



Reptile and amphibian response to season of burn in an upland hardwood forest

[Cathryn H. Greenberg](#), [Tyler Seiboldt](#), [Tara L. Keyser](#), [W. Henry McNab](#), [Patrick Scott](#), [Janis Bush](#), [Christopher E. Moorman](#), *Forest Ecology and Management* 409 (2018) 808–816

In this study, researchers compared reptile and amphibian (herpetofauna) community responses to dormant versus growing season prescribed fires. Reptiles and amphibians are potentially vulnerable to habitat alterations due to fire, but most previous studies have considered dormant season fires only. This study compared the number of species (richness) and relative abundance (capture rate) of common herpetofaunal species between growing- and dormant-season burns and associated vegetation changes.

The study occurred from 2013 to 2016 in an upland hardwood forest in the southern Appalachians, at the 2500 ha Bent Creek Experimental Forest (Pisgah National Forest) located in western North Carolina, USA. Nine ~5 hectare research units were designated, consisting of three dormant-season burn units, three growing-season burn units, and three control units. All occurred in closed canopy forests dominated by mature oaks. Common tree species included: black oak (*Quercus velutina*), chestnut oak (*Q. montana*), scarlet oak (*Q. coccinea*), white oak (*Q. alba*), sourwood (*Oxydendrum arboreum*), red maple (*Acer rubrum*), and dogwood (*Cornus florida*).



Five-lined skink (*Plestiodon fasciatus*)
(Photos this page: Tyler Seiboldt)

MANAGEMENT IMPLICATIONS

- Neither dormant-season nor growing-season prescribed fires had an adverse effect on capture rates of reptiles and amphibians in a Southern Appalachian upland hardwood forest.
- Five-lined skink captures increased after growing-season burns, likely due to modest reductions in forest canopy cover that increased light reaching the forest floor.

Growing-season burns were conducted in late April 2013, and dormant-season burns in March 2014. Dormant season was defined by the absence of live leaves on deciduous trees, and the beginning of the growing season was defined by the presence of new, small leaves on white oak, dogwood, yellow poplar and red maple, and full flowering of dogwood and certain oaks. Researchers measured fire temperatures and the effects of treatments on live tree density, percent cover of woody understory, percent canopy cover, and leaf litter depth.

Herpetofauna trapping was conducted continuously throughout late spring and summer over four years. The animals were live captured using pitfall and funnel traps aided by drift fences. Captured reptiles and amphibians were identified to species, weighed, measured, sexed, and marked by scale-clips, toe-clips, or scute-notches prior to release. Species richness and relative capture rates were assessed for frogs, salamanders, lizards, snakes, and total herpetofauna, and also for commonly trapped individual species.

Results from vegetation measurements showed that the density of overstory and midstory trees did not differ between treatments. Shrub cover and leaf litter depth was reduced immediately after both seasons of burn. Changes in the percent of canopy cover were small within the

control and dormant-season burn units. However, in growing-season units, canopy cover decreased by about 16% within four years. Fire temperatures were significantly lower in dormant-season burns than in growing-season burns, and authors suggest that higher burn temperatures may have influenced the canopy reduction by weakening trees.



Slimy salamander (*Plethodon teyahalee*)

Reptile and amphibian response to season of burn

During four years of sampling, researchers trapped 489 individual amphibians (plus 6 recaptures) representing 12 species. The most abundant amphibians were American toad (*Anaxyrus americanus*), Southern Appalachian salamander (*Plethodon teyahalee*), and red salamander (*Pseudotriton ruber*). Additionally, researchers trapped 192 individual reptiles (plus 11 recaptures) representing ten species. Five-lined skink (*Plestiodon fasciatus*) and Eastern fence lizard (*Sceloporus undulatus*) dominated reptile captures.

Overall, herpetofaunal species richness was higher in growing-season burns than in dormant-season burns or controls, but only in some years. Salamanders were captured in greater numbers immediately following both season of burn treatments relative to subsequent years. More five-lined skinks were captured in growing-season burns compared to dormant-season burns or controls. Capture rates of total lizards and snakes, Southern Appalachian salamanders, American toads, and red salamanders did not differ among the three treatments; fewer frogs were found in control units than in burned areas. For reptile and amphibian species that were captured in numbers sufficient for statistical analysis, the study showed no adverse effects from prescribed fire, regardless of season of burn.

