. Juveniles tend to be dark underneath, and they may have bright orange-to-yellow tubercles under their feet.
- Size characteristics: adults are 55–145 mm snout-to-vent; females are usually 80–120 mm, while males can be smaller and are usually 60–90 mm snout-to-vent; recently metamorphosed toadlets are 10–16 mm snout-to-vent.
- During the breeding season males develop a smoother skin than females, and they develop dark nuptial pads on their thumbs.
- Females reach sexual maturity in 4–5 years and males in 3 years.
- They are known to live in the wild up to 11 years, and one survived ~35 years in captivity.
- Seasonal movement: very extensive movement scale $\sim > 3.11$ mi (> 5 km).

Pacific Treefrog (*Hyla regilla*)

		
Adult characteristics (Thurston Co.). Credit: WNHP et al. 2009; Photo by K. McAllister.	Circular discs (toe-pads) on fingers and toes. Credit: WNHP et al. 2009; Photo by W.P. Leonard.	
		
Light, bumpy glandular, throat of female (Thurston Co.). Credit: WNHP et al. 2009; Photo by J. Lewis.	Dark throat of male (Pend Oreille Co.). Credit: WNHP et al. 2009; Photo by L. Hallock.	Gravid female with wide torso, during migration to breeding pond (Thurston Co.). Photo: J. Schuett-Hames.

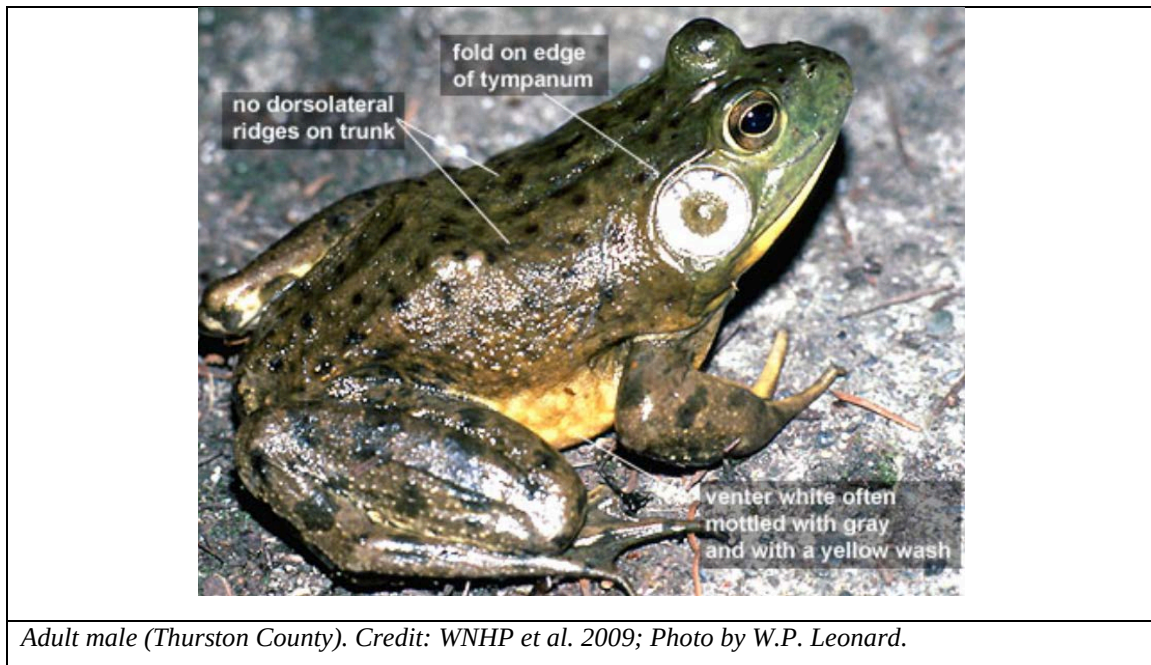
- Pacific Treefrogs are small-to-medium size, typically brown or green (but sometimes tan, gray, red, or other colors), with variable dorsal patterns. Dark masks (eye-stripes) run between their nostrils and shoulders. Relatively large toe-pads on fingers and toes can be observed on adult frogs, and sometimes on juveniles. The toe-pads distinguish this species from all other amphibians in Thurston County.
- Size characteristics: adults range from ~25–50 mm snout-to-vent; newly metamorphosed frogs can be ~15 mm (sometimes < 10 mm).
- Gender characteristics: females are cream-colored underneath and have yellow thumbs; males have a distinctive gray-black throat. Gender identification of gravid female mortalities can sometimes be based on the presence of nearby gelatinous egg masses.
- Juveniles grow quickly and some may reproduce as 1-year-olds. However, most do not breed until their second year. Longevity of this species is unknown.
- Seasonal movement: intermediate movement scale ~164 ft to < 0.25 mi (50 to < 400 m)

Red-legged Frog (*Rana aurora*)

 dorsolateral folds dorsum usually with indistinctly-edged small black spots and flecks light lip line from eye to shoulder dark eye mask see photos below for additional key identification traits Photo by D. Hagin		
Adult characteristics. Credit: WNHP et al. 2009; Photo by D. Hagin.	These frogs are highly edible – it is common to only find fresh remnants on the road. Photo: J. Schuett-Hames.	
		
