Woodland Fish & Wildlife

Amphibians in Managed Woodlands

Tools for Family Forestland Owners

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Pacific Tree (chorus) Frog

Photo by Kelly McAllister.

Though amphibians and reptiles regulate their body temperature by their surroundings and can look alike, they are distinct groups of animals. Reptiles have thick, dry and scaly skin, and are often found in warm, dry places though some forage near water. Amphibians have thin, moist skin and are found in cool, moist areas. Reptiles lay their eggs on land, usually in warm, dry places. Amphibians generally lay their eggs in water or in moist habitats. Frogs, toads, salamanders and newts are amphibians. Reptiles include snakes, lizards and turtles.

Introduction

Amphibians are among the most ancient vertebrate fauna on earth. They occur on all continents, except Antarctica, and display a dazzling array of shapes, sizes and adaptations to local conditions. There are 32 species of amphibians found in Oregon and Washington. Many are strongly associated with freshwater habitats, such as rivers, streams, wetlands, and artificial ponds. While most amphibians spend at least part of their life-cycle in water, some species are fully terrestrial, spending their entire life-cycle on land or in the ground, generally utilizing moist areas within forests (Corkran and Thoms 2006, Leonard et. al 1993).

Amphibians are of great ecological importance and can be found in all forest age classes. Many amphibian species utilize both aquatic and upland habitats throughout their life-cycle, therefore, they are considered good indicators of habitat quality (e.g., habitat diversity, habitat connectivity, water quality). Amphibians also play a key role in food webs and nutrient cycling as they are both prey (eaten by fish, mammals, birds, and reptiles) and predators (eating insects, snails, slugs, worms, and in some cases, small mammals). The presence of forest salamanders has also been positively correlated to soil building processes (Best and Welsh 2014).

Landowners can promote amphibian habitat on their property to improve overall ecosystem health and to support the species themselves, many of which have declining or threatened populations. The following sections of this publication describe amphibian habitats, which amphibian species are found in Oregon and Washington, common threats, and habitat recommended enhancement techniques.

Example of Amphibian Habitat

Photo by Lauren Grand.

Northwestern Salamander

Large, heavy-bodied with smooth brown moist skin. Can reach nearly 10 inches in total length. Photo by Jessica Homyack.

Amphibian Habitats

Amphibians are truly unique because they not only require water or moist habitats for breeding, but most of them migrate to forests and other terrestrial (upland) areas for the rest of the year. For example, terrestrial salamanders, such as the Ensatina and Dunn's Salamander, do not have lungs, but exchange oxygen through their skin (Corkran and Thoms 2006). Rough-skinned newts and western toads utilize still and open waterbodies for breeding and egg laying, but spend most of the year under logs, underground, and in leaf litter foraging and hiding from potential predators.

Except for fully terrestrial amphibians, breeding habitat takes the form of either standing water in wetlands, or the moving water found in streams. Both permanent and seasonal wetlands are used for egg-laying. Most terrestrial salamanders lay their eggs in decaying logs and seeps next to streams. Key habitats for amphibians are described below.

Aquatic Habitat

Many Oregon and Washington frogs and salamanders lay their eggs in still or slow-moving water. Aquatic habitats used include wetlands, including ponds, sloughs, marshes, swamps, bogs, fens, floodplains, riparian fringes, ditches, fire ponds, irrigation ponds and storm water ponds. Having a variety of wetlands on the landscape is important to maintaining amphibian diversity because some species need wetlands that are present year-round while other species rely on seasonal wetlands to avoid predators. Westslope, low elevation, seasonal wetland ponds often have the highest diversity of amphibian species because of an absence of competitive and predatory fish, and minimal numbers of other predators such as the non-native invasive American bullfrog.

Most amphibians prefer shallow wetlands with gently sloping sides, a range of water depths, and little to no current (less than 15 cubic feet/second). Emergent and riparian vegetation provides good habitat, adding oxygen to the water, provides egg-laying substrate / egg mass attachment sites, and allows larvae to forage and seek cover. Some species require the emergent vegetation to be submerged at least 2-3 feet deep to minimize the risk of the wetland drying out before eggs hatch and juveniles disperse. Diverse native emergent vegetation also provides habitat for a wide array of insects for amphibians to eat. Many amphibians need sun exposure for successful reproduction. When direct sunlight can reach over 60% of the pond's edge the larvae grow and develop into healthier adults. Sunlight, with the help of wind breaks, will encourage a warm microclimate and a healthy amount of floating aquatic vegetation such as native duck weed which cools water and increases oxygen and food for larvae. Basking sites that protrude out of the open water such as logs, rocks, floating vegetation, and fallen limbs are great habitat features that add complexity to the wetland and benefit a variety of species. While vegetated buffers around wetlands are highly beneficial, too much shading can make the pond less suitable for some amphibian species.

