

Notes on Amphibians and Reptiles in Riparian and Upland Habitats on Fort A. P. Hill, Virginia

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INTRODUCTION

Riparian habitats are used extensively by amphibians and reptiles in North America (Rudolph & Dickson, 1990; Pauley et al., 2000) and act as dispersal corridors for some species (Harris, 1984; Naiman et al., 1993). Most of the research conducted on the ecology of these groups in riparian ecosystems has occurred in the Midwest (Burbrink et al., 1998) and the Pacific Northwest (e.g., Brode & Bury, 1984; McComb et al., 1993; Gomez & Anthony, 1996). Comparatively little has been conducted in eastern North America. Pauley et al. (2000) found only three studies that evaluated differences in herpetofaunal assemblages between riparian and upland habitats in the East. These studies suggest that riparian habitats are important components in conservation and management of amphibian and reptile diversity in regional landscapes.

The purpose of our study was to compare amphibian and reptile assemblages between riparian and adjacent upland habitats in a forested ecosystem in the Upper Coastal Plain of Virginia. We hypothesized that herpetofaunal species richness and relative abundance would be higher in riparian habitats. Because a diverse array of forested habitats, a network of streams, and topographic relief occur on Fort A.P. Hill, this kind of study was deemed feasible in the upper Coastal Plain.

MATERIALS AND METHODS

Fort A. P. Hill, Caroline County, Virginia, is a 30,329 ha military training installation located in the Coastal Plain physiographic province. Descriptions of the environment and habitats of this installation are in Mitchell & Roble (1998), Bellows (1999), and Bellows & Mitchell (2000).

We selected fourteen sites for study - 7 in riparian habitats and 7 in upland habitats. Riparian sites were located on the floodplains of seven different streams. Each of the 7 upland sites was located 150-250 m from the adjacent riparian site. Two of the pairs of sites were located in the Mattaponi River watershed and the remainder were located in the Rappahannock River watershed. The latter offered greater topographic relief than the former. Bellows & Mitchell (2000) provided qualitative descriptions of the 14 study sites in their report on small mammals in these habitats on Fort A.P. Hill.

We assessed habitat variables by a line-intercept method using eight equally spaced 25 m transects that radiated from the center of each study site. Variables were recorded at one-meter intervals (total each site = 200) and included presence or absence of downed woody debris (DWD). Diameter of DWD encountered in transects was measured to the nearest cm. Percent canopy closure was estimated visually over each transect point by viewing the canopy through a cardboard tube (4.5 cm diameter, 11.5 cm length).

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We used drift fences with pitfall traps to sample amphibians in an area approximately 30 m in diameter within each study site. We constructed three pitfall arrays approximately 120° apart and 15 m from the center of each study site (see Figure 1 in Bellows et al., 1999). We made drift fences with black fiber silt fencing 61 cm high and one m in length, and used plastic 3.8-l buckets (18 cm diameter x 19 cm height) for the center pitfalls. We used plastic 2-l soda bottles with the tops cut off (11 cm diameter x 20 cm height) for the peripheral pitfalls; one 2-l bottle was placed on each side of the distal end of all three drift fences. There was a total of seven pitfalls per array.

We conducted 12 four-day trapping sessions every 12-16 days from 9 April through 12 October 1998 and a mid-winter trapping session from 21 to 24 January 1999 for a total of 5,854 trap nights. Flooded pitfall traps were considered non-functional and were subtracted from the total effort. We released all captured individuals following identification in the field.

Site Descriptions

Overstory trees in riparian sites consisted primarily of hardwoods (e.g., red maple [*Acer rubrum*], sycamore [*Platanus occidentalis*], American beech [*Fagus grandifolia*]). Loblolly pine (*Pinus taeda*) was the only gymnosperm observed and only in low numbers. Understory trees were represented by saplings of overstory species and, for example, American holly (*Ilex opaca*) and flowering dogwood (*Cornus florida*). Frequency of DWD in riparian sites varied from 8.5% to 21.0% and mean diameter of DWD varied from 4.5 cm to 20.6 cm. Mean canopy closure varied from 72.8% to 85.7%.

Overstory trees in upland sites included white oak (*Quercus alba*), southern red oak (*Q. falcata*), pignut hickory (*Carya glabra*), tuliptree (*Liriodendron tulipifera*), loblolly pine, and Virginia pine (*P. virginiana*). Understory trees were similar to those in riparian sites. Frequency of DWD was 8.5-13.0% and mean diameter of DWD was 5.1- 24.0 cm. Mean canopy closure varied from 54.7% to 85.0%.

Neither average DWD occurrence frequencies (t-test = 1.78, P = 0.0997) nor mean diameters of DWD (t = 0.111, P = 0.9136) were significantly different between riparian and upland habitats. Mean canopy closure was not significantly different between the two habitat types (t = 0.443, P = 0.666).

RESULTS AND DISCUSSION

A total of six species of frogs and five species of salamanders was captured; 30 individuals total (Table 1). There were twice as many species of frogs caught in riparian habitats as upland habitats and about twice as many individuals. Five species of salamanders were captured in riparian habitats compared to three species in upland habitats. Numbers of individuals captured were nearly equal (9 in riparian sites, 12 in upland sites). Average amphibian species richness per riparian site was 1.6 ± 1.9 (0-5) and average species richness per upland site was 1.0 ± 1.2 (0-3). Average number of captures (2.1) was identical between sites. Similarity of capture rates among sites may have been a function of their close proximity, well within the home ranges and dispersal distances of many of the species captured (Pauley et al., 2000).

One eastern box turtle (*Terrapene carolina*), one eastern mud turtle (*Kinosternon subrubrum*), and one black racer (*Coluber constrictor*) not captured in traps were also observed in riparian habitats. Two box turtles were observed in one upland site. Two five-lined skinks (*Eumeces fasciatus*) were captured in a single riparian site and one eastern worm snake (*Carphophis*

Table 1. Amphibian and reptile captures in riparian and upland habitats April 1998 to January 1999 on Fort A.P. Hill, Virginia.

Species	Riparian	Upland	Total
Frogs			
<i>Bufo americanus</i>	0	2	2
<i>Bufo fowleri</i>	2	0	2
<i>Rana clamitans</i>	2	0	2
<i>Rana palustris</i>	1	0	1
<i>Rana sylvatica</i>	1	0	1
<i>Scaphiopus holbrookii</i>	0	1	1
Number of frog species	4	2	6
Salamanders			
<i>Ambystoma opacum</i>	4	1	5
<i>Eurycea guttolineata</i>	1	0	1
<i>Notophthalmus viridescens</i>	1	1	2
<i>Plethodon cinereus</i>	2	10	12
<i>Plethodon cylindraceus</i>	1	0	1
No. of salamander species	5	3	5
Total number of captures	15	15	30
Total amphibian species	9	5	11

amoenus) was captured in an upland habitat. Overall herpetofaunal species diversity was low compared to the known species richness of Fort A.P. Hill (Mitchell & Roble, 1998) and the Coastal Plain of Virginia (Mitchell & Reay, 1999).

The low numbers of amphibians and reptiles captured in this study was likely a function of the size of the drift fences and pitfall traps and the drought that occurred during 1998. Large pitfall traps (e.g., 19 l buckets) with large drift fences capture many more terrestrial amphibians and reptiles than small pitfalls like those used in this study (Mitchell et al., 1993, 1997). Rainfall amounts were at drought levels in 1998, averaging 17% below normal for the trapping period (Bellows & Mitchell, 2000). Amphibians and reptiles are active and disperse much more readily during rainfall events than when surface conditions are dry (Stebbins & Cohen, 1995; JCM unpublished). There were few opportunities to disperse during our study year, especially in late spring and summer months. Thus, a combination of factors contributed to the low sample sizes.

Although riparian habitats should offer moist microhabitats on a more consistent basis than upland sites, our hypothesis that herpetofaunal species richness and relative abundance would be higher in this habitat type than in upland habitats was not supported by our results. This result is similar to that for small mammals in these habitats (Bellows & Mitchell, 2000). They concluded with larger sample sizes that both upland and riparian habitats were important to the small mammal fauna on Fort A.P. Hill. Elucidation of amphibian and reptile distributions between riparian and upland habitats in the upper Coastal Plain of Virginia requires more effective sampling methods than that used here. Such methods used in non-drought conditions may yield different results. However, the relatively low topographic relief in this area may not provide sufficient microgeographic variation in habitats to segregate amphibian and reptile species or populations. Other environmental variables, such as forest cover type and proximity of wetlands, may be more important in determining distribution patterns of these vertebrates on Fort A.P. Hill.

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