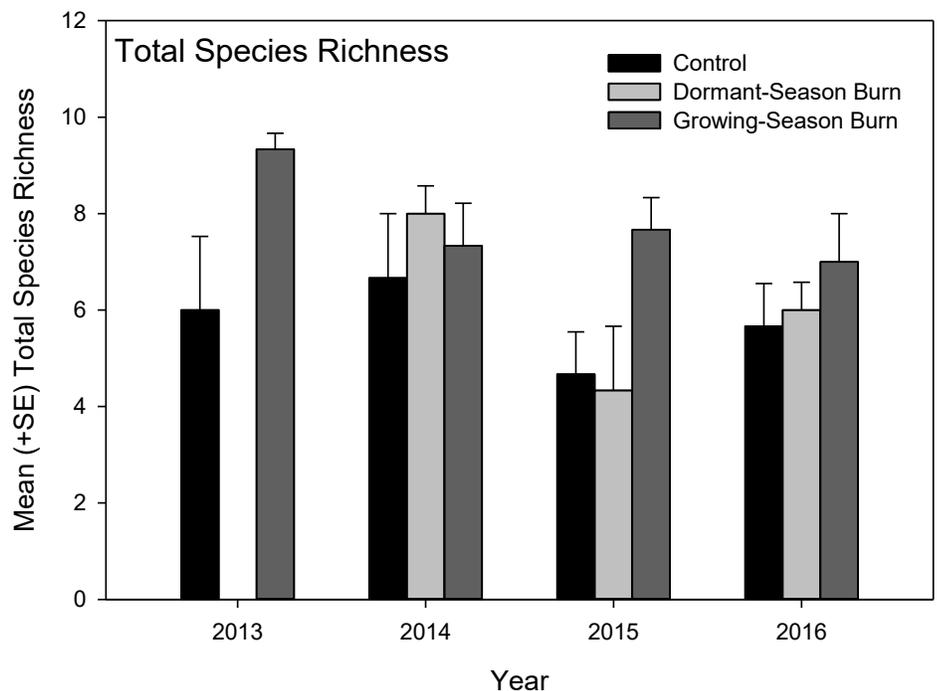
Results of this study clearly indicated that prescribed burns, whether conducted during the dormant or the growing season, did not adversely affect reptile or amphibian populations. Further, growing-season burns may benefit five-lined skinks, possibly due to modest reductions in canopy cover. Other studies also indicate

that prescribed burning in upland hardwood forests does not negatively affect reptiles or amphibians, and may benefit some lizard species (see Harper et al. 2016). Previous studies have also shown that canopy disturbances of various kinds – whether due to wind, harvesting, thinning, or burning – create conditions favorable to lizards, which in turn increases their abundance. In this study, canopy cover decreased gradually and modestly in growing-season burn units, and reptile captures there increased more than in the other treatment types. While researchers did not conclusively attribute the increase to reduced canopy cover, they noted that lizards benefit from the warmer and drier forest floors that result from a thinner forest canopy. The authors suggest that the marked increase in salamander captures immediately after prescribed fires was likely associated with a temporary decrease in leaf litter.

The authors note that capture rates may

represent aboveground activity levels rather than relative abundance of animals among the treatments; many species, such as salamanders, spend much of their time belowground. They cautioned against generalizing their results beyond the common herpetofauna captured in the study area. Authors also note that although the study was not designed to assess the ability of herpetofaunal species to find refuge during fires, results indicated that many of them apparently can retreat to safety during burns.

Further research is warranted, authors say, but they concluded that common reptile and amphibian species were not negatively affected by either dormant-season fires or growing-season fires in this upland hardwood setting, and that increased herpetofaunal activity post-burn was probably linked to changes to microhabitats and light levels rather than to the season of burn per se.



Mean (+ SE) total herpetofaunal species richness in early growing-season burn (April 26, 2103; GSB), dormant-season burn (March 5, 2014; DSB), and unburned controls (C), 2013–2016. GSB and C units were sampled 2013–2016; DSB units were sampled 2014–2016, Bent Creek Experimental Forest, Pisgah National Forest, Buncombe County, NC.

FOR FURTHER READING

[Harper, C.A., Ford, W.M., Lashley, M.A., Moorman, C.E., Stambaugh, M., 2016. Fire effects on wildlife in the Central Hardwoods and Appalachian regions. *Fire Ecol.* 12, 127–159.](#)

Chart is reprinted by permission of [Forest Ecology and Management](#) 409 (2018) 808–816