Long-toed Salamander

Named for the exceptionally long fourth toe of the hind foot. Smooth brown skin with green/yellow stripe down the back. Approximately 6 inches in total length. Photo by Lauren Grand.

Tiger Salamander

Large, heavy-bodied with smooth brown moist skin and small protruding eyes. Can reach nearly 13 inches long in total length. Photo by Chris Loggers.

A specialized group, the tailed frogs, giant salamanders, and torrent salamanders, only lay their eggs in streams or seeps. These amphibians prefer cold turbulent streams that are 3 – 9 feet wide, with a variety of pools separated by stretches of faster moving water (riffles) or steep plunging water (cascades). Streams with these characteristics often are headwater streams, and may be found in areas with steep valley walls and rocky faces. Tailed frogs, giant salamanders and torrent salamanders prefer these cold and clear water habitats (with silt being quickly washed downstream) that contain high amounts of oxygen due to the mixing of turbulent water with the air. High and brushy, riparian vegetation with deep litter on the forest floor increases relative humidity and provides habitat for the insects that these amphibians prey upon. Ideal stream habitats for these species also have streambeds with deep cobble and small boulder substrates and an abundance of large wood in streams that creates pools. This complex habitat allows for both foraging and hiding. Giant salamanders usually forage in pools, while tailed frogs are found in riffles and cascades. Torrent salamanders usually hide in the splash zones of cascades and waterfalls, at the edges of larger streams, or buried in the rocks and logs of the seeps that flow into the stream. Torrent salamanders can be found high up in stream systems, in headwater streams, seeps and springs.

Upland Habitat

The majority of Oregon and Washington amphibians spend only a few weeks at their breeding wetlands or streams before migrating back to their upland habitats. Forests are often the preferred upland habitat for migrating amphibians because forested canopies provide an abundance of shade, moisture, and cool temperatures that amphibians need to thrive. Forests are also rich in water features (including forested wetlands, seeps, and streams) that amphibians use to stay moist while moving through the landscape.

Adequate cover (such as down logs, slash piles and leaf litter) in the upland habitat not only provides amphibians with places to hide and find food, but also minimizes fluctuations in temperature and moisture to which amphibians are extremely sensitive. This prevents amphibians from over-stressing or drying out during the warm summer months and periods of drought. Forests have the potential to provide a moderately dense, but diverse understory structure of forbs, grasses, and shrubs that create microhabitats frequently used by amphibians. Amphibians take advantage of falling leaves and aerated soils by burrowing under loose soil, deep leaf litter, and moss for cover. They will also take advantage of rodent burrows during the heat of the day, or to hibernate during freezing winter months. Rotting wood in the form of large logs, fallen limbs, loose bark, stumps, or woody piles provide moisture, shelter, movement corridors, and many invertebrates for food. Large standing dead legacy trees provide valuable habitat for the Pacific tree frog and some salamanders such as the clouded salamander that are adapted to climbing. Rocks, rock piles, and talus also provide habitat that is essential for many amphibian species such as the Del Norte and Larch Mountain salamander. All of these structures can be used for various life activities including shelter from predators or inclement and extreme weather, cavities for hibernating, and hunting. Downed wood and rock structures eventually develop small underground cavities for salamanders to burrow in and provide shade when a disturbance has opened up the canopy.

Rough-skinned Newt

Dry granular skin brown above and bright orange below. Skin is toxic if ingested. Can reach nearly 8 inches in total length. Photo by Kelly McAllister

Amphibians of Oregon and Washington

Table 1 includes amphibians found in the forests of Oregon and Washington. Common species are highlighted in green within the table, and are illustrated with photographs in the article, whereas Candidate, Threatened, Endangered, Species of Concern or Sensitive species are denoted with a star (*).

