# Maintaining Lentic-Breeding Amphibians in Urbanizing Landscapes of the Puget Sound Ecosystem: Do Current Regulations Protect Pond-Breeding Amphibians?

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## Background

Lentic (or stillwater) aquatic habitats are a common feature in the terrestrial landscape of the Puget Sound Ecosystem. These stillwater habitats provide breeding sites for eight native amphibian species: Northwestern Salamander (*Ambystoma gracile*), Long-Toed Salamander (*Ambystoma macrodactylum*), Western Toad (*Anaxyrus* [formerly *Bufo*] *boreas*), Pacific Treefrog (*Pseudacris* [formerly *Hyla*] *regilla*), Northern Red-Legged Frog (*Rana aurora*), Cascade Frog (*Rana cascadae*), Oregon Spotted Frog (*Rana pretiosa*), and Roughskin Newt (*Taricha granulosa*). Except for the two most aquatic species (Oregon Spotted and Cascade Frogs), these amphibians have a seasonal cycle where they breed in the lentic habitat and then move into terrestrial habitats for a substantial portion of their non-breeding season. Until recently, most efforts to conserve these species focused on protecting breeding sites, mostly in the form of wetland buffers with little attention paid to the terrestrial portion of their habitat.

Our purpose here is to use the Northern Red-Legged Frog as a case study to assess the most current (and most protective) wetland regulations in light of new information about terrestrial habitat requirements of native stillwater-breeding amphibians.

## Northern Red-Legged Frog

Like most Pacific Northwest stillwater-breeding amphibians, Northern Red-Legged Frogs adults deposit eggs in lentic habitat (Figure 1). However, they only utilize lentic habitat for breeding and a relatively brief post-breeding interval (4-8 weeks), after which they migrate into surrounding uplands, where they spend up to 9 months annually. Though their movement into upland habitat has been recognized for some time, until recently, we believed that most of those movements were relatively short distances up to about 1,000 m (1 km). Systematic studies have recently revealed that Northern Red-Legged Frogs typically move 1-2 km and as far as 4.8 km from their breeding sites (Hayes et al. 2007, 2008). These large-scale movements into terrestrial habitats surrounding breeding sites are not unique to Northern Red-Legged frogs. Recent studies have documented relatively large (1+ km) movements in a number of ranid frog species (e.g., Pilliod et al. 2003) and western toads (e.g., Bartelt et al. 2003). Needless to say, wetland buffers surrounding amphibian breeding sites do not address upland habitat needs for these species.

## Large Spatial Scale Movement Consequences

The Northern Red-Legged Frog will be sensitive to habitat fragmentation, especially in urbanizing landscapes. In particular, roads can act as both a direct mortality factor as well as contributing to fragmentation that hinders movement (Andrews and Gibbons 2008). For example, surveys of roads intersecting Northern Red-Legged Frog movement pathways in a rural landscape have revealed moderate levels of traffic-related mortality (Figure 2). Because road mortality is positively related to road density and traffic volume (Hels and Buchwald 2001), we expect urbanization to increase mortality rates.

## Relationship to Regulations

Washington State has some of the most protective buffer guidelines across Northern Red-legged Frog range with wetland buffers from 15.4 m to 91.4 m wide depending on wetland quality, function and size. However, even the largest of these buffers encompasses only a very small fraction of the terrestrial habitat used by Northern Red-Legged Frogs.