Bright rear under-legs of young frog. Photo: J. Schuett-Hames.	Wide forearm below elbow of male, and dark pad on outside of "thumb". Photo: J. Schuett-Hames.	Cylindrical, linear forearm of adult female. Photo: J. Schuett-Hames.

- Northern Red-legged Frogs are medium-size, with smooth skin marked by small black "freckles", dorsolateral folds, dark eye masks, and a white jawline. Their colors vary from greenish in spring, to brown, gold, and reddish. Their legs have dark banding. A distinctive trait is red–orange coloring on the underside of their hind legs.
- Size characteristics (locally): lengths overlap between first year frogs, second year sub-adults, and adults. First-year frogs can be ~33–50+ mm snout-to-vent. Female second-year frogs can be up to ~60–68 mm, while breeding females may be ~65 – 79 mm snout-to-vent. Adult males range from ~50–63 mm snout-to-vent.
- Adult forearm characteristics: females have somewhat linear forearms while those of males are large and wide adjacent to the elbow.
- Breeding season adult males have dark nuptial pads on the outside of their thumbs.
- Gender of gravid female mortalities can sometimes be determined by the presence of nearby gelatinous egg masses.
- Sexual maturity is reached in ~3 years for females and 2 years for males. Longevity of Red-legged Frogs is poorly known, but is reported to exceed 10 years in captivity.
- Seasonal movement: extensive movement scale ~0.25 to 3.11 mi (400 m to 5 km).

Bullfrog (*Rana catesbeiana*) (introduced species)



Adult male (Thurston County). Credit: WNHP et al. 2009; Photo by W.P. Leonard.

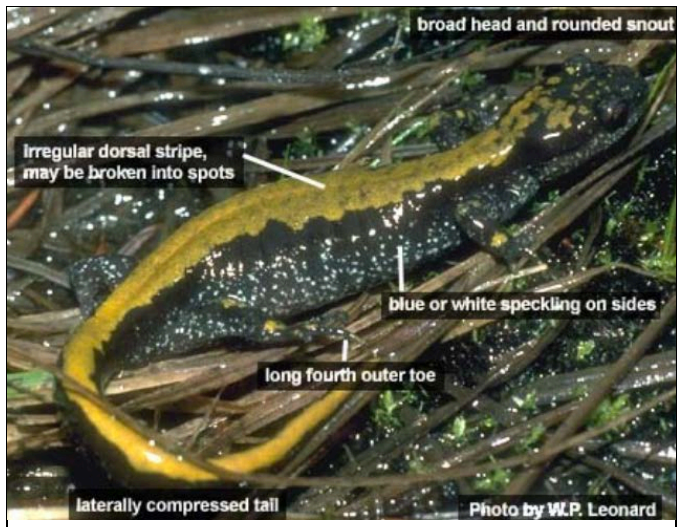
- Bullfrogs can be very large. Their dorsal color is tan, brown, or olive-brown, and eyes are large and golden colored. They have a large and distinct tympanum (ear) just behind and below the eye. This species has a distinct supratympanic fold from the back edge of the eye, around the top of the tympanum, and ending at the shoulder. No other native Washington frog or toad has this trait.
- Size characteristics: adults may reach 229 mm snout-to-vent. Recently metamorphosed frogs range from 25–67 mm snout-to-vent.
- Mature males have a tympanum much larger than the size of the eye whereas females have a tympanum similar in size to the eye.
- Mature males also have enlarged forearms, a yellow-colored throat, and gray nuptial pads on their thumbs; females lack these characteristics.
- Sexual maturity is reached in ~2–3 years post-metamorphosis.
- Longevity of Bullfrogs in the Pacific Northwest is unknown, but elsewhere they are known to live < 8 years.
- Seasonal movement: extensive movement scale ~0.25 to 3.11 mi (400 m to 5 km).

Northwestern Salamander (*Ambystoma gracile*)

 dark body with no markings or pattern glandular ridge on top of tail parotoid gland costal grooves laterally compressed tail fourth hind toe not exceptionally long Photo by D. Hagin		
Adult male breeding season characteristics (Thurston Co.). Credit: WNHP et al. 2009; Photo by D. Hagin.		
 Photo by D. Hagin	 Photo by D. Hagin	
Female vent during breeding season (Thurston Co.). Credit: WNHP et al. 2009; Photo by D. Hagin.	Male vent during breeding season (Thurston Co.) Credit: WNHP et al. 2009; Photo by D. Hagin.	Gravid female road mortality, with egg mass. Photo: J. Schuett-Hames.

