



Comparison of Herpetofaunal Communities in Areas Disturbed by Oak Regeneration Silvicultural Treatments

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Abstract

Herpetofaunal (reptiles and amphibians) communities are a crucial ecological component of hardwood forests and could be impacted by habitat disturbance caused by prior silvicultural practices used to promote advanced oak regeneration in the Southern Appalachian Mountains. From May to August 2013 herpetofauna were trapped to evaluate the continuing impact of different silvicultural practices implemented 3-4 years earlier, intended to promote oak regeneration by altering light and competition (oak shelterwood by midstory herbicide (OSW), shelterwood-burn (SW; burns had not yet been conducted), and prescribed fire (B) plus controls (C). Each silvicultural treatment and control consisted of five-ha units with four replicates each. Herpetofauna were trapped using eight drift fences with two pitfall and two funnel traps at each fence in each treatment unit. Total number of herpetofauna captured during the sampling were similar among all treatments. Further captures of the seven species most commonly detected were similar among treatments. As this is the fourth year post treatment, herpetofaunal communities may have not had enough time to respond to the change in habitat conditions caused by the forest disturbances. Conversely, environmental changes following the oak regeneration practices may be too minimal to alter reptile and amphibian abundance strategies. We will continue sampling in summer 2014 after a second prescribed fire is conducted in the prescribed fire treatment and after the prescribed fire is conducted in shelterwood-burn treatment unit during winter 2013-14.

Introduction

Upland, mixed-oak forests occupy over 50% of the forested land base in the Central Hardwood Region of the United States (Johnson et al, 2002), and oak trees play a pivotal role in forest ecology of the region. Despite its ecological importance, eastern oak forests are threatened by oak decline and widespread oak regeneration failure (Aldrich et al, 2005).

Silvicultural disturbances used to regenerate oaks affect forest structure and composition at macro- and micro habitat scales. Many species of reptiles and amphibians use structural features of forests, ranging from the tree canopy to the forest floor. Microsites such as coarse woody debris (CWD), brush-piles, and forest floor duff and leaf litter may be used for cover, nesting, foraging, and thermoregulation (Loeb, 1996).

The forested stands selected for study were located on the Cold Mountain Game Land (CMGL) in western North Carolina. CMGL, which is managed by the North Carolina Wildlife Resources Commission, is located along the escarpment of the Blue Ridge Physiographic Province and encompasses ~5,900 ha of second-growth, upland mixed-oak forests. Elevations within the area range from approximately 350 -800 m. Terrain is mountainous with gentle to steep slopes. Oaks along with hickory (*Carya* spp.), red maple, and yellow-poplar are the predominant overstory trees except along ridgelines where shortleaf (*Pinus echinata*) and Virginia (*Pinus virginiana*) pine dominate (Keyser et al, 2008).

Introduction cont'd



Figure 1: Cold Mountain Game Lands is shown in light green. Inset (A) shows the specific location of the game lands within the state of North Carolina (NCWRC, 2013).

There are uncertainties of the amount of impact silvicultural treatments aimed at oak regeneration may have on forest floor dwelling vertebrates. This study was conducted to determine the impact the silviculture treatments may have on reptile and amphibian populations in the southern Appalachians.

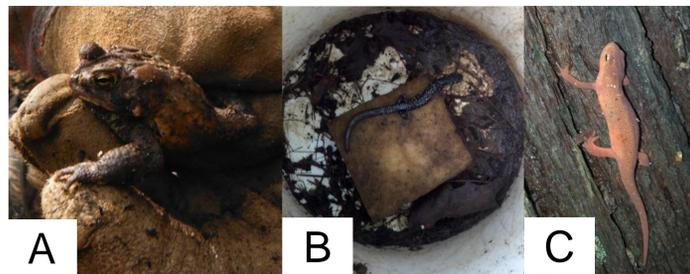


Figure 2: Some common species found in the study. A) *Bufo americanus*, B) *Plethodon teyahalee*, C) *Notophthalmus viridescens*

