

## **Assessing Amphibian Responses to Forest Harvest and Streamside Management Zone Practices in the Dry Creek Watershed, Georgia**

D.W. Bennett<sup>1,2</sup>, B.L. Talley<sup>1,2</sup>, and T.L. Crisman<sup>2,3</sup>

<sup>1</sup>Graduate Student, <sup>3</sup>Professor and Director

<sup>2</sup>Department of Environmental Engineering Sciences, University of Florida and Howard T. Odum Center for Wetlands, Gainesville, FL, USA

Amphibians (frogs and salamanders) have been monitored monthly since December 2002 as part of a study examining the impact of forest harvest and Streamside Management Zone (SMZ) practices. The study encompassed four adjacent subwatersheds of the Dry Creek Watershed at the Southlands Experimental Forest of International Paper, Bainbridge, GA. Two watersheds were left intact, while two were harvested. The SMZ was left intact in the upstream reach of each treatment stream, while in the downstream, 50% of basal area was removed from the SMZ (selective harvest). Terrestrial salamanders were assessed using plywood coverboards at fixed stations throughout the watersheds. Salamander numbers were greatest closer to the streams, within the width covered by the SMZ, and were higher in intact than thinned SMZs. After three years, boards began to deteriorate. Comparison of concurrent old and new coverboard data for one year suggested that board replacement had little effect on salamander captures. Treefrog assessment utilized PVC pipes driven vertically into the substrate as habitat attractants. Capture likelihood was reduced at high temperature and increased colonization of pipes by wasps in harvested areas. Finally, while both leaf litterfall bags and sweep nets were used to assess stream salamander abundances, both displayed biases that must be incorporated into long-term assessments of salamanders.

### **MATERIALS AND METHODS**

Southlands Experimental Forest of International Paper occurs within the Coastal Plain region, GA (30° 47' 30"N and 84° 37' 30"W), approximately 16 km south of Bainbridge, GA (Figure 1). First-order perennial streams draining four neighboring watersheds (termed A, B, C, and D) were studied. Pre-harvest in-stream habitat composition included coarse woody debris, undercut banks, leaf packs, fine roots, and pools. Streams were groundwater-fed with sand-dominated substrates.

Amphibian monitoring began in December 2002. All four watersheds were sampled for 10 months in order to collect base-line data before harvesting watersheds B and C. Terrestrial adult salamanders were monitored utilizing coverboards (1.9 cm untreated plywood sheets cut into 60 X 60 cm squares) as habitat attractants. Vertical polyvinyl chloride (PVC) pipes (5.1 cm diameter, 60 cm height above ground) were used for treefrog monitoring. Sampling locations were placed along transects perpendicular to the stream toward adjacent uplands. Eight coverboards and PVC pipes were placed on each side of the stream in designated habitat zones (64 total sampling locations per watershed). The four habitat zones were designated as (1) streamside, (2) riparian, (3) midslope, and (4) upslope, with increasing distance from the stream.

Salamanders and treefrogs found at sampling locations were identified to species, counted, and snout-to-vent length recorded for salamanders.

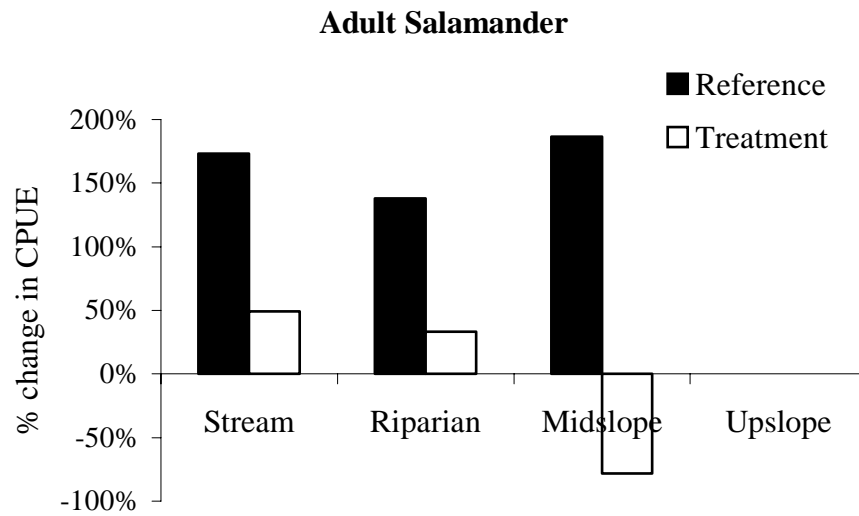
Watersheds B and C were harvested utilizing two treatment regimes beginning in September 2003. The SMZ was left intact in the upstream portion of each watershed, while 50% of the basal area was removed (selective harvest) in the downstream portion. Watersheds A and D were not harvested, but left intact to serve as reference sites. Post-harvest monitoring for this study continued until April 2006.

