

Fire Management Planning—Developing Strategies and Setting Measurable Objectives for Adaptive Management¹

S.L. Robertson,² H. Roose³

Abstract

Direction for fire management planning has been recently revised for all federal wildland fire agencies in the U.S. Fire management plans have become important planning tools that spatially document fire management strategies that support land and resource management planning objectives. Increasingly, however, fire management plans are tools that ensure program accountability and program effectiveness through the development of specific measurable objectives that track the implementation of strategies and their success. The development of measurable objectives in fire management plans addresses not only resource management objectives for wildland fire, but also tie to national performance measures for the federal wildland fire program. These measurable objectives are the cornerstone for the Fire Program Analysis System that measures program effectiveness for adaptive management and the development of the federal wildland fire budget.

Background

The task of designing and implementing new standardized fire planning direction for the five federal wildland agencies, including the Bureau of Indian Affairs (BIA), the Bureau of Land Management (BLM), the Fish and Wildlife Service (FWS), the National Park Service (NPS), and the USDA Forest Service (USFS) has been a challenging endeavor considering the wildland fire events that have taken place in the last few years here in the U.S.. The events which occurred during the fire seasons of 2000 and 2001 are remarkable in that they shape much of the federal wildland fire program as we know it today. Of particular note were the Cerro Grande prescribed fire in Los Alamos, New Mexico in May of 2000; the subsequent 2000 fire season; and the Thirty-Mile Fire Fatalities in July of 2001.

These events resulted in several important reports and initiatives that continue to guide the wildland fire program in the U.S. including, “Managing the Impact of Wildfires on Communities and the Environment - A Report to the President in Response to the Wildfires of 2000” (September 2000); the National Fire Plan (2001); Western Governors’ “A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: Ten-Year Comprehensive Strategy” (2001) and “Implementation Plan” (2002); “Restoring Fire-Adapted Ecosystems on Federal Lands – A Cohesive Fuel Treatment Strategy for Protecting People and Sustaining

¹ An abbreviated version of this paper was presented at the second international symposium of fire economics, policy, and planning: a global view, 19–22 April, 2004, Córdoba, Spain.

² U.S. Forest Service, National Park Service, National Interagency Fire Centre, 3833 South Development Avenue, Boise, ID 83705-5354 USA, email: sara_robertson@nps.gov.

³ Bureau of Land Management, National Interagency Fire Centre, 3833 South Development Avenue, Boise, ID 83705-5354 USA.

Natural Resources” (2002); and the “Thirty-Mile Hazard Abatement and Accident Prevention Plan” (2002).

The manner and degree to which fire management planning and fire management plans implement these initiatives and policies is significant. The public, congress, the federal Office of Management and Budget (OMB), and the Government Accounting Office (GAO) all have increased awareness and expectations about the function and accountability fire management plans have in addressing these wildland fire program issues. The need for sound fire management planning will continue as fire management plans play an increasingly pivotal role in implementing the federal wildland fire program.

In addition to responding to the events and policies above, the five federal wildland agencies also have a shared concern in regards to measuring the efficiency and effectiveness of their fire management programs. Agency managers at the national level have begun working together to develop and implement a compatible, interagency, performance-based fire program and budget analysis process.

Federal Wildland Fire Policy stipulates:

- Agencies will use compatible planning processes, funding mechanisms... operational procedures, values-to-be-protected methodologies... for all fire management decisions,
- Fire management programs and activities will be based on economic analyses that incorporate commodity, non-commodity and social values,
- Federal agencies will use a compatible fire planning system that recognizes both fire use and fire protection as inherent parts of natural resource management; this system will ensure that adequate fire suppression capability and support for fire reintroduction efforts is provided.

In December 2001, a study team released a report titled, “Developing an Interagency, Landscape-scale Fire Planning Analysis Tool”. Findings in the report are serving as the basis for development of a new interagency fire program evaluation system. This new system will replace budget and analysis systems currently used by the wildland agencies such as the US Forest Service National Fire Management Analysis System (NFMAS), and FIREPRO used by the National Park Service.