- Northwest Salamanders are relatively large and uniformly dark brown, but sometimes individuals are grey or black to purple, and they may have light flecks on their backs. Adults and juveniles have large, dark, protruding eyes. In addition, adults have broad heads with large parotoid (poison) glands visible as swellings behind the eyes.
- Size characteristics: females ≤ 248 mm total length; males ≤ 228 mm total length; adults become sexually mature at ~ 70 – 75 mm snout-to-vent; recently metamorphosed subadults may be ~ 50 mm snout-to-vent (75 – 90 mm total length).
- Adult female tails are shorter than or about the same length as half of their total length; male tails are slightly longer than half of their total length.
- During the breeding season females have a rounded protuberance around the vent and males have conspicuously swollen vent lobes.
- Gender of gravid female mortalities can sometimes be identified based on the presence of nearby gelatinous egg masses.
- Sexual maturity is reached in ~ 3 – 4 years. Longevity of terrestrial (vs fully aquatic “neotenic” which live ~ 5 years) Northwest Salamanders is unknown.
- Seasonal movement: intermediate movement scale ~ 164 ft to < 0.25 mi (50 to < 400 m).

Long-toed Salamander (*Ambystoma macrodactylum*)

	
Adult characteristics (Pierce Co.). Credit: WNHP et al. 2009; Photo: W.P. Leonard.	Key characteristic: long fourth toe on hind feet (Pend Orielle Co.). Credit: WNHP et al. 2009; Photo: L. Hallock.

- Long-toed Salamanders are of medium size, and are named for the diagnostic long fourth toe on their hind feet. They have a background color of dark gray to almost black, and a greenish-yellow or yellow dorsal stripe. The stripe has uneven borders, and is sometimes broken into blotches. The sides, abdomen, and chest are speckled with white, silver, or blue flecks. These salamanders are the earliest amphibians to breed in our area.
- Size characteristics: adults may measure up to ~85 mm snout-to-vent (165 mm total length); adults become sexually mature at ~48–55 mm snout-to-vent; recently metamorphosed subadults may be ~23–48 mm snout-to-vent (~41–90 mm total length).
- Females have shorter limbs and tails than males.
- During the breeding season males develop a blade on their tail, and their vent becomes swollen. Females have short vent openings that are not swollen.
- Gender identification of a gravid female mortality can sometimes be based on the presence of a nearby gelatinous egg mass.
- Long-toed Salamanders reach sexual maturity ~1–3 years after metamorphosis, and can live up to 10 years.
- Seasonal movement: intermediate movement scale ~164 ft to < 0.25 mi (50 to < 400 m).

Rough-skinned Newt (*Taricha granulosa*)

	
Adult female during migratory movement. Note the wide lower body of this gravid female. (Thurston Co.). Photo: J. Schuett-Hames.	Female vent during breeding season. (Thurston Co.). Credit: WNHP et al. 2009; Photo: J. Lewis.
	
Defensive “unken reflex” posture. Photo: G. Nafis. As road mortalities, newts can be found flattened in this posture indicating they may use this reflex to attempt warding off the threat of an on-coming vehicle.	Male breeding season characteristics: prominent swollen vent and spatula-like tail. (Thurston Co.). Photo: J. Schuett-Hames.

- Rough-skinned Newts are medium-to-large salamanders with rough glandular skin. They are brown with a bright orange underside. Their eyes are pale yellow, with a dark lateral bar through the middle. Wash hands after any handling as the skin of this species contains the poison tetrodotoxin, and is our most toxic local amphibian.
- Size characteristics: adults are ≤ 90 mm snout-to-vent; males are larger than females. Juvenile sizes are variable – locally they are as small as 19 mm snout-to-vent.
- During the breeding season males develop smooth skin, swollen vent lobes, a long, tall, spatula-like tail, and dark patches of skin (nuptial pads) on feet and hind legs. Females have a conical swelling around the vent.
- Gender of female mortalities can sometimes be identified by the presence of nearby gelatinous egg masses. Gravid females may have eggs visible from their underside.
- Newts have tough, poisonous skin. When run over they tend to persist on the road longer than other amphibians. After a few days they can become tan-colored, with a white vertebrae “stripe”, but if turned over they may still show orange coloration.
- Rough-skinned Newts reach sexual maturity in 4–5 years, and live ~12 years.
- Seasonal movement: intermediate movement scale ~164 ft to < 0.25 mi (50 to < 400 m).

Ensatina (*Ensatina eschscholtzii*)



Adult characteristics. Credit: WNHP et al. 2009; Photo by A. Nöllert.



