MULTI-PARTY MONITORING—A GOOD TOOL FOR MANAGERS

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Abstract—The use of prescribed fire has increased dramatically over the last 15 years in the Appalachian Mountains; managers are interested in tracking the effects of their fire programs. Since the mid-1990s, Southern Region National forests have been required to collect data on fuels and vegetation in permanent plots. However, lack of personnel dedicated to this effort has limited the number of plots each forest is capable of maintaining. Thus, National forests are encouraged to work across boundaries and share information with neighboring districts, National forests, and agencies with similar burn prescriptions and monitoring types to increase the size of datasets. We discuss the results of this endeavor, including recommendations for improving this approach. In general, data collected in such a manner can be used at least to document trends, which can be used to supplement the more-rigorous research projects which now are becoming more commonplace. Fire effects monitoring completed internally by firefighters and other employees offers multiple benefits to the local units.

INTRODUCTION

The U.S. Department of Agriculture, Forest Service manages 193 million acres of forests and grasslands. The Southern Region of the Forest Service encompasses 13 States and Puerto Rico, including 14 National forests and two special units. Unlike some other areas of the country (e.g., the Western United States), most of the South is privately owned. The Forest Service manages only 13.3 million acres in this region, which is also referred to as Region 8. Across the agency, prescribed fire is a common management tool and nowhere is it more prevalent than in the Southern Region. In 2012, Region 8 burned 885,112 acres.[2] In comparison, the rest of the agency burned 84,448 acres (National Interagency Fire Center 2014). The region that makes up about seven percent of the agency's land base burned more than 91 percent of the total prescribed fire acres. State agencies in the south ignited millions more. Controlled burning is critical in the fire-adapted South because fire is an essential disturbance for natural systems and when intentionally applied also helps protect landowners from the threat of damaging wildfires.

While the South is very fire-adapted, it is also vegetatively diverse. Region 8's States are covered by Braun's (1950) southeastern evergreen, oak-pine, oak-chestnut, mixed mesophytic, western mesophytic, and oak-hickory forest regions (Puerto Rico is not a focus of this discussion). Within Region 8's physiographic regions—including the Gulf and Atlantic Coastal Plains, Piedmont, Appalachian Mountains, and the Interior Highlands—plant composition varies greatly. Coastal plain communities were historically dominated by longleaf pine; piedmont by shortleaf pine and a variety of oaks; and upland areas were or still are oaks, mesic hardwoods, and yellow pines. But even within these general groups, diversity is the rule rather than the exception. Topography, precipitation, historic land use, and disturbance regimes, including fire, contribute to the patterns of vegetation across the landscape.

National forests are located in each of the vegetative and physiographic divisions. Each forest currently prescribe-burns anywhere from a few thousand to more than a hundred thousand acres annually. However, in most of the region, fire had been absent as a landscape-scale disturbance for decades before being reintroduced. Managers recognize the need for fire, but because it is a relatively new management practice for this generation, they often are unsure of the nuances of fire application and effects. In the time since fire was removed from the landscape, vegetation has changed; simply putting fire back at a certain return interval does not necessarily achieve a desired future condition. Fire management officers (FMOs) track changes over time and movement towards desired conditions. Until recently, there was a paucity of fire ecology research in the Eastern United States. FMOs indicated that existing research often was not specific to the situations found on a particular forest. Effective land management is difficult without utilizing current and applicable monitoring or research.

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Because of the diversity of vegetation, fuels, fire regimes, and fire behavior, fire personnel need to understand fire effects in relation to fire prescription. In 2003, Region 8 FMOs asked for direction with regard to internal data collection within permanent plots in order to document local changes as well as to educate new employees with regard to fire effects. Ultimately, they wanted local data that answered their questions, in language they understood.

Monitoring the effects of prescribed fire is essential for documenting movement toward a desired future condition and tracking changes. Data provide the scientific basis for planning and implementing future burn treatments. Monitoring is a critical part of the adaptive management cycle, an iterative feedback loop that allows prescribed fire managers to alter management if objectives are not achieved. It is, in effect, learning by doing.

FIRE EFFECTS MONITORING IN FOREST SERVICE REGION 8

In 2003, a regional team recommended a program of monitoring prescribed fire effects to be implemented within the Southern Region. The team developed monitoring direction for National forests across Region 8, facilitating a uniform standard of data collection associated with prescribed fire. Those standards include methods to evaluate fuel reduction and vegetative effects.

The recommended protocols allow flexibility within National forests and geographic areas to determine the amount and extent of monitoring needed to meet local issues of concern, while still maintaining a minimum standard dataset. Most protocols and datasheets rely heavily on those described in the National Park Service's Fire Monitoring Handbook (FMH) (USDI National Park Service 2003). Since 2004, fire effects monitoring has been required work on National forests in Region 8 (USDA Forest Service 2011a).