The new Fire Program Analysis System (FPA) is a performance based program evaluation system that focuses specifically on goals, strategies, and objectives identified in the fire management plan development process. FPA will rely on measurable land management plan objectives to help formulate future Preparedness and Hazardous Fuel programs. The FPA system is scheduled for field-testing during the summer of 2004. Release and technology transfer is scheduled to start October 1, 2004 for the first module which is preparedness.

The following are key attributes of the FPA System:

- Uses land and fire management objectives as the cornerstone for planning
- Provides a common approach to fire management program planning and budgeting for all five wildland fire management bureaus

- Displays tradeoffs for meeting various fire management objectives at any given budget level, such as for protecting various natural and cultural resources, and for protecting infrastructure and property
- Helps quantify meaningful performance requirements under the National Fire Plan and the Government Performance Results Act
- Facilitates partnerships between Federal interagency planning units, and Tribal, State, and local governments

Interagency Fire Management Planning

Fire management plans are plans which identify and integrate all wildland fire management and related activities within the context of approved land/resource management plans. They define a program to manage wildland fires (wildfire, prescribed fire, and wildland fire use). The fire management plan is supplemented by operational plans, including but not limited to preparedness plans, preplanned dispatch plans, prescribed fire burn plans and prevention plans. Fire Management Plans assure that wildland fire management goals and components are coordinated.

To facilitate the implementation of FPA, the federal wildland agencies developed the Interagency Fire Management Plan (FMP) Template that standardizes fire management plan development and content. The Interagency FMP Template, signed in June of 2002 is a single, landscape scale planning process that considers:

- the goals and objectives found in land management plans, as well as
- the objectives and performance elements found within agency Strategic Plans which are a part of the Government Performance and Results Act (GPRA), and
- the performance measures developed in the Ten-Year Implementation Plan for the document “A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment.”

The Interagency FMP Template also encourages the development of local objectives and measures that reflect the input from local government, the public, stakeholders, and other land management partners. However, these local objectives must support the goals and objectives found in federal land management plans.

Developing Measurable Objectives in Fire Management Plans

The Fire Program Analysis system also requires managers to have a set of measurable objectives that meet the needs of land management planning, and fire program implementation.

These measurable objectives need to be both outcome-based and useful for traditional accountability purposes. Previous budgeting initiatives focused on outputs because it was deemed more practical to measure agency processes and outputs rather than outcomes. FPA uses the measurable objectives found in fire management plans that are developed from land management plan direction and evaluates not only efficiency but effectiveness as well.

Fire managers have expressed dissatisfaction with current evaluation and reporting requirements. They explain that tracking and reporting costs and number of acres treated is inadequate in describing program accomplishments and measuring results. Managers are held accountable to efficiency standards with little or no reporting of whether desired results are achieved.

“We need a better system of measurement, other than treatment costs and number of acres treated. Everything focuses on efficiency; not on results. We need to measure by/for the objective of the fire management activity. We also need a fuels management strategy for fire management that speaks to outcomes. Something that helps prioritize our work.”

When given the opportunity to expand on alternative forms of measurement, managers advocate for the development of a system that more clearly measures the desired outcome and goal of the strategy or activity.

Many fire managers surveyed asked for standards of measurement or acceptable ranges of change that describe conditions or changes in conditions as a result of fire management activities. Several advocate for standards or ranges that relate to interdisciplinary goals and objectives that help describe ecosystem health and sustainability, as well as community and public safety.

Most of the managers referred to the complexities of trying to find appropriate measurement for program accomplishment. Much of the meaningful measurements that will help to describe the impacts of prescribed fire are very long-term. As a result, managers acknowledge the need for interim measurable objectives, to help with short-term program accountability.

Fire managers explained that they need to do a better job of explaining the long-term, value-added benefits of prescribed fire using resource values instead of commodity driven values. This includes understanding measuring the social and cultural impacts of prescribed fire.

Lastly, several fire managers want measurements that speak to the social and cultural impacts of fire use. The National Fire Plan and the Comprehensive Strategy for Protecting Communities and the Environment highlight the protection of high-risk interface areas with special emphasis on treatments in short-interval fire adapted ecosystems. Clearly, fire managers are asking for some form of measurement that helps evaluate accomplishment and investment.

