DEVELOPMENT OF A PHOTO GUIDE FOR FUELS IN THE SOUTHERN APPALACHIAN MOUNTAINS OF NORTHEAST GEORGIA AND WESTERN SOUTH CAROLINA

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Abstract—Current methods of assessing the characteristics of forest fuels are time-consuming, expensive, and impractical in the mountainous terrain of the southeastern United States. A photo guide to fuels is being developed. It will be a quick, inexpensive, and easy-to-use tool for various management applications in the Southern Appalachian Mountains. Fuels data and photos were taken at 250 sites in the Sumter National Forest in South Carolina and 250 sites in the Chattahoochee National Forest in Georgia. Eight major fuel types were identified for the Southern Appalachian Mountains. Using annual summary weather data from the two nearest airports, typical weather conditions were calculated for the season of greatest wildfire activity. The guide will have several example photos for each fuel type with descriptions of the fuel loads and type, vegetation, and terrain. It will also describe potential fire behavior in that fuel type on a day with specified weather conditions.

INTRODUCTION

The Southern Appalachian Mountains have a great diversity of plants and plant communities. Many factors, including soils, aspect, elevation, weather patterns, disturbances, and land use history combine to create this diversity and a wide range of fuel types and loads. Prescribed burning to reduce fuel loads had only limited use in the Southern Appalachians until the mid- to late 1980s. Land managers considered prescribed fire too risky because of the difficulties of controlling fire on steep slopes and potential damage to valuable hardwoods. Burning is still limited but is increasing as fire managers gain necessary skills.

At present, there is no practical method for rapidly quantifying fuels for management purposes in the Appalachians. Typically, fuels are evaluated either by physically collecting, drying, and weighing plot samples or by the line transect method (Brown 1974). These methods are useful when a high degree of accuracy is necessary, but they are time-consuming, expensive, and often impractical in mountainous terrain. When fire managers lack the time or resources to employ these estimation methods, they must make best guesses at fuel loading to predict fire behavior.

In other regions, photo series have long been used to obtain quick estimates of fuel loading in connection with prescribed burning, smoke management, and wildfire control (Reeves 1988, Sanders and Van Lear 1988, Wade and others 1993). A fuels photo guide for the Southern Appalachians is needed because the 20 fuel models of the National Fire Danger Rating System (Deeming and others 1977) and the 13 standard fire behavior fuel models (Albini 1976, Rothermel 1972) typically are not representative of Appalachian fuels. Fuel loads and types are very diverse, and the existing models do not make allowance for the live ericaceous fuels that are often abundant in Southern Appalachian forests. A photo guide that is constructed specifically for the Southern Appalachians would provide a quick, inexpensive, easy alternative for management purposes when less than perfect fuel load estimations are acceptable.

SITES

A total of 500 sites in the mountains of western South Carolina and north Georgia were sampled; 250 sites were in the Sumter National Forest, SC, and 250 were in the Chattahoochee National Forest, GA. Initially, a 10-square-mile area that represented many different slope and aspect combinations was identified in each forest. The 250 sites within each area were stratified to ensure that a variety of slope and aspect positions were represented. Fifty sites were located in each of the following five slope positions: ridgetop, upper slope southwest facing, lower slope southwest facing, upper slope northeast facing, and lower slope northeast facing.

METHODS

Each plot was permanently marked with a 2-foot piece of conduit in the ground and paint on surrounding trees. Three 50-foot tapes were extended horizontally from the conduit and were used for tallying dead fuels. The azimuth for the middle tape was randomized by multiplying the value indicated by the sweep hand of a watch by six. A second tape was extended from the conduit at the azimuth of the middle tape minus 22°, and the third tape was extended along an azimuth 23° greater than that of the middle tape. This resulted in a crow's-foot pattern for the three fuels tapes (fig. 1). The middle tape began with 0 at the common end, while the outer tapes ran from 0 at the far end to 50 at the common end. This was done to avoid surveying all fine woody fuels in one location. Along each tape, dead and down 1- and 10-hour fuels intercepting the tape were tallied along the first 6 feet. The 100-hour fuels were tallied along the first 12 feet, while 1,000-hour fuels were surveyed along the entire 50-foot transect. Diameter, species, and condition were recorded for 1,000-hour fuels. At the 12-, 25-, and 40-foot points along each transect, litter depth, duff depth, and aboveground height of dead woody fuels were recorded to the nearest half inch. Using the center transect as the midline and a tape stretched perpendicular to it at both ends, workers established a 50- by 44-foot (0.02-ha) plot for sampling standing trees (fig. 1). All trees > 6 feet tall were recorded by species, 2-inch diameter class at breast height,

