David Pilliod

RIPARIAN AREAS

Deanna H. Olson

Riparian areas occur adjacent to aquatic habitats, and as such, occur in all ecoregions. They are the transition zones between land and water, where these systems interact. The width and character of riparian areas depend on a suite of site conditions including topography, geology, soils, hydrology, climate, and disturbance history. In the Northwest, especially in arid regions, you can easily recognize many riparian areas; they are the ribbons of green along rivers and streams and the lush belts around wetlands, lakes, and ponds.

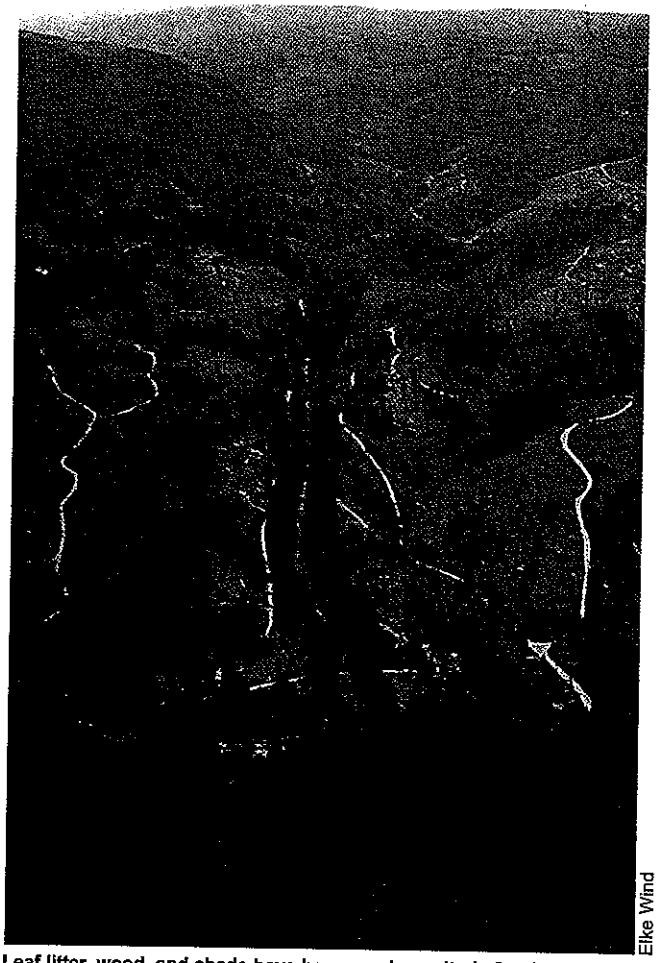
Riparian forests often create a unique microclimate of cool temperatures and moist air conditions, which enable certain plants and animals to exist within drier landscapes that they would normally not tolerate. Wetland riparian areas similarly host distinct vegetation communities and herpetofauna. Plants that tolerate wet soils and typify riparian areas include alder, cottonwood, and willow. Forbs, sedges, and grasses may proliferate along stream banks and lake shores in areas prone to inundation.

Over 70 reptile and amphibian species may be routinely sighted in riparian areas of the Northwest. Species occurring in riparian areas are those that are: 1) either aquatic or terrestrial obligates that can also occur in riparian zones; or 2) associated with riparian areas for some or all of their life history requirements such as breeding, foraging, hydro- and thermoregulation, and dispersal. Obligate riparian species, at least for part of their life cycle, include Dunn's Salamanders, Rocky Mountain and Coastal Tailed Frogs, the Giant Salamander species, most true frogs of the genus Rana, and all three Gartersnakes. Turtles rely on sparsely vegetated patches within riparian zones for their terrestrial nests or are transient through riparian areas to nest up to 1300 feet (400 m) from the water's edge. More than 30 pond-breeding amphibians migrate to still water habitats for mating and oviposition, and disperse into upland areas for their non-breeding season. These include Rough-skinned Newts, Long-toed and Northwestern Salamanders, Western Toads, Columbia and Oregon Spotted Frogs, Pacific Treefrogs, and Boreal Chorus Frogs. Adults may or may not linger in riparian areas, but their newly metamorphosed young may spend weeks in riparian areas upon emergence in mid to late summer. Adults may also become more closely associated with riparian areas during periods of hot, dry weather.