The Transition from Current Program Evaluation to Fire Program Analysis

National agency program strategies and objectives are beginning to be expressed in terms of desired outcomes. Much of this work is related to the Government Performance and Results Act (GPRA) of 1993. However, some planning, budget allocation and program implementation are still driven by efficiency measures. Upward reporting consists of costs and number of acres treated, generating an efficiency ratio that is often used in making budget allocation decisions.

Managers are still primarily held accountable for issues of cost and quantity. Questions of effectiveness become secondary in this scenario. GPRA states that program activities and measurement must be linked directly to desired outcomes, and

that they address the issue of effectiveness. Measurement information about the manner and degree to which programs impact desired conditions becomes important in several ways.

One, it allows agencies to accurately report on the effectiveness of program strategies and activities. In performance based budgeting and the GPRA, accountability reporting informs agency and congressional decision-makers and policy-makers about program successes, or where program corrections need to occur. It also informs the public about whether programs are really delivering the outcomes agencies have deemed important. At the field level, internal reporting of program effectiveness becomes a valuable tool for managers to make needed changes in field implementation, particularly if this information is available in a timely fashion.

Secondly, with measurement information in hand managers can begin to fund results rather than efficiency alone. When the impacts of activities are measured in terms of changes in conditions, funding decisions become driven by which activities are most effective in addressing desired outcomes. When efficiency information is added to this equation, managers can fund activities that show the best cost-benefit ratio rather than cost-output. This becomes useful information when designing program strategies and priorities.

Lastly, in the process of testing performance measurements and program indicators for their correlation with desired outcomes, managers are able to discard measurements and indicators that fail to provide useful information, and replace them with indicators that show a strong relationship with outcomes. This process takes time. Implementing a performance measurement process successfully will require evaluating chosen program measures periodically to incorporate lessons learned and new policy. Program measurable objectives will be added and deleted to the long list of program indicators in an attempt to fine tune which program activities have the greatest impact on desired outcomes.

Federal wildland fire specialists in all the wildland fire agencies are working toward this end. In responding to congressional concern, their efforts are focusing on mutually beneficial objectives, program strategies, accountability, measurement, and program reporting processes.

The Fire Program Analysis System

The Fire Program Analysis System (FPA) will assist federal wildland fire specialists in transitioning from measuring outputs to measuring results and outcomes. FPA is a strategic rather than tactical budget planning tool. This tool to evaluates the effectiveness of alternative fire management programs. It will provide managers with a process that helps define accountability and performance measures that track success. It is objective driven and performance based in that it incorporates measuring cost-effectiveness rather than efficiency alone. It also assists in evaluating tradeoffs in achieving objectives at different budget levels. It is an interagency program evaluation tool in that it identifies efficiencies of sharing fire resources across jurisdictions. Lastly, when completed, it will address the full scope of fire management activities.

The full project scope of FPA will analyze:

- Initial response for suppression and fire use
- Extended attack, large fire support, and national resources

- Prescribed fire and fuels mgmt
- Prevention and education
- Emergency stabilization and rehabilitation

FPA relies on agency land management plans to assess the current landscape condition and to define the desired condition. Wildland fire specialists must identify the differences between desired condition and current condition, and determine the appropriate role of wildland fire management in achieving the desired conditions.

Fire management plans bring forward descriptions of desired condition as well as resource management goals and objectives from the land management plan. FMPs represent this direction in fire management units that spatially define land management objectives, standards and guides within the context of wildland fire management. Fire management units will:

- Specify suppression goals and objectives that support the desired condition
- Specify program approaches or strategies for managing fire
- Define measures of accomplishment over a relevant time period (performance measures)
- Address public and firefighter safety in all aspects of fire management strategies
- Describe sensitive social, economic, and resource issues as they relate to fire management strategies and objectives.

A fire management unit is any land management area definable by objectives, management constraints, topographic features, access, values to be protected, political boundaries, fuel types, major fire regime groups, and so on, that set it apart from the management characteristics of an adjacent fire management unit. Fire management units may have dominant management objectives and pre-selected strategies assigned to accomplish these objectives.

Fire management unit objectives are important triggers for the Fire Program Analysis System. FMU objectives are a synthesis of federal fire policy objectives, land management plan objectives, and national performance measure objectives. They also may reflect local issues of concern that involve community protection or public safety. Most importantly, these objectives, as listed in each FMU, must not be in conflict with the direction outlined in the land management plan. The fire management unit highlights