

Restoration of degraded ecosystems

Katherine J. Elliott, James M. Vose, Jennifer D. Knoepp, and Barton D. Clinton
 USDA Forest Service, Southern Research Station, Coweeta Hydrologic Laboratory, Otto, NC



Background: Restoration of degraded ecosystems has been a component of Coweeta's research program for several years. Areas of interest include riparian zones; pine/hardwood communities affected by a combination of drought, southern pine beetle, and fire exclusion; and invasive species impacts such as the hemlock woolly adelgid. In many areas, the structure and function of riparian zone ecosystems have been severely degraded. The most dramatic changes occur where the natural landscape has been converted to alternative uses, such as urban and suburban development, livestock grazing, hayfields, or row crop agriculture. Vose et al. (2005), in collaboration with the EPA, quantified the short-term recovery of N cycling processes in restored riparian zones in agricultural (pasture and hayfields) watersheds and used the resistance/resilience analogy to evaluate responses. Research on hemlock woolly adelgid impacts and headwater stream riparian areas is presented in another poster (see Clinton, Forest Watershed Science Area pg. 67). In the southern Appalachians, continued use of prescribed fire for fuel reduction, wildlife habitat creation, and competing vegetation reduction has generated concern about the effects of fire on ecosystem integrity. Coweeta scientists are particularly interested in the question: "Can fire be used as a restoration tool while maintaining or enhancing watershed ecosystem health and sustainability?"

Fire as a restoration tool: What are the ecosystem responses to prescribed fire?

Description of burn study areas						
Site	Burn	Community	Burn description	Time	Area (ha)	References
Jacob Branch (2 burns)	Fell and burn	Mid elevation, Oak/pine	High intensity, low to moderate severity	Sept	6	Switt et al. 1991, Vose & Swanik 1993, Knoepp & Swanik 1993, Vose & Swanik 1995, Knoepp et al. 2004
Wine Spring	Stand replacement	High elevation, Oak/pine	Moderate intensity, low severity	April	82	Vose et al. 1999, Elliott et al. 1999, Vose et al. 2003
Joyce Kilmer	Wadine	High elevation, Old growth hardwood	Low intensity, low severity	Nov	1000	Clinton et al. 2003
Hickory Branch	Stand replacement	Mid elevation, Oak/pine	Moderate intensity, low severity	March	365	Clinton et al. 2003
Conasauga, TN & GA (4 burns)	Understory	Low elevation, pine/hardwoods	Low to moderate intensity, low severity	March	15	Hultine et al. 2004, Elliott & Vose 2002
Robin Branch	Understory	Mid elevation, Mixed oak	Low intensity, low severity	March	~10	Vose et al. 2005
Roach Mill, GA	Understory	Mid elevation, Mixed oak	Low intensity, low severity			Elliott et al. 2004
Uwharrie, NC	Understory	Mid elevation, Mixed oak	Low intensity, low severity	March	245	Vose et al. 2005
Coastal, NC	Understory	Coastal plain, Longleaf pine	Low to moderate intensity	Jan	160	
Ocoee, TN (6 burns)	Site preparation	Low elevation, Pine/hardwoods	Moderate to high intensity	March	10-15	



Jacob Branch, Fell and burn 1990



Mulberry, understory burn 1998



Robin Branch, understory burn 2003



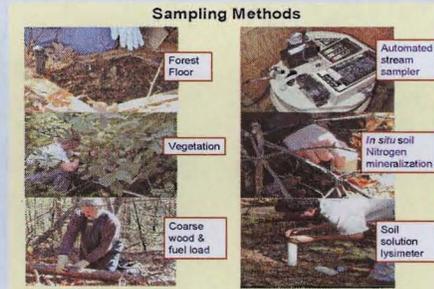
Wine Spring, stand replacement 1995



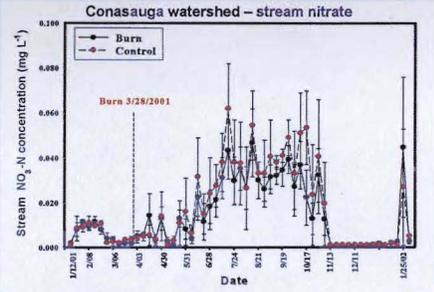
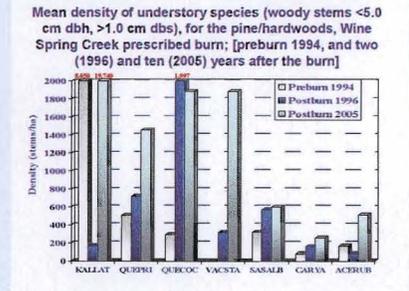
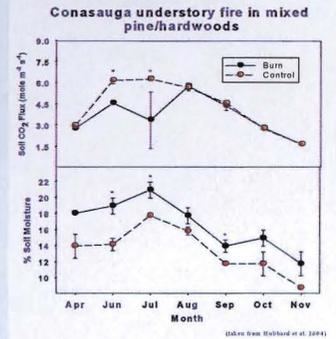
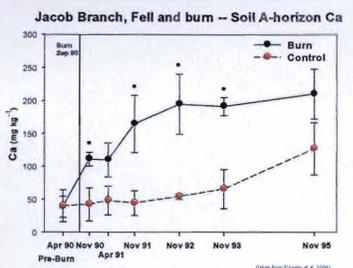
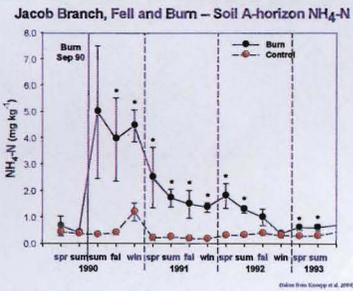
Coastal Plain, NC 2003



Ocoee, TN, site preparation burn 2006



Sampling Methods



Summary of other responses

Parameter	Response	References
Diversity	+	Elliott et al. 1999, 2004, 2005
Nutrient cycling	+	Knoepp & Swanik 1993, 1995; Vose et al. 1999; Knoepp et al. 2004
Water quality	0	Clinton et al. 2003; Vose et al. 2005; Elliott & Vose 2005
Erosion	0	Vose et al. 2005; Elliott & Vose 2005
Small mammals & insects	+/-	Ford et al. 1999; Crossley et al. 1999; Love et al. 2007

Acknowledgements

- Nantahala, Cherokee, Chattahoochee-Ocoee, Uwharrie and Croatan National Forests for conducting the prescribed burns.
- Field Staff: Stephanie Laster, Mike Gavazzi, Chris Sobek, Robert Mickler, Sara Strickland, Johnny Boggs, Patsy Clinton, Duane Foster, Jason Love, Neal Muldron
- Funding provided in part from National Fire Plan, Cow-Pls James M. Vose, Robert Mickler and Ge Sun; and Joint Fire Science Program, Cow-Pls James M. Vose and Katherine J. Elliott.