Table 1. *Amphibians of Oregon and Washington found in forested habitats*

Primarily Aquatic			
Cascade torrent salamander*	*Rhyacotriton cascadae*	Cascades in Northern Oregon and Southern Washington	Found in and near permanent, cold and clear streams, seeps and waterfall splash zones in older coniferous forests.
Coastal tailed frog*	*Ascaphus truei*	Coast Range and Cascade Mountains of Oregon and Washington	Found in fast running, small, permanent streams in forests.
Columbia spotted frog*	*Rana luteiventris*	Northeastern and isolated portions of Southeastern Oregon and Eastern Washington	Found in still water habitats and slow moving streams with abundant aquatic vegetation.
Columbia torrent salamander*	*Rhyacotriton kezeri*	Coast Range of Washington and Oregon in SW Washington and NW Oregon	Found in and near cold and clear streams, springs, waterfalls and seeps in older forests.
Cope's giant salamander*	*Dicamptodon copei*	Mostly Washington and small portions of Northern Oregon	Found in cold, fast flowing streams in coniferous forests with abundant downed wood.
Foothill yellow-legged frog*	*Rana boylii*	Southern portion of Western Oregon (not found in Washington)	Found along edges of permanent streams and rivers with exposed rocky streambeds and off-channel waters that are slow flowing.
Olympic torrent salamander	*Rhyacotriton olympicus*	Only found on the Olympic Peninsula of Washington	Found in or very near cold, clear streams, seeps or waterfalls in forested areas.
Oregon spotted frog*	*Rana pretiosa*	Isolated areas of Deschutes, Jackson, Josephine, Klamath, Lane, and Wasco Counties, Oregon, and Whatcom, Skagit, Thurston, Skamania and Klickitat counties, Washington	Found in wet areas that provide abundant aquatic vegetation.
Rocky Mountain tailed frog*	*Ascaphus montanus*	Eastern Oregon and Washington	Restricted to perennial streams found in or associated with cold clear rocky streams in mature forests.
Southern torrent salamander*	*Rhyacotriton variegatus*	Coast Range of Oregon excluding NW Oregon.	Found in and near permanent, cold and clear water bodies in older coniferous forests.
Terrestrial Only			
Black salamander	*Aneides flavipunctatus*	Extreme Southern Oregon	Found in moist crevices of decaying logs or stumps in coniferous forests.
California slender salamander	*Batrachoseps attenuatus*	Extreme Southwest Oregon	Found in humid coastal conifer forests.
Clouded salamander*	*Aneides ferreus*	Coast Range and Cascades of Oregon	Found in forest habitats or burned areas that provide large decaying logs or stumps – especially Douglas-fir.
Del Norte salamander*	*Plethodon elongates*	Extreme Southwest Oregon	Found in older redwood and Douglas-fir forests, commonly in talus slopes.
Dunn's salamander*	*Plethodon dunni*	Western Oregon and SW Washington	Found in rocky edges of humid forested streams and moist talus slopes.
Ensatina	*Ensatina eschscholzii*	Western Oregon and Western Washington	Found in humid forests, forests, and shrublands.
Larch mountain salamander*	*Plethodon larselli*	Extremely rare. Columbia Gorge area and North Cascades in Oregon and Washington.	Found in moist steep basalt talus slopes in forested areas.
Oregon slender salamander*	*Batrachoseps wright*	Northern Oregon Cascade Mountains	Found in moist older forests with abundant large decaying Douglas-fir logs.
Siskiyou mountains salamander*	*Plethodon stormi*	Isolated populations in Southern Oregon	Found in talus slopes or rocky outcroppings in older forest stands.