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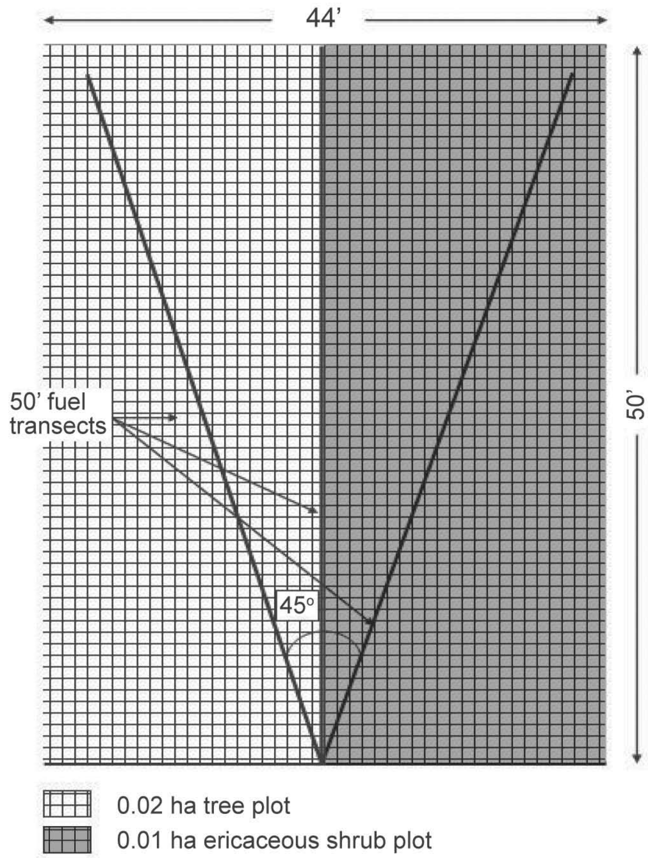

Figure 1—Plot layout for photo and sampling of fuels, trees, and shrubs.

crown class, and status (dead or living). Ericaceous shrubs, which make up the great majority of the live fuel component, were recorded in the half of the plot on one's right when one stands at the zero end and looks down the middle transect (fig. 1). Shrubs were recorded by species and status (dead or living). Height, basal diameter for each stem, and two crown diameters were recorded for each shrub. Last, a photo of each plot was taken from the convergence point of the three transects with a range pole located at the 40-foot point for perspective. All fuels data were converted to tons per acre for each plot.

To begin converting these data to a fuels guide, we first wrote descriptions of all the fuels and vegetation layers visible in the photos: overstory, midstory, understory, surface fuels, ladder fuels, live ericaceous fuels, etc. Because managers will use only visual characteristics of photos and sites to determine which photo best represents fuel conditions for a site, we decided to rely only on visual characteristics of the photos to define fuel categories for the photo guide. This resulted in eight major fuel types for the Southern Appalachians. These are:

1. Hardwood overstory with hardwoods underneath
2. Pine-hardwood mixed overstory with hardwoods underneath
3. Pine or hardwood overstory with nonericaceous ladder fuels
4. Rhododendron fuels
5. Mountain laurel fuels
6. Large dead and down woody fuels
7. Hardwood overstory open underneath
8. Dense hardwood poles

The final product will have example photos for each of these fuel types with descriptions of the fuel loads and types and terrain.

To make the guide useful, descriptions of possible fire behavior in a given fuel type under "bad" fire weather conditions will be included. Annual summary weather data were obtained from the National Climate Data Center in Asheville, NC. Dew point and wind speed were taken from weather data for the closest airports. Certain weather conditions will be identified, such as temperature, wind speed, and relative humidity. Predictions of possible rates of spread, intensity, and ease of containment will be given. The guide will be specific to the lower elevation Appalachian Mountains of north Georgia and western South Carolina. National forest managers and fire management officers will be able to use the photo guide in either wild or prescribed fire situations. However, users will have to make allowances for the presence of multiple fuel types in a large area and adjust for variations in fuel and weather conditions.

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