PRESCRIBED FIRE RESEARCH IN PENNSYLVANIA

Patrick Brose[1]

[1]Research Forester, U.S. Forest Service, Northern Research Station, Irvine, PA
To contact, call (814) 563-1040 or email at pbrose@fs.fed.us

Prescribed fire in Pennsylvania is a relatively new forestry practice because of the State's adverse experience with highly destructive wildfires in the early 1900s. The recent introduction of prescribed fire raises a myriad of questions regarding its correct and safe use. This poster briefly describes the prescribed fire research projects of the Forestry Sciences Lab located at Irvine, PA.

One of the primary reasons prescribed fire is becoming increasingly popular with land managers is its ability to benefit oak regeneration at the expense of other hardwood reproduction. Earlier research identified four principal factors that determine whether an advanced regeneration stem sprouts after being top-killed by a fire. Those factors are: season-of-burn, fire intensity, size of the stem's root collar, and depth of the root collar in the forest floor. The ***Post-Fire Sprouting Probability Project*** seeks to further understand this complex relationship by linking a fire's seasonality and total heat output to the sprouting response of the advance regeneration of 10 common hardwood species. This linkage is done on 6-ft circular plots by 1) determining litter and woody fuels loadings before and after a prescribed fire; 2) measuring heat output of the passing flame front with a datalogger/thermocoupler; and 3) tagging advanced regeneration of different hardwood species and excavating dead and sprouting hardwood advanced regeneration several weeks after the burn. These data will be developed into predictive models that land managers can use to better plan and implement prescribed fires to aid in regenerating Pennsylvania's oak forests.

Closely related to the above project is the ***Shelterwood—Burn Applicability Study*** done in cooperation with the Allegheny National Forest (ANF). This project seeks to ascertain whether a forestry practice that originated in the Piedmont Region can work in northern Pennsylvania, given the differences in forest conditions. From 2002 through 2004, extensive preburn data were collected on four fenced oak shelterwood stands on the ANF. In May 2005, half of each shelterwood stand was burned with a moderately intense prescribed fire to release the oak regeneration from competing hardwood reproduction. Initial post-fire data collection in 2006 indicated that the fires had done their job; densities of competing hardwood regeneration, primarily black birch (*Betula lenta*) and red maple (*Acer rubrum* L.), were reduced and nearly all the oak reproduction had sprouted. Another inventory is scheduled for summer 2008 and results will be published in a forestry journal.

One of the arguments against burning shelterwood stands is the distinct possibility of killing a high value tree or damaging the butt log. Post-fire mortality models have existed for decades for predicting whether a tree is likely to die within 3 years of being injured by a fire. Unfortunately, these models are limited to oaks and do not take into account the other high-value species, such as black cherry (*Prunus serotina* Ehrh.), sugar maple (*Acer saccharum* Marsh.), and yellow-poplar (*Liriodendron tulipfera* L.), that are often important associates in a mixed oak forest.

The ***Residual Tree Damage Project*** is being undertaken to fill that knowledge gap. Before a partially cut stand is burned, it is scouted for residual trees with excessive fuel loadings near their bases. These fuels are inventoried and the tree base and fuels photographed. The fuels are reinventoried after

the fire and the tree is monitored for survival for 3 years. Preliminary results indicate only woody fuels exceeding 10 tons/acre that lie within 5 ft of a tree's base pose a threat of killing that tree.

A key part of any prescribed fire program is having and using fuel models to aid in predicting fire behavior. However, hardwood fuel models are few in number, are broad and general in terms of application, and have not been rigorously tested. Since 2002, the ***Eastern Fuel Models Project*** has been underway to evaluate the existing hardwood fuel models, develop new models for unrepresented fuel types, and disseminate this knowledge to forest managers in a photo series. Early results indicate that Fuel Model 9 (loose leaf litter) is reasonably accurate for oak-dominated forests in fall and spring; Fuel Model 8 (compacted litter) is appropriate for Allegheny hardwood and northern hardwood forests in spring; and no model seems to consistently work well for heath shrubs (e.g., blueberry, huckleberry, and mountain laurel) and hardwood slash.