Common name	Scientific name	Range	Habitat
Van Dyke's salamander*	*Plethodon vandykei*	Isolated populations in Western Washington	Found in humid coniferous forests often in or near the splash zone of springs, seeps, and waterfalls.
Western red-backed salamander	*Plethodon vehiculum*	Western Oregon and Western Washington	Found in humid coniferous forests in talus slope and among boulders and rock outcroppings.
Aquatic and Terrestrial			
American bullfrog (non-native invasive)	*Lithobates catesbeianus*	Throughout Oregon and Washington; introduced	Thrives in warm ponds, lakes, marshes, sloughs, irrigation ditches and streams.
Cascades frog*	*Rana cascadae*	Cascade Mountains of Oregon and Cascade and Olympic Mountains of Washington	Found in a variety of habitats including forested swamps, ponds, marshes and lakes.
Great basin spadefoot	*Spea intermontana*	Eastern Oregon and Eastern Washington	Found in dry sagebrush, grasslands and forests with sand soils near ponds.
Long-toed salamander	*Ambystoma macrodactylum*	Washington and Oregon in most regions of both states	Spend most of the year underground. Found in a variety of forested habitats near wetlands.
Northern leopard frog*	*Rana pipiens*	Possibly still found in isolated portions of Eastern Oregon. Isolated areas of Grant County, Washington	Found in and near various water sources with abundant vegetation such as wet meadows, marshes, riparian areas and moist, open forests.
Northern red-legged frog*	*Rana aurora*	Western Oregon and Western Washington	Found in damp coniferous or deciduous forests and forested wetlands.
Northwestern salamander	*Ambystoma gracile*	Western Washington and Western Oregon	Moist forests or partly wooded areas. Primarily live underground.
Pacific Tree (chorus) frog	*Pseudacris regilla*	Throughout Oregon and Washington	Found in a variety of habitats including forests. Found near water during the breeding season.
Pacific giant salamander	*Dicamptodon tenebrosus*	Western Washington and Oregon	Terrestrial adults found in cool moist coniferous forests near cold and clear streams.
Rough-skinned newt	*Taricha granulosa*	Western Washington and Western Oregon	Forested areas. Breeds in ponds or very slow moving water.
Tiger salamander	*Ambystoma tigrinum*	Columbia Plateau Ecoregion in Washington	Dry habitat types characterized by ponderosa pine/Douglas-fir forests.
Western toad*	*Anaxyrus boreas*	Most areas in Oregon and Washington except the Willamette Valley and portions of Eastern Oregon and Eastern Washington	Found in a wide variety of habitats including forests. Can be locally rare or locally abundant.
Woodhouse's toad	*Anaxyrus woodhousii*	Along the Snake River in Washington and an isolated population along the Owyhee River in Oregon	River valleys in sagebrush or grassland areas. Breed in ponds, lakes, slow streams or irrigation ditches.

Sources: Amphibians of Washington and Oregon, Leonard et. al 1993; Amphibians of Oregon, Washington and British Columbia, Corkran and Thoms 2006.

Table Legend

*Priority Species is a species that has a special status from the State or the Federal government: State or Federal Threatened, Endangered Sensitive, or Candidate Species. These statuses mean that the species may require special protections.

Common species are highlighted in green.

Many of the individual descriptions for the species shown in Table 1 may be found in the Oregon Forest Resources Institute A Guide to Priority Plant and Animal Species in Oregon Forests , Washington State's Living with Wildlife Program: http://wdfw.wa.gov/living/frogs.html and ODFW's Living with Wildlife webpage: http://www.dfw.state.or.us/wildlife/living_with/frogs.asp.

Threats to Amphibians on Managed Forests

Globally, amphibian populations are in decline, with natural population fluctuations overwhelmed by human influences, including in Washington and Oregon (Houlahan et al. 2000, Green 2003). While amphibians may be resilient to some individual threats, when threats are compounded, effects to amphibian populations can be devastating. Threats to amphibians found in Oregon and Washington are discussed below.

Habitat Loss

Habitat loss and fragmentation are the greatest threats to amphibian populations (Cushman 2006). Most amphibians need an aquatic breeding site with nearby upland and aquatic non-breeding sites, as well as a suitable habitat in-between to allow access. Additionally, yearly movement between their aquatic and upland habitats increases exposure to pathogens, chemicals, and predation.

Effects of habitat loss and fragmentation include:

Northern Red-legged Frog

Medium-sized frog with a slender body and an eye mask. Females are larger than males. Total length is usually between 2.5 – 4 inches.

Photo by Noelle Nordstrom.

- Reduced availability of food and resources
- Reduced availability of water and cover
- Reduced ability to move from one habitat to another

Ultimately, these impacts can lower populations and species diversity. Landscapes are fragmented when large areas are converted without planning for wildlife movement. Roads can be impassable barriers to some species, and further fragment the landscape. These effects make pool-breeding amphibians, such as Western toads or red-legged frogs, especially vulnerable because habitats become isolated from each other and they may not be able to disperse or be killed in the process, thus reducing reproductive success and sometimes leading to local extirpation.

