

Herpetological Review

PLETHODON CINEREUS (Eastern Red-backed Salamander).
WETLAND HABITAT

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literature confirm the species' use of moist habitats, for example, two dead *P. cinereus* were observed in leaves of the bog-dwelling Purple Pitcher Plant (*Sarracenia purpurea*; Hughes et al. 1999. Herpetol. Rev. 30:160). We observed *P. cinereus* in moss along shorelines of wetlands and also observed the species under rocks and leaf litter in stream channels in Maine. We are aware of no previous literature documenting the occurrence and breeding of *P. cinereus* in wetland shoreline. Two publications document *P. cinereus* presence in stream channel habitat: 25 *P. cinereus* were detected under rocks (18–30 cm in diameter, 30% embedded in substrate) in ≥ 6 streams in Maine (Perkins and Hunter 2006. J Wildl. Manag. 70[3]:657–670) and the species was observed beneath stones in small streams in Maryland (Cooper 1956. Herpetologica 1956:165–166). Our observations further describe the stream channel habitat used by *P. cinereus*. The occurrence of *P. cinereus* in wetland and stream habitat has relevance to managers and biologists surveying for the species.

We thoroughly searched the vegetation growing in wetlands and on the shoreline of palustrine wetlands (N = 67) in Maine, USA (Acadia National Park, Massabessic Experimental Forest, U.S. Fish and Wildlife Service Sunhaze Meadows National Wildlife Refuge, University of Maine Foundation Penobscot Experimental Forest, University of Maine Demeritt Forest) during 2001–2003. We searched by parting vegetation growing <30 cm from water with methods described by Chalmers and Loftin (2006. J. Herpetol. 40:479–486). We detected 49 *P. cinereus* (of which at least 12 were gravid) and one clutch of eggs in vegetation in wetlands (N = 26; 39% of wetlands surveyed). We typically observed the *P. cinereus* located directly above water and in *Sphagnum* or *Thuidium* (feather moss). Twice we observed *P. cinereus* with Four-toed Salamanders (*Hemidactylium scutatum*). We observed an adult of each species entwined at one wetland. We found eggs of *P. cinereus* and *H. scutatum* within <8 cm of each other at another wetland. The *P. cinereus* clutch was located in *Sphagnum* along the shoreline of a slow moving stream in a palustrine wetland with a Red Maple (*Acer rubrum*) canopy, alder (*Alnus incana*) understory, and herbaceous layer of Blue-joint Reed Grass (*Calamagrostis canadensis*). The *P. cinereus* clutch (detected 20 June 2002 by J. Bertman) was on the underside of a rotten, leaning stump surrounded by *Sphagnum*. The clutch was attended by a female and contained six eggs. We observed the *P. cinereus* on 1 July attending two eggs attached to the stump and two eggs attached to *Sphagnum*. Twice, we observed *P. cinereus* in a wetland >10 m from the wetland edge on islets (<2 m²) that the salamanders may have reached during low water. The species can swim (Bishop 1941, *op. cit.*); however we observed *P. cinereus* placed in water initially sink, then surface and swim to shore.

We surveyed stream salamanders in Acadia National Park, Mount Desert Island, Maine, 15 May–21 June 1999 and in August 2001–2003. The only stream salamander species currently vouchered on the island is the Northern Two-lined Salamander (*Eurycea bislineata bislineata*; Brotherton et al. 2004. Acadia National Park Amphibian and Reptile Inventory: March–September 2001. Tech. Rep. NPS/NER/NRTR-2005/007. National Park Service, Woodstock, Vermont). We detected *P. cinereus* with two survey methods: 25-m long transects parallel to the stream with width 1 m onto shore and 1 m into water, and “belt” transects per-

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PLETHODON CINEREUS (Eastern Red-backed Salamander). **WETLAND HABITAT.** *Plethodon cinereus* are noted for their ability to live and breed in terrestrial “forest litter habitats in deciduous, northern conifer, and mixed deciduous-conifer forests” (Petranka 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. 587 pp.). However, although “many individuals are found far from any visible water supply and the species is less dependent on water than many others, [*P. cinereus* can be found] in greatest numbers in fairly damp situations” (Bishop 1941. The Salamanders of New York. New York State Mus. Bull. 324). Scattered reports in the

pendicular to the stream for length spanning the stream bed plus 1 m onto each shore and 1 m width. We made 72 observations of juvenile and adult *P. cinereus* (≥ 26 individuals) in transects at four (Breakneck Stream, Duck Brook, Hadlock Brook, Kebo Stream) of six streams surveyed. *Plethodon cinereus* were observed in stream bars and bank face. Microhabitat used by individuals on stream bars typically was under rock cover and on a moist substrate of sand, gravel, or cobble. Salamanders occupying the stream bank face typically were under wet leaf litter and on soil or bedrock substrate. Salamanders were occasionally found on substrate with pooled water. *Plethodon cinereus* were observed in stream channel habitat during both periods of flow and periods of low water in which intermittent flow was interspersed with pools in the stream channel.

Plethodon cinereus are found in Maine along the vegetated shoreline of wetlands and the channels and banks of streams as well as in habitat farther from water. Individuals could be moving into wet habitat temporarily during dry conditions (e.g., summer drought) when the forest floor is otherwise too dry for the species. Alternately, *P. cinereus* may use wet habitats for a longer duration if the conditions of the surrounding terrestrial habitat (shallow, rocky, well-drained soil) are typically too dry for the species. Large numbers of Eastern Red-backed Salamanders migrate towards wetlands with *Hemidactylium scutatum* and Blue-spotted Salamanders (*Ambystoma laterale*) in the spring in Vermont (J. Andrews, unpubl. data). The timing of these migrations is too early for seasonal drying of the forest floor, which typically occurs in late summer, and Andrews suggests that at these wetlands, the salamanders may leave the wetlands only for overwintering (J. Andrews, pers. comm.) Streams in our study area annually decrease in surface water area in the summer and subsequently expose cover rocks in the stream channel. We observed *E. bislineata* moved to those cover rocks closest to the remaining surface water. *Plethodon cinereus* may have an increased opportunity to use stream bed habitat during summer drought because of a greater number of cover objects available and a simultaneous decrease in interspecific competition for cover. *Plethodon cinereus* typically are displaced from moist habitats by other plethodontid species via competitive interactions (Hairston 1949. Ecol. Monogr. 19:47–73) and predation (Hairston 1980. Am. Nat. 115:354–366). The relatively few amphibian species (*Eurycea bislineata*, *Desmognathus fuscus fuscus*, *Gyrinophilus porphyriticus*, in streams, and *Hemidactylium scutatum* along wetland shoreline) occupying these habitats in Maine may improve the opportunity for *P. cinereus* to colonize these habitats with less interspecific competition than present in more southerly regions.

Further study is necessary to determine the spatial extent, duration, and seasonal patterns of stream- and wetland-habitat use by *P. cinereus* in Maine. *Plethodon cinereus* also may use wetland habitats elsewhere in its range, although this had not been reported in published literature. Researchers and surveyors of *P. cinereus* should consider the possibility that this species may occur in wetland habitats in northern portions of the species' range.

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