Riparian areas play an important role in the ecological processes and functions of all water bodies. Riparian vegetation filters surface and groundwater, and traps sediment. Overhanging trees and shrubs create shade, which moderates water temperatures. When dead leaves fall into streams and lakes they provide an important food source for invertebrates, and nutrients for aquatic organisms. Invertebrates provide abundant prey for aquatic amphibians and reptiles, as well fish. Emerging insects and amphibians that have transformed from aquatic eggs and larvae that move onto land provide a food source for birds and other terrestrial predators. As trees die and fall into streams, they create pools that provide habitat for amphibians, reptiles, and fish, and slow sediment movement downstream.

Bill Leonard

Riparian areas are biodiversity hotspots, often containing more species than the adjacent upland. Maintenance of these zones would enhance the diversity of amphibians and reptiles.



Elke Wind

Leaf litter, wood, and shade have been used as criteria for riparian reserves. These inputs extend 340-400 feet (about 100-120 m) away from the wetted edge of streams and up to 500 feet (about 150 m) in productive forestlands. The width of riparian habitats required by all species is not well documented, but may be greater than this.

HEALTHY RIPARIAN AREAS BENEFIT EVERYONE!

Healthy watersheds and riparian-wetland areas are critical to providing communities with the economic, ecological, and social benefits that come from the reliable availability of adequate supplies of clean water.

The U.S. Department of Agriculture (USDA) Forest Service and the U.S. Department of Interior Bureau of Land Management, in partnership with the USDA Natural Resources Conservation Service, has created a strategy for accelerating cooperative riparian restoration and management. This is accomplished by developing a critical mass of people who interact with and manage riparian-wetland resources based on shared knowledge of the attributes and processes that constitute sustainability.

For more information about how you can participate as a landowner, go to the National Riparian Service Team's website at ***www.blm.gov/or/programs/nrst***

Riparian areas are prone to natural disturbance, including fluctuating water levels, high flows, treefalls, and slope failures. Riparian areas are also sensitive to human-caused disturbances, with amphibians and reptiles being particularly vulnerable to riparian habitat alteration. Changes may result from vegetation removal, stream channelization, hydrological changes, mining, road construction, livestock grazing, and chemical applications. Timber harvest activities (including associated road networks) may negatively affect some resident amphibians by altering surface microclimates, refugia (e.g., loss of downed wood and soil compaction), and stream sediment loads. Livestock grazing can similarly alter vegetation and microclimate, disturb substrates, change water flow patterns, and may cause direct mortality of amphibians by trampling. When inappropriately used, chemical applications including many fertilizers, herbicides, pesticides, and fire retardants may adversely affect amphibians and reptiles.

How much upland habitat should be appropriately managed around wetlands and streams to maintain viable amphibian and reptile populations? When asked this question, a wildlife biologist might respond with, "It depends." It depends on the species, the wetland or stream characteristics, and the surrounding landscape. However, to maintain viable populations of amphibians and reptiles, it is important to provide at least some upland habitat around each water body, and more is usually better.

A general approach based on indirect evidence* of buffer widths:

1. At the very least, maintaining some riparian vegetation and minimizing shoreline disturbance within 3 – 30 feet (1-9 m) could allow some amphibian and reptile species to use the water body.
2. Providing 30 - 50 foot (9 – 15 m) of mostly intact riparian and upland habitats (referred to as "riparian buffers" or "buffer zones") along all or part of a wetland or stream is usually considered a minimum buffer for habitats managed for wildlife or water quality protection.
3. Establishing a mostly contiguous 50 to 330-foot (15 – 100 m) buffer zone around or along the water body and the core terrestrial habitat will help maintain many ecological characteristics and functions of the wetland or stream, including some amphibian and reptile species, despite surrounding land use.
4. When managing habitat specifically for turtles, salamanders, and other semi-aquatic species that use uplands, an additional "core habitat" area should extend to a distance of about 540 to 900 feet (165 m - 275 m) from the water's edge. These surrounding upland habitats are necessary for population persistence of these species, and may require additional "buffering" themselves.