Habitat Degradation

Amphibian habitats in altered landscapes may suffer significant degradation from human influences. Land management can change local hydrology, increasing runoff and sedimentation to streams and wetlands. Exaggerated flooding can strand eggs and tadpoles on shores. Compacted soils reduce burrowing capacity and moisture retention. Invasive plants spread easily and can quickly overtake wetlands, often outcompeting native plants and reducing plant diversity both in the water and on land. Forest management activities may also unintentionally degrade amphibian habitat. Disturbances, especially those that are conducted adjacent to streams or wetlands, can degrade habitat by reducing productivity and oxygen availability. Soil compaction can limit the ability of native vegetation to grow and thrive, and can spread or encourage invasive species growth. Loss of canopy cover reduces shade, hiding cover, and relative humidity. This inhibits insect populations and amphibians' ability to stay moist, thus causing many amphibians to retreat underground or to cold seeps or springs. Forest management may also degrade amphibian habitat by removing down logs and canopy that provided shade, shelter and leaf litter.

Ensatina Salamander

Tail appears 'pinched' at the base and skin is reddish, orangish, brown or tan. Reaches about 4.5 inches in total length.

Photo by Kelly McAllister.

Effects of habitat degradation may include:

- Increased surface temperature
- Increase in sedimentation
- Decreased oxygen availability
- Increase in invasive species
- Compacted soils
- Reduced soil moisture
- Reduced prey availability

Chemicals

Chemicals such as herbicides and fertilizers may be found in freshwater habitats where most amphibians spend at least part of their life cycle. Amphibian populations are particularly sensitive to environmental contaminants because their porous skin and eggs readily absorb pathogens and chemicals directly into their body. Numerous studies suggest that fertilizers, pesticides and herbicides are harmful to amphibians in a variety of ways. It is important to use only herbicides approved for aquatic use when working near streams and other waterways and to always follow the forest practice rules for buffers near waterways. High levels of contaminants may affect amphibian health by reducing survival, disrupting growth and survival

American Bullfrog

Bullfrogs are an invasive amphibian found throughout low elevations in Washington and Oregon. Bullfrogs are aggressive predators of other amphibians and fish, and can outcompete native amphibians for resources necessary for survival. Bullfrog harvest is encouraged and controlling their population is important for native amphibian and fish populations.

Photo by Jenny Cafferata

behaviors (especially in larvae), increasing susceptibility to pathogens and parasites, and causing deformities (Marco et al. 1999; Alford & Richards 1999).

Invasive predators

A variety of species have been introduced to Oregon and Washington waterways and wetlands that prey upon amphibians. These include the American bullfrog and warm-water fish such as largemouth bass. (Jennings and Hayes 1985). Some of these species, including carp, affect amphibian populations indirectly, by out-competing them for resources, degrading habitats and limiting dispersal and movement.

Although invasive predators can have direct and indirect impacts to amphibians, they may also be able to survive conditions that native species cannot, and are therefore able to spread to areas that have degraded habitat conditions that native amphibians no longer find suitable.

Invasive predators such as bullfrogs and non-native fish are limited to deeper, year-round water supplies. Native species of amphibians benefit from the protection of shallower, seasonal wetlands. Unfortunately, many shallow, seasonal wetlands are most at risk to loss from development and disturbance due to their size and ephemeral nature. Protection and enhancement of such sites can greatly benefit native amphibian populations.

Management Practices

Amphibians are resilient and wondrous forest wildlife species that woodland owners can help and encourage through thoughtful management practices. The following sections describe practices that woodland owners can implement to help amphibians.

Protection:

Amphibian populations benefit the most from the protection of existing upland and aquatic habitats that provide the natural complexity to meet life history needs. These may include:

- Follow forest practice rules in Oregon and Washington for stream-side and wetland buffers.
- Stream and wetland buffers:
  - Limit soil and ground disturbance directly adjacent to streams and wetlands and where possible in forested areas between aquatic features.
  - Consider increasing buffers and/or providing suitable habitat between wetlands and uplands.
- Avoid disturbance to and provide a vegetated buffer around wetlands, ponds, streams, downed wood, rock outcrops and rock piles or talus slopes.
- Retain snags and large trees during harvest activities.
- Retain down wood and fallen limbs both in stream and riparian areas.
- Retain native deciduous species that provide leaf litter and food for invertebrates that amphibians prey upon.
- Retain patches of forest (leave trees), especially around seeps and wetlands, in even-aged harvest blocks.

