Subject: Conservation of amphibian and reptile communities with streamside management zones in forest management and construction sites.

Background

Streamside management zones (SMZ) are narrow strips of undisturbed vegetation adjacent to bodies of water that protect riparian areas and streams from impacts of timber and other land management activities. Guidelines for SMZ widths vary depending on the managing agency or local regulations. SMZ's rarely exceed 50 m in width and often are much less. According to best management practices (BMP) for forestry in Mississippi, a 9.2-m (30 feet) SMZ width is recommended for intermittent streams and perennial streams with 0-5% slope of adjacent land. Recommended widths increase with increase in slope to a maximum of 18.3 m (60 feet) for land with >40% slope (Mississippi Forestry Commission 2008). Other states recommend similar or less protection for headwater streams. Idaho BMP's recommend a minimum 1.5-m (5 feet) SMZ surrounding headwater streams without a fishery (Belt et al. 1992). Some areas of North Carolina require 10.7-m SMZ's surrounding small streams (MCDEP 2001).

We conducted studies on 21 sites of Tombigbee National Forest and Noxubee National Wildlife Refuge from 2002 – 2005 (Fogarty 2005). One of our primary goals was to determine if adequate SMZ widths for conservation of herpetofauna habitat in timber harvest areas, including seed tree, shelterwood and clear cuts for pine regeneration. Also, we sought to identify factors that potentially influenced herpetofaunal dispersion within riparian habitats of sreams. We used area searches to estimate abundance of reptiles and amphibians during fall-winter, spring, and summer periods. Area searches were conducted within 300-m^2 belt transects measuring 6 m x 50

m. in hardwood or mixed hardwood pine forests adjacent to streams. Four sets of transects were marked and arranged parallel to streams at 0, 25, 50, 75, and 100 meters from selected first- and second-order streams. Transects were searched at least three times/year from April 2000 - October 2002 resulting in 111 surveys. Twenty-five reptile species (1,226 individuals) and 16 amphibian species (825 individuals) were recorded during area searches.

Best models of herpetofaunal dispersion were determined using Akaike's Information Criterion corrected for small sample size (AIC_c). Dispersion was measured as the slope of the linear regression line formed by plotting amphibian and reptile abundance by distance from stream. Habitat variables included in modeling dispersion included slope of adjacent land, stream channel width, percent basal area of overstory trees consisting of pine, density of smaller drainages and pools within the study area, and density of logs on the forest floor. One variable, slope, had a significant positive association with amphibian dispersion from streams. This result may be related to slope influences on microsite conditions and amphibian sensitivity to xeric conditions of higher elevation slopes. Abundance of pine (basal area) in the overstory had a negative influence on amphibians. No habitat variable had a significant association with reptile dispersion. Reptile abundance declined with increasing distance from stream, but the decline was gradual. Amphibian abundance declined sharply from 0 to 100 m from streams with a noticeable decline in numbers from 0 to 25 m. Because reptiles are less dependent on riparian areas than amphibians, reptile communities may not suffer the same unfavorable effects as amphibian communities in areas with narrow SMZ requirements. Dispersion patterns revealed that 72.0% of all amphibians were found within 1 m of the stream, 83.2% were detected within 25 m of streams, and 91.0% were detected within 50 m of streams. A 50-m buffer strip would be needed to protect over 90% of all amphibians found within 100 m from streams. Over 80% of the amphibian community would be protected with a 25-m buffer strip. However, SMZ widths of 9

to 18 m would be inadequate to protect over 80% of the amphibians inhabiting riparian habitats of small streams.

Current BMP's for forestry in Mississippi recommend at least 9.1-m (30 feet) SMZ's for perennial streams, and recommended width for SMZ's increases with increasing slope of adjacent land to a maximum of 18.3 m (60 feet) for slopes over 40%. Intermittent streams have a minimum recommended SMZ width of 9.1 m with wider SMZ's left to the judgment of forest managers.

Recommendations

1) We recommend an SMZ width of 25 m for low-order streams in this region of Mississippi to protect at least 80% of the amphibian community in riparian areas from direct impacts of timber harvest. A width of 30 m may be considered to protect the outer edge of the buffer from windfall and erosion effects. For protection of >90% of the amphibian community within 100 m of streams, SMZ widths of 50 m are recommended.
2) Wider SMZs are recommended for steeper slopes for erosion considerations. In contrast, our data show more gradual slopes should have wider SMZ's if we consider the amphibian community, because amphibians are more dispersed from streams with less slope.
3) Site conversion of drainages and riparian habitats to pine strongly discouraged due to the negative influence of pine overstory, xeric habitat conditions, and overstory and substrate disturbance on selected amphibian species, such as streambank salamanders (*Eurycea* spp.), woodland salamanders (*Ambystoma* spp.), and rare salamanders, such as red salamander (*Pseudotriton ruber*) and Webster's salamander (*Plethodon websterii*).
4) When regeneration harvest for pine or grassland enhancement such as timber removal and herbicide application is conducted, we strongly recommend the retention of

hardwoods along ephemeral drainages and pools and streams for conservation of amphibians and selected reptile species. This approach can also provide habitat for gray squirrels, turkeys, and many resident, winter migrant, and neotropical migrant birds that inhabit NNWR. This approach can also retain soft and hard mast producing vines, shrubs, and trees within intensely managed pine or pine grassland habitats (ie. Quail Management Area). This retention of food sources can benefit targeted game species (Quail and Turkey) as well as invertebrate pollinators and neotropical migrant birds (ie. Wood Thrushes, Hooded Warblers, Catbirds; Dickson and Wigley 2001).

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Citation for this study:

Fogarty, J.H. 2005. Distribution and habitat associations of reptiles, amphibians, and fishes on public lands of east-central Mississippi. Ph.D. Dissertation, Mississippi State University, Starkville.