



A Soil's Story of Southern Prescribed Fire

Adam Coates, Virginia Tech, acoates4@vt.edu

MAIN QUESTIONS OR ISSUES THAT YOU ADDRESSED

How does prescribed fire impact forest soil resources in the southern Appalachian Mountains, southeastern Piedmont, and southeastern Coastal Plain?

LOCATION AND ECOSYSTEM INVESTIGATED

Southern Appalachian Mountains: Green River Game Lands, Hendersonville/Saluda, North Carolina
Southeastern Piedmont: Clemson Experimental Forest, Clemson, South Carolina
Southeastern Coastal Plain: Tom Yawkey Wildlife Center, Georgetown, South Carolina and Santee Experimental Forest (Francis Marion National Forest), Cordesville, South Carolina.

KEY FINDINGS OF YOUR RESEARCH

Prescribed burning, both alone and in conjunction with mechanical thinning, caused little impact to macronutrients, micronutrients, nitrogen dynamics, and soil bulk density in mixed pine-hardwood forests of the southeastern Piedmont and southern Appalachian Mountains up to four years beyond implementation of these treatments. Forty years of frequent prescribed fire in a longleaf pine forest located in the southeastern Coastal Plain in Georgetown, South Carolina did not significantly alter forest floor chemistry. This included no significant alteration to polycyclic aromatic hydrocarbons (PAHs) and compounds that are associated with black carbon (pyrogenic carbon). Long-term fire exclusion in an additional watershed located in the southeastern Coastal Plain on the Santee Experimental Forest near Charleston, South Carolina has altered overstory composition and forest floor chemistry. Preliminary results suggest that this has subsequently affected surface water quality. When comparing water quality from a burned watershed, it appears that prescribed burning may improve surface water quality over the long-term.

HOW DID YOU ANSWER THE MAIN QUESTIONS OR INFORM THE ISSUES?

Research representative of the southeastern Piedmont and southern Appalachian Mountains was conducted as part of the National Fire and Fire Surrogate Study. Forest restoration treatments were conducted under the guidance of local, forest management expertise. Specific questions regarding the methods are addressed in the following article: Coates, T. A., Shelburne, V.B., Waldrop, T.A., Smith, B.R., Hill, H.S. Jr., Simon, D.M. 2010. Forest soil response to fuel reduction treatments in the Southern Appalachian Mountains. In: Stanturf, John A., ed. 2010. Proceedings of the 14th biennial southern silvicultural research conference. Gen. Tech. Rep. SRS121. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 283-287. https://www.srs.fs.fed.us/pubs/gtr/gtr_srs121/gtr_srs121.pdf

The research conducted in Georgetown, South Carolina on the southeastern Coastal Plain at the Tom Yawkey Wildlife Center was conducted according to the burn plans of Mr. Jamie Dozier, South Carolina Department of

This research was presented at the 7th International Fire Ecology and Management Congress, which was held in Orlando, Florida, November 28-December 2, 2017 and was hosted by the Association for Fire Ecology, in cooperation with the Southern Fire Exchange.

Natural Resources. Forest floor chemistry was determined using analytical pyrolysis/gas chromatography-mass spectrometry. Specific method questions are referenced in the following article: Coates TA, Chow AT, Hagan DL, Wang GG, Bridges WC, Dozier JH (2017) Frequent prescribed fire as a long-term practice in longleaf pine forests does not affect detrital chemical composition. *Journal of Environmental Quality* 46:1020-1027. <https://dl.sciencesocieties.org/publications/jeq/abstracts/46/5/1020>.

Aerial burning has been conducted periodically (approximately every 5 years) as part of the management strategy of the USDA Forest Service on the watersheds of the Santee Experimental Forest. Long-term water sampling has been conducted there for many years. Additional information regarding the watershed locations and long-term management strategy can be found at: <https://www.srs.fs.usda.gov/charleston/santee/> .

HOW MIGHT/WILL IT INFLUENCE FIRE MANAGEMENT DECISIONS OR PRACTICES?

Our research indicates that typical prescribed fire operations (i.e. low intensity surface fires) in southern forests alter forest soil resources very little, if at all, over the long-term. In cases where there is alteration, such as on the Santee Experimental Forest near Charleston, South Carolina, alterations in forest soil properties as a result of fire may actually enhance properties such as water quality.

WHO IS THE MAIN END-USER OF YOUR RESEARCH?

This research is management focused. Our results should provide additional confidence to managers that the standard fire prescriptions in southern forests do not negatively impact forest soil resources and processes. Wildfire hazard reduction and habitat management are largely the focus of their treatment objectives. According to our research, the implementation of fire for these objectives has not compromised long-term forest soil health or integrity.

CONGRESS SESSION

Fire Ecology and Effects