Habitat Creation and Enhancement

The practices you may implement to enhance or create amphibian habitat will depend upon the species of amphibians that could potentially be present near your forestland. However, a variety of amphibians will benefit from the application of one or more of the following enhancement activities:

- Create log surrogates and habitat piles.
- Leave slash piles post-harvest.
- Place downed wood or fallen limbs in areas where it is lacking, especially between wetland and/or stream habitats to facilitate amphibian dispersal.
- Limit scarification practices and encourage a dense leaf/forest litter.
- Create rock piles.
- Increase direct sunlight and encourage native emergent vegetation within and surrounding existing wetlands.
- Install basking sites which are usually logs or boulders that allow amphibians access to sunlight.
- Provide vegetative buffers of native trees and shrubs surrounding wetlands.
- Create seasonal wetlands or small fish-free ponds outside of wetted streams. Note creation of wetlands could require permits. *More information at:* WDFW Living with Wildlife or OSU Extension Woodland Ponds: A Field Guide.

Creating Log Surrogates

In areas where little or no down wood is present, replacement habitat for amphibians can be created by laying smaller diameter logs in linear piles, thus creating a concentration of coarse woody habitat. This material will break down in place to create duff, and will provide hiding cover. Layers of finer material on top will also provide habitat for birds and small mammals.

Photo by Ken Bevis.

Common Best Management Practices

There are several Best Management Practices that can be implemented on forestlands to help support and protect amphibians during forest management, including:

- Conduct smaller (<10 acres) harvests (MacNeil and Williams 2014).

Frog Puddle

Photo by Ken Bevis.

- Utilize techniques to leave some forest canopy, where possible. This may include thinning, shelterwood harvests and selective harvesting practices. Maintaining the forest canopy will minimize temperature increases and humidity decreases.
- When harvesting, provide/place down wood in created open areas to offset loss of tree canopy, lessening changes in microclimate conditions.
- Limit soil compaction by utilizing low impact logging machinery, such as cable logging. Where possible, leave areas of undisturbed soil within harvest units. Cable logging in the winter months is thought to decrease the mortality of hibernating amphibians.
- Minimize alteration of understory vegetation (leaf litter, loose bark, down wood and other woody material).
- Leave/plant native deciduous species that amphibians rely on for food.
- Control invasive plant species and re-seed/re-plant with native plant species.
- Limit or eliminate use of pesticides and herbicides, especially near waterways. Follow all label requirements of herbicides.

Pacific Tree (chorus) Frog. Morph brown

Conspicuous dark mask and long slender legs and rounded toe pads. Skin may be green, brown, reddish bronze or pale gray. Adults reach up to 2 inches in length.

Photo by Lauren Grand.

Forks Log Habitat Area

Photo by Ken Bevis.

Western Toad

Photo by Ken Bevis.

Summary

Amphibians are good indicators of overall ecosystem and forest health, due to their role in the ecosystem, life history requirements, and sensitivity to environmental changes. Many amphibians are also threatened, endangered or sensitive species, and are experiencing declining populations across the globe. Amphibians are being threatened by habitat loss and degradation, degraded water quality, invasive predators, and potentially improper use of herbicides.

The best thing forest landowners can do for amphibians is keep their land in forests. Landowners can utilize numerous methods to benefit amphibians, including habitat protections and enhancements and best management and timing practices. These methods can both offset and minimize impacts to amphibians from forest management, and help create a healthy ecosystem for amphibians and other species alike.

Cascades Frog

Photo by Ken Bevis.

Additional Resources

Oregon Forest Resources Institute (OFRI): www.oregonforests.org

Know Your Forest: www.knowyourforest.org

Other Woodland Fish and Wildlife Documents found on http://woodlandfishandwildlife.com/

OSU extension: http://extension.oregonstate.edu/

WSU extension: http://extension.wsu.edu/

WDFW Priority Habitats and Species: http://wdfw.wa.gov/mapping/phs/

ODFW's The Oregon Conservation Strategy: http://www.oregonconservationstrategy.org/

Northwest Partners in Amphibian and Reptile Conservation (PARC): http://www.nwparc.org/

Western Red-backed Salamander

Photo by Kelly McAllister.

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Pacific Giant Salamander

Photo by Michael Ahr.

Photo by Noelle Nordstrom.

Wetlands. Photo by Lauren Grand.

About the Woodland Fish and Wildlife Group

The Woodland Fish and Wildlife Group is a consortium of public agencies, universities, and private organizations which collaborates to produce educational publications about fish and wildlife species, and habitat management, for use by family forest owners in the Pacific Northwest.

Currently available publications can be viewed and downloaded, free of charge, at the organization's website:

www.woodlandfishandwildlife.com

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