National forests receive direction on where to install plots, how many to install, and what data shall be collected (USDA Forest Service 2011b). Collecting the data via standard protocols and using the recommended plot size are encouraged, although National forests have the option to use different protocols and plot sizes, as long as the minimum data are collected.

Plots are installed in a stratified random method. Strata are defined as "monitoring types," or areas of similar vegetation, fuels, burn prescription, and management history. Plots are installed randomly within monitoring types. National forests are encouraged to work together to define monitoring types, to facilitate data sharing across unit boundaries. Each forest district is instructed to install two permanent monitoring plots per year, in the monitoring types of their choice. The agency recognizes that such a small number of annual plots generates concern in that the vegetation and weather conditions inherently vary from year to year, but the Forest Service does not employ dedicated monitoring personnel; monitoring is but one of many job duties for each data collector. Thus, the number was a compromise that would allow some data to be collected with minimal interference with other duties. Trends can be documented in these burn units, even if the monitoring results cannot prove statistically valid changes.

Vegetation and fuel data are collected at each visit. Trees are documented by species, density, diameter at breast height (dbh), mortality, and damage. Live tree seedling (all trees <2 inches at dbh or less than 4.5 feet tall) density is also tracked by species. Understory cover in classes is recorded by lifeform, including grass and grass-like, ferns, other forbs, woody shrubs, and vines. Individual species and/or species groups of special interest are also recorded. Examples are mountain laurel (*Kalmia latifolia*) and great rhododendron (*Rhododendron maximum*), which are important because of their role in fire behavior, and nonnative invasive species including *Microstegium vimineum*. National forests track dead and down fuels in size classes and also record litter and duff depth. A minimum of four photos is taken at each visit. Plots are visited the growing season before each burn, and then revisited multiple growing seasons following the burn. In addition, plots are visited immediately post-burn to document fuel consumption and severity.

PARTNERSHIPS

Over half the National forests in Region 8 have joined the U.S. Fire Learning Network (FLN), a federally-funded initiative to decrease barriers to restoring fire on the landscape. Collaborative planning, implementation, adaptive management, and the sharing of lessons learned are at the core of the FLN. One of the most commonly cited barriers is the lack of local fire ecology data to inform the fire management program, and consequently the National forests often also work with partners on monitoring projects. Districts are encouraged to work together internally (intra- and inter-forest) in order to improve the expertise level and increase the workforce, as well as sample size. Additionally, some National forests work with external agency partners in the FLN including The Nature Conservancy (TNC); the National Park Service, which employs permanent monitoring crews; and other agencies who are similarly strapped for time and funding.

Some National forests have dedicated a position to oversee fire effects monitoring on the districts. Those National forests and districts that recognize the value of monitoring tend to devote the most resources toward this program. For example, the Cherokee National Forest (Tennessee) has installed about 40 0.2-acre plots beginning in 2002. The plots are mainly in oak and yellow pine monitoring types and have been tracked through several prescribed fire applications. Program oversight, including data entry, quality control, and plot visit scheduling, comes from the forest level. The Unaka District shares the workload with National Park Service partners from the Southern Appalachian fire effects monitoring crew based in neighboring Great Smoky Mountains National Park (GSMNP, North Carolina and Tennessee). Since datasheets and collection methodologies are very similar, there is quick adaptation to the work assignment. In addition to more expedient data collection, the forest personnel exchange valuable fire behavior and effects observations with partners. Both the Cherokee National Forest and GSMNP are active members of the Southern Blue Ridge FLN, which allows both sets of data to be incorporated into a much larger dataset encompassing the same monitoring types across the southern Appalachians.

The Southern Blue Ridge FLN partnership includes, along with previously mentioned units, the Nantahala and Pisgah National Forests (North Carolina), the Chattahoochee-Oconee National Forest (Georgia), and the Francis Marion-Sumter National Forest (South Carolina). Other major partners include TNC and several State agencies in each of these States (in particular, North Carolina Wildlife Resources Commission), and Land Trust for the Little Tennessee, a conservation owner working in the same landscape. In addition to data being collected by these agencies and organizations, the FLN funds Forest Stewards, Inc. (FSI), to more than double the number of permanent plots on these lands. FSI is headed by a professor at Western Carolina University (North Carolina), who is working with the Forest Service Southern Research Station to analyze the data for the four-state area.

The neighboring George Washington and Jefferson National Forests (GWJNF, Virginia), in the central mountains, is a member of the Appalachian FLN. This network is active in Virginia and West Virginia. The GWJNF is similarly working with their primary fire effects monitoring partner, TNC of Virginia. Through a cost-share agreement, TNC employees work closely with all the districts of the GWJNF, using identical protocols, datasheets, and plot placement decisions. Their interagency monitoring working group had a very productive 2013 with progress made on a number of projects, especially revision of the collaboratively-developed Forest Structure and Composition (FSC) monitoring protocol and data forms. Revisions included editing monitoring goals and measureable objectives that can be referenced in burn plans and development of standardized data entry forms for Feat and Firemon Integrated (FFI) (Lutes and others 2009). FFI is a free software program for ecological monitoring which includes components for data entry, data storage, Geographic Information System, summary reports, and analysis. The most current versions of the FSC protocols and data forms can be found on the Conservation Gateway Web site. Significant progress was also made entering a backlog of previously collected data, with 55 percent of pre- and/or post-burn visits to the 0.01-acre plots monitored by TNC and the GWJNF into FFI. After five years of plot installation, the partnership has 330 plots in three monitoring types analogous and easily cross-walked to the monitoring types used in the Southern Blue Ridge. A next step for this network will be to determine whether more plots should be installed in any of the monitoring types.