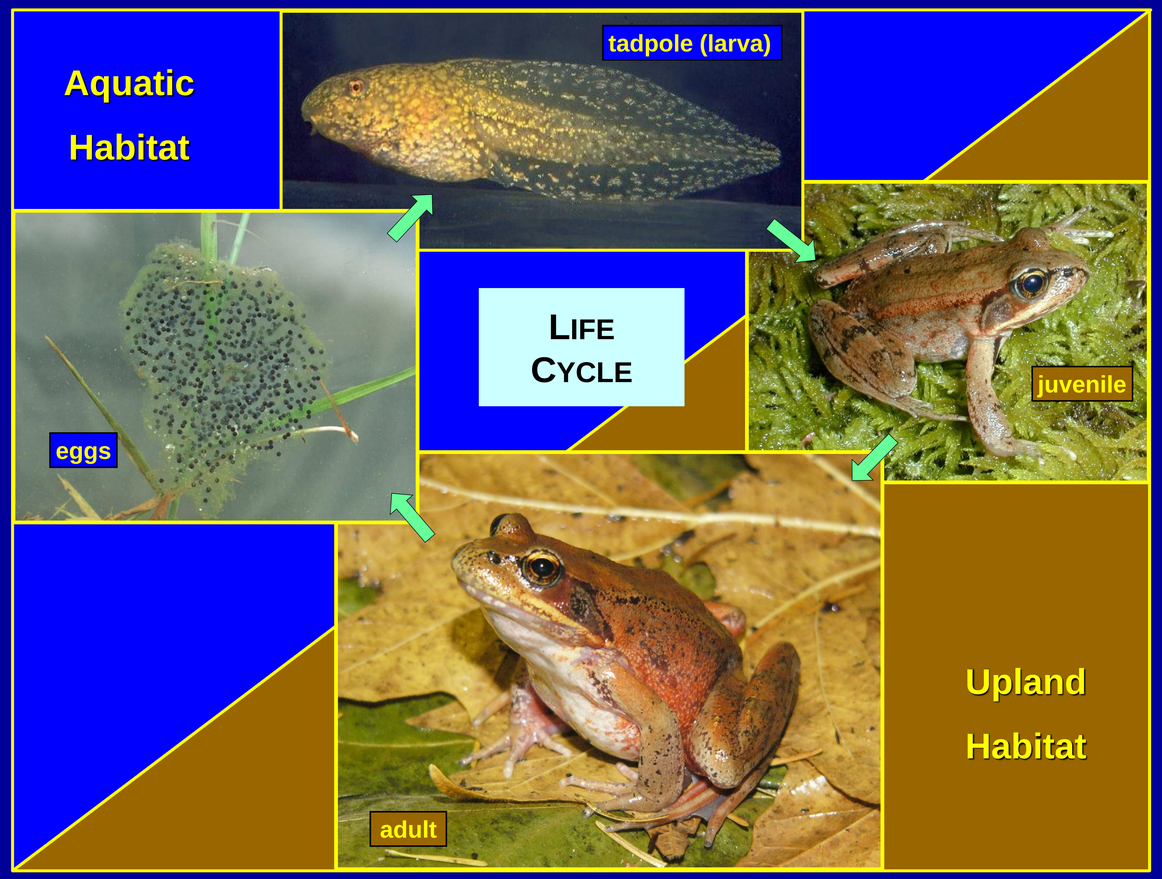


***Figure 1 (above): Northern Red-Legged Frog Annual Life Cycle.*** The blue area shows aquatic habitat and the aquatic egg and larval life stages, whereas the brown area shows terrestrial habitat. Post-metamorphic life stages, which lap the two colors, utilize both aquatic and terrestrial habitats.

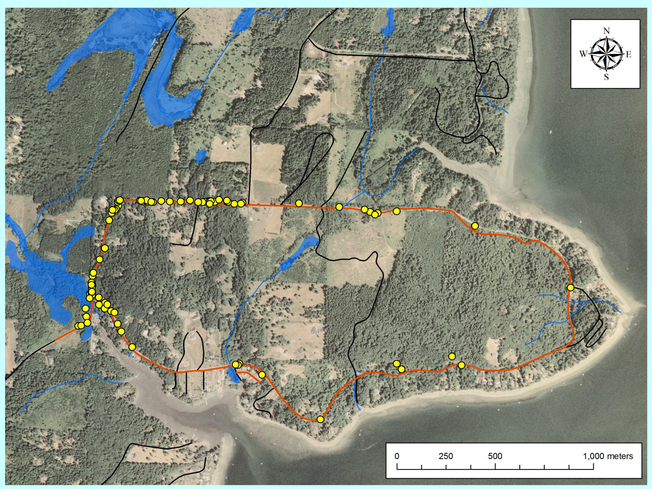


***Figure 2 (right): Traffic Mortality of Northern Red-Legged Frogs on Gravelly Beach Loop Road, Thurston County, Washington, 2006-2007.*** The roadkill survey route (in red) overlaying the road layer (in black). Wetlands and streams are blue, and yellow dots are individual Northern Red-Legged Frog roadkills from 65 surveys conducted during 2006 (n = 35) and 2007 (n = 54). Note the relative proximity of Northern Red-Legged Frog observations to wetlands and stream crossings.

Aside from buffers, few guidelines or regulations provide for terrestrial habitat needs of lentic-breeding amphibians. Within many Urban Growth Boundaries, protection of upland habitat was typically haphazard, at least until recently. The Washington State Growth Management Act (GMA) requires jurisdictions to designate geologic hazards, aquifer recharge areas, flood-prone areas, and fish and wildlife conservation areas. These designations provide for varying levels of protection from human activities. For example, fish and wildlife conservation areas are often designated as specific sites (i.e., location of a verifiable occurrence record) with localized protection measures similar in concept to a buffer. Rarely do jurisdictions consider “wildlife population” needs in such sites. Only the King County (Seattle) Critical Area Ordinance, currently under legal challenge, included provisions for protecting corridors between wetland complexes and between wetlands and upland areas in an attempt to meet amphibian habitat needs.

## Conclusion

For most local jurisdictions in the Puget Sound Ecosystem, upland habitat needs of Northern Red-Legged Frogs (and other amphibians that move over large spatial scales) will not be met with wetland buffers alone. If conservation of such species is desired, then planning for these species early in the urbanization process will be required.

## Selected Literature

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