Methods

- This study compares three different treatments recommended to promote oak regeneration: midstory herbicide (MH), shelterwood harvests (to be burned winter 2013-2014) (SW), prescribed burn only (Rx), and a control(C).
- A total of 16, 5 ha units (3 treatments plus control, 4 replicates each) were installed in 2008 at Cold Mountain State Gamelands near Canton, NC
- Treatments were assigned randomly to each treatment unit resulting in a completely randomized design
- Two prescribed fire treatments units were burned in April 2008 and the other two in April 2009
- Midstory herbicide was implemented in late summer 2008
- Shelterwood harvest took place from winter 2009 to early spring 2010

Methods cont'd

- Within each unit were eight randomly oriented 7.6 m long drift fences with a 20 L bucket buried flush with the ground surface at both ends, and a double-sided funnel trap on both sides of each fence.
- Each fence was greater than 10 m apart at center of fence.
- Traps were checked daily (except Sundays) from May 28 to August 9, 2013.
- 18,688 trap nights for the study period.
- Second phase of long term herpetofaunal monitoring (first phase 2008-2011)

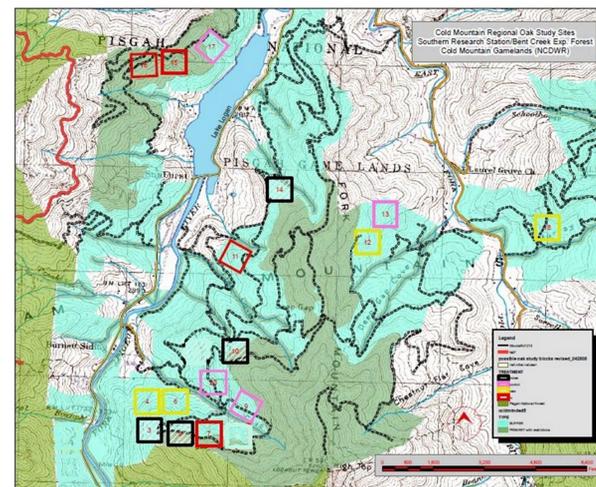


Figure 3: Regional oak study area at Cold Mountain State Gamelands showing 3 treatments and control with 4 replicates each. Each treatment unit is 5 ha.

Results

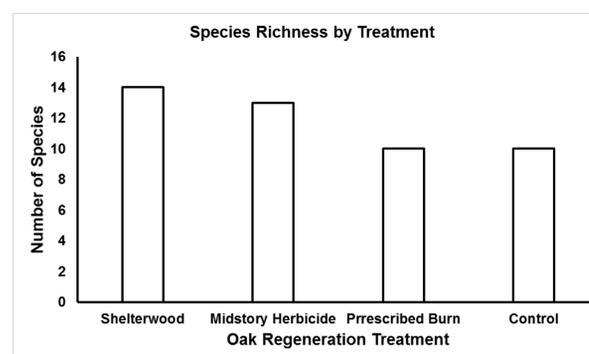


Figure 4. Number of species caught in each treatment and control

Results - con't

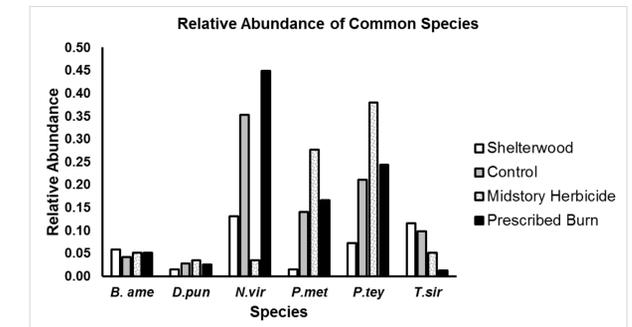


Figure 5. Relative abundance of the six most commonly caught species by treatment.

Conclusions

- Total number of herpetofauna captured were similar among all treatments and control ($P = 0.2509$)
- Similar results to phase 1 study, no differences found
- Sampling to continue summer 2014.
- Shelterwood harvest burns over winter 2013-14
- Continual monitoring necessary to determine long-term effects of habitat disturbance

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