The Ozark and Ouachita National Forests (Arkansas and Oklahoma) are active members in the South Central FLN, and have been working with TNC of Arkansas and many other partners to collect data since 2003. For example, more than 120 fire effects monitoring plots have been established across the Big Piney and Pleasant Hill Ranger Districts. Plots also have been established on the Sylamore and Boston Mountain Ranger Districts. Data is entered into FFI and may be combined in the future with data from similar monitoring types in the central and southern Appalachians for a meta-analysis across the oak and yellow pine systems.

Regardless of land ownership, burn plans include objectives such as reducing litter depth, increasing density of oak and pine seedlings, and reducing small dbh non-fire-adapted trees. Across all three Fire Learning Networks, data analysis is under way. Data in the South Central FLN indicate that fire is moving landscapes toward desired future conditions. Analysis is less complete in the other two FLNs, though managers observe positive changes across their landscapes.

SUMMARY

Prescribed fire is being increasingly reintroduced across the southern landscape. Only within the last ten years have managers had access to much fire ecology literature for landscapes outside the Coastal Plain, to help inform their fire management decisions. Even now that research is much more widely available, managers often would prefer to have data collected on their own unit and to be

involved with the process. In 2004, National forests in the Southern Region received direction to collect fire effects monitoring data for vegetative strata ranging from the understory to the canopy, as well as for dead and down fuels. Managers also were advised to capture change using photo points. Plots are permanent and are re-measured on a schedule which is dependent on time since last treatment. All data is entered into FFI in order to facilitate sharing and also because this program provides basic statistical analyses that are easily interpreted by managers.

It has become apparent that regardless of good intentions, some National forests are unable to dedicate a position to oversee the fire effects monitoring at the forest level. Thus, the regional program has become one in which the units with the time, personnel, and interest are the ones with quality datasets. Additionally, National forests recognize that sharing data across unit borders is critical to increase the size of datasets and correspondingly reduce the variability within them. With the help and encouragement of partners—the FLN in particular—units work together to describe monitoring types, establish desired future conditions, define protocols, synchronize monitoring visits, and enter and analyze data. Each time managers work across boundaries, relationships are strengthened, trust is garnered, and information is exchanged. When they are collecting data, firefighters are given the chance to observe the changes to the landscape, without needing to focus attention on other management tasks. They can visually connect the fire effects to the fire application techniques, and their sense of ownership of and commitment to the project increases. When managers compare notes, whether in the field or via analyses, they improve the corporate fire ecology knowledge base amongst all their partners. In the near future, fire effects databases will be merged and analyzed, and compared with research projects in similar monitoring types, thus expanding our understanding of fire effects in the Southern United States.

LITERATURE CITED

Braun, E.L. 1950. Deciduous forests of eastern North America. Philadelphia: Blakiston Co. 596 p.

Lutes, D.C.; Benson, N.C.; Keifer, M. [and others]. 2009. FFI: a software tool for ecological monitoring. International Journal of Wildland Fire. 18: 310-314. http://www.frames.gov/files/6213/6631/8579/FFI_Overview.pdf. [Date accessed: January 9, 2014].

National Interagency Fire Center. 2014. [Homepage of National Interagency Fire Center]. http://www.nifc.gov/fireInfo/fireInfo_stats_prescribed.html. [Date accessed: January 9, 2014].

U.S. Department of Agriculture (USDA) Forest Service. 2011a. [Homepage of Forest Service Manual Southern Region], [Online]. (2011, December 20). FSM 5100, Chapter 5140 Fire Management. R8-5140-2011-1. http://fsweb.r8.fs.fed.us/spf/fire/. [Date accessed: January 9, 2014].

U.S. Department of Agriculture (USDA) Forest Service. 2011b. [Homepage of Forest Service Manual Southern Region], [Online]. (2011, December 20). FSM 5100, Chapter 5140 Fire Management. R8-5140-2011-1, Included by reference. http://fsweb.r8.fs.fed.us/spf/fire/documents/2011/SOUTHERN%20REGION%20PRESCRIBED%20FIRE%20EFFECTS%20MONITORING%20GUIDEBOOK%202011.pdf. [Date accessed: January 9, 2014].

U.S. Department of the Interior (USDI) National Park Service. 2003. Fire Monitoring Handbook. Boise, ID: Fire Management Program Center, National Interagency Fire Center. 274 p.