Yellow-orange patches at the tops of arms and legs. This feature, along with the large eyes can be helpful in identifying an Ensatina that has become road mortality. (Thurston Co.). Photo: J. Schuett-Hames.

- Ensatinas are medium-sized terrestrial salamanders with a short body, long legs, and large dark eyes. Adults have orange-brown dorsal coloration that may have fine black speckling, and dark mottling along the sides. Juveniles are gray to brown. All age classes have bright yellow or orange patches at the tops of their legs and arms. This is our only local salamander with a constriction at the base of the tail.
- Size characteristics: adults reach 64 mm snout-to-vent and 115 mm total length; adult females (sexually mature) are > 60 mm snout-to-vent; adult males (sexually mature) are ~48–55 mm snout-to-vent; hatchlings are ~20 mm snout-to-vent.
- Females have short, stout tails, and eggs may be visible from the side and underside.
- Males have tails that are slimmer than those of females, and the tails may be a bit longer than the head plus body length. Their snouts are longer and blunter than those of females.
- Ensatinas reach sexual maturity at 3–4 years, and live up to 15 years.

- Seasonal movement: small movement scale $\sim < 164 \text{ ft} (< 50 \text{ m})$.

Western Red-backed Salamander (*Plethodon vehiculum*)



Adult characteristics. Credit: WNHP et al. 2009; Photo by W.P. Leonard.

- The Western Red-backed Salamander is a small, slender, terrestrial salamander with an even-edged dorsal stripe that extends to the tip of the tail. The stripe is typically red or yellow, but may be olive or tan. Patches of stripe color usually occur on the tops of the upper legs. Some animals do not have a stripe, and others may have a stripe color that covers their full body. Sides are typically dark with speckles of white, and the underside is dark with flecks of white, orange, or yellow. Juveniles resemble the coloration of adults, but may have more vivid coloration.
- Size characteristics: adults 40–60 mm snout-to-vent and ~70–115 mm total length; females become sexually mature at ~44 mm snout-to-vent, and males at ~42 mm snout-to-vent; juvenile hatchlings are ~13–15 mm snout-to-vent.
- The tail length of adults is about as long as the head and body; this may be shorter in females.
- Mature females have a slightly concave vent with pleated margins and have more rounded snouts than males; mature males have small vent lobes (flaps), and squarish snouts.
- Females reproduce every 2 (to 3) years; males may mate every year.
- This species reaches sexual maturity at ~2–3 years; longevity can be up to 10 years.
- Seasonal movement: small movement scale ~ < 164 ft (< 50 m).

Appendix E References

- Blaustein, A.R., J.J. Beatty, D.H. Olson, and R.M. Storm. 1995. The Biology of Amphibians and Reptiles in Old Growth Forests in the Pacific Northwest. U.S. Forest Service GTR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR.
- Corkran, C.C., and C.R. Thoms. 1996. Amphibians of Oregon, Washington, and British Columbia; A Field Identification Guide. Lone Pine Publishing. Renton, WA.
- Efford, I.E., and J.A. Mathias. 1969. A comparison of two salamander populations in Marion Lake, British Columbia. *Copeia* 4:723–736.
- Government of Canada. Species at Risk Act Public Registry. Accessed Dec. 15, 2016. <http://www.registrelep-sararegistry.gc.ca/>.
- Hayes, M. 2006. Personal communication. Washington Department of Fish and Wildlife Research Biologist. Olympia, WA.
- Jones, L.L.C., W.P. Leonard, and D.H. Olson (coordinating editors). 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society. Seattle, WA.
- Landscape PHS Amphibian and Reptiles Workgroup. 2007. Working documents. WDFW. Olympia, WA.
- Lannoo, M.J. (Editor). 2005. Amphibian Declines: The Conservation Status of United States Species. University of California Press. Berkeley, CA.
- Leonard, W.P., H.A. Brown, L.L.C. Jones, K.R. McAllister, and R.M. Storm. 1993. Amphibians of Washington and Oregon. Seattle Audubon Society. Seattle, WA.
- Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press. Moscow, ID.
- Schuett-Hames, J. 2016. Unpublished data. Independent Research Biologist. Olympia, WA.
- Tirhi, M. 2016. Personal communication; presentation information. Washington Department of Fish and Wildlife District Biologist. Lakewood, WA.
- Vonesh, J.R., and O. De la Cruz. 2002. Complex life cycles and density dependence: assessing the contribution of egg mortality to amphibian declines. *Oecologia* 133:325–333.
- Washington Natural Heritage Program (WNHP), Washington Department of Fish and Wildlife, U.S.D.I. Bureau of Land Management, and US Forest Service. 2009. Washington Herp Atlas. Accessed Nov. 10, 2016. <http://www1.dnr.wa.gov/nhp/refdesk/herp/>.