A word of caution: Few studies have looked at the relationship between population performance and buffer widths, so a complete understanding of appropriate buffer widths for amphibians or reptiles is lacking and the distances provided are mostly based on habitat use patterns of amphibians around water bodies and relative changes in habitats observed with various buffer widths. In addition, the geographic area (e.g., climate) and surrounding land use affects buffer effectiveness; a buffer in an agricultural, forestry, or urban setting is not equivocal. See Appendix H for more information on buffers.

CHARACTERISTIC SPECIES

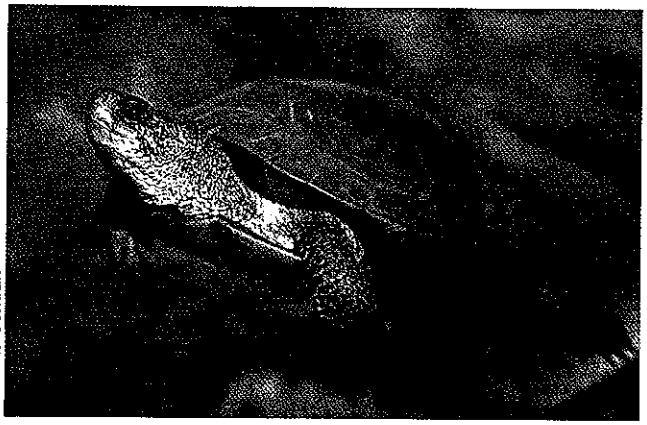
Salamanders: Giant Salamanders, Torrent Salamanders, Dunn's Salamander, Coeur d'Alene Salamander, Van Dyke's Salamander, Western Red-backed Salamander. **Frogs and Toads:** Rocky Mountain Tailed Frog, Coastal Tailed Frog, Western Toad, Pacific Treefrog, Red-legged Frog, Foothill Yellow-legged Frog, Cascades Frog, Columbia Spotted Frog, Oregon Spotted Frog. **Lizards:** Six-lined Racerunner, Western Skink. **Snakes:** Common Gartersnake, Terrestrial Gartersnake, Aquatic Gartersnake. **Turtles:** Pacific Pond Turtle, Painted Turtle, Pond Slider (introduced), Snapping Turtle (introduced except for eastern Montana and Wyoming).

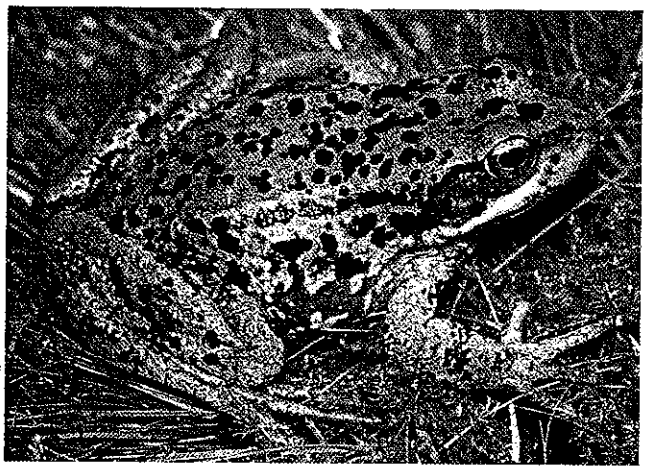
MAXIMIZING COMPATIBILITY: Timberlands, Farmlands, Recreational Lands, and Other Integrated Land Uses

Consider the following options if benefiting amphibians and reptiles is secondary to other management objectives.

- **Consider applying a mix of riparian protective measures, such as different buffer widths.** *Buffer widths used may depend on the upslope management scenario, landscape and site conditions, resident species and species of concern, and buffer objectives. A tiered approach might be employed with a smaller no-entry zone and a larger limited-entry zone, or interspersed larger and smaller zones. The benefits of alternative riparian management designs are not well-documented, hence monitoring is recommended to advance our knowledge of their efficacy relative to retention of species and riparian functions.*
- **Consider connectivity of aquatic and terrestrial habitats in management plans.** *Consider the habitat requirements of species using riparian areas as a corridor through an inhospitable landscape (e.g., pond-breeding amphibians that forage or overwinter in uplands, or streamdwellers that must pass through culverts), and potential linkages across watersheds by relative proximity of headwater riparian areas and across adjacent ridgelines.*
- **Carefully manage activities and ground disturbances in or near riparian areas.** *Timing of activities needs to reflect the annual life cycle of species. Generally, riparian-dependent gartersnakes are active during drier warmer conditions, many amphibians are surface active or breed during a narrow window in spring or fall,and turtle activities will include nesting (spring-early summer) and hatching (late summer).*


Bill Leonard


Charlotte Corkran


Bill Leonard

The Coeur d'Alene Salamander, Pacific Pond Turtle, and Cascades Frog are all obligate riparian species, meaning that they spend the majority of their time in or very close to water bodies.

- **Avoid development activities such as road construction in riparian areas.** *Roads intersecting riparian zones can increase sunlight and sedimentation, adversely affecting the aquatic and riparian habitats required by amphibians and reptiles. If the location of new road construction projects along streams cannot be changed, provide passageways for amphibians and reptiles such as culverts with natural substrates that provide banks and full wetted channel widths to allow instream movements of animals.*

- **Minimize the use of chemicals, such as fertilizers, pesticides, and fire retardants in or near riparian areas.** *This is especially important in riparian areas during amphibian breeding seasons. Follow the directions on the label as to where these chemicals can be applied.*

- **Reduce access to riparian areas that may facilitate the spread of invasive and nonnative plants.** *Limit access points for trails used by both people and animals (pack animals, dogs) to streams and wetlands. Construct viewing platforms and boardwalks on sensitive soils and steep banks to reduce erosion and sediment runoff.*

- **Avoid orienting trails and roads parallel to riparian areas.** *This reduces the magnitude of potential impacts from habitat fragmentation, movement barriers, mortality during migration, erosion, and sediment runoff.*

IDEAL: Refuges, Sanctuaries, and Preserves
Consider the following options if benefiting amphibians and reptiles is a primary objective and when landowners and managers wish to optimize herpetofauna diversity and abundance.

- **Identify areas for protection or restoration priority.** *Managing adjacent uplands and aquatic-riparian areas together is ideal, because riparian conditions are highly associated with both aquatic and upslope habitat conditions. Focus on areas around unique habitats (e.g., isolated seeps or wetlands, the only known breeding site for a species within a watershed) or used by unique biota (e.g., watersheds with species of concern or distinct populations). Other priority areas may include riparian areas with high disturbance potential (e.g., unstable riparian slopes due to geology or topography that increase likelihood of scour or sedimentation) caused by invasive nonnative vegetation, road construction, grazing, mining, or other human-caused disturbances.*

- **Provide aquatic-riparian linkages via delineation of riparian buffers.** *Retain or restore aquatic-riparian habitat conditions, functions, and processes. Consider buffer widths needed to retain riparian microsites and microclimates used by herpetofauna, including distances from water needed to provide terrestrial subsidies to water (shading, litter, wood), aquatic subsidies to land (transformed aquatic invertebrates and amphibians), and critical upslope habitats for species' life histories (nests, food resources, overwintering hibernacula). Buffer widths may depend on the upslope management scenario, landscape and site conditions, resident species or species of concern, and buffer objectives. Buffer widths of 50-330 feet (15-100 m) may be needed to*

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Dunn's (left) and Van Dyke's (right) Salamanders are associated with riparian areas.

maintain habitat conditions used by many riparian-dependent herpetofauna. A mix of buffer widths may be considered to integrate local knowledge of habitats or to hedge uncertainties. For example, a buffer may be expanded to include a known turtle nesting site that is 500 feet (>152 m) from water.

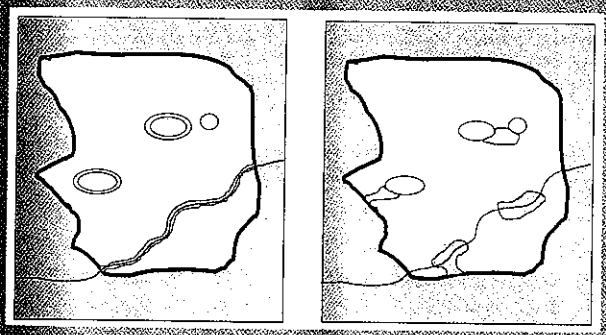
- **Maintain or restore large downed wood, interstitial spaces in substrates, vegetation, temperature, and hydrological patterns.** *Suitable microhabitat refugia and microclimates are important for both aquatic and riparian-occurring species. In areas where water flow has been regulated or altered, consider management activities that will lead toward natural flow regimes (timing and extent of peak flows, reduced water diversion).*
- **Replace culverts that fail to provide adequate aquatic organism passage, such as perched culverts.** *Open arch culverts that have natural substrates provide easier passage for salamanders, frogs, and toads, as well as snakes (see Dirt Roads and Trails page 20).*

This is the "Riparian Areas" module of the PARC Publication HMG-4. ISBN 0-9667402-5-4. Please visit ***www.parcplace.org*** for further information, copies of the complete document, or a web-based version of the Guidelines.

THINK BEYOND THE DONUT: CORRIDOR APPROACHES

One concern with recommending fixed-width core habitat areas around wetlands is that they give the impression that wetlands will continue to provide habitat for wildlife as long as they are surrounded solely by a buffer and core habitat. However, this donut-style buffer approach to habitat management may result in wetland isolation and fail to provide for landscape connectivity, genetic exchange, and movement of animals between populations. It is important to consider the needs of the population at a site and in a landscape. It may not always be necessary to provide a fixed width zone that completely encircles a wetland. Perhaps a landowner can only afford to maintain upland vegetation around half of a wetland. In that case, the side of the wetland that is most likely to serve as both core upland and as a corridor to other wetlands might be the better side to select.

Elke Wind



Riparian buffers have traditionally encircled wetlands and followed the length of streams. These minimum buffers often result in relatively narrow strips of trees that are often vulnerable to windthrow. Research into alternative buffer designs may be useful in meeting specific objectives for amphibians and reptiles under some circumstances.

PARTNERS IN AMPHIBIAN AND REPTILE CONSERVATION

HABITAT MANAGEMENT GUIDELINES FOR AMPHIBIANS AND REPTILES OF THE NORTHWESTERN UNITED STATES AND WESTERN CANADA

TECHNICAL PUBLICATION HMG-4

PURPOSE AND INTENDED USE OF THIS DOCUMENT

The goal of this book is to provide amphibian and reptile habitat management guidelines that are easily understood and practical for resource managers and private landowners to integrate with other management objectives on the landscape.

Many amphibian and reptile populations are vulnerable to the effects of habitat loss and degradation in the United States and Canada. A significant challenge is to ensure the persistence of amphibians and reptiles through thoughtful management of private and public lands and the resources they contain. When applied on the ground as general management principles, the guidelines provided in this document will promote conservation of amphibians and reptiles by

- Keeping common species common
- Stemming the decline of imperiled species
- Maintaining existing habitats
- Guiding restoration of degraded habitats

Landowners and resource managers will benefit from these guidelines because their implementation will provide ecological benefits beyond amphibian and reptile conservation. Even if only some of these guidelines are implemented, the cumulative effect will be positive.

The general information and specific management guidelines presented here (hereafter Guidelines) are based on the best available science, peer-reviewed expert opinion, and published literature. The "Maximizing Compatibility" and "Ideal" management guidelines are recommendations made and reviewed by groups of professionally trained herpetologists and wildlife biologists from private, state/provincial, and federal organizations. Because of the taxonomic and ecological diversity of amphibians and reptiles, some recommendations may not apply to every species in every situation. The authors and editors of the Guidelines suggest consulting a local herpetologist before making significant land-use changes when implementing the suggested guidelines. The Guidelines, which are developed by Partners in Amphibian and Reptile Conservation (PARC), are not legally binding or regulatory, and they do not in any way attempt to limit landowner rights. They can be regarded simply as recommendations from the PARC community to landowners and managers who are considering the needs of amphibians and reptiles in the course of their land and resource management activities. References to specific sources of information used in each of the regional Guidelines can be found at ***www.parcplace.org***.

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