Amphibian data was analyzed on a catch per unit effort (CPUE) basis. CPUE is the number of individuals encountered at a sampling location divided by the total number of visits to the location.

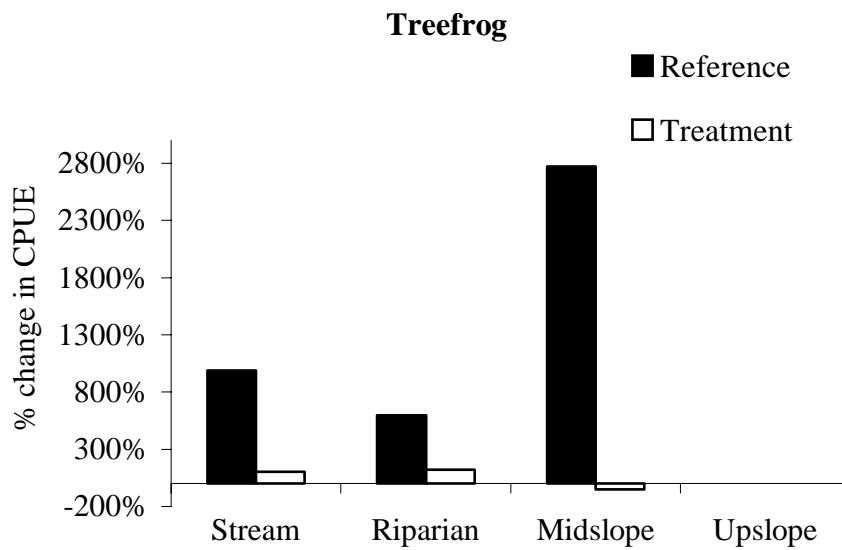
## **RESULTS AND DISCUSSION**

Amphibian CPUE increased in all watersheds from September 2003 to April 2006 following timber harvest (fig. 1, a and b). Reference watershed amphibian CPUE experienced a high increase in both the region outside the SMZ (midslope and upslope), and within the SMZ (stream and riparian). Treatment watershed CPUE decreased in the region outside of SMZ (midslope and upslope) in as expected in harvested zones, and had a small increase in the region within the SMZ. CPUE differences within the SMZ between reference and treatment watersheds may be attributed to temperature and moisture changes within the SMZ following harvest. Upstream and downstream treatments of the SMZ yielded similar results for both treatment and reference watersheds. In all cases the upstream portion was found to have a greater CPUE.

After three years of sampling, coverboards began to deteriorate. New coverboards were placed next to old coverboards in April 2005. Comparison of concurrent old and new coverboard data for one year suggested that board replacement had little effect on salamander captures. In harvested watersheds, coverboards and PVC pipes experienced a notable increase in occupation by ants and wasps. Capture likelihood was reduced at high temperature and increased colonization of coverboards and pipes.



**Figure 1(a).** Adult salamander percent change in CPUE from pre-harvest baseline data (12/2002-9/2003) to post-harvest data (10/2003-4/2006).



**Figure 1(b).** Treefrog percent change in CPUE from pre-harvest baseline data (12/2002-9/2003) to post-harvest data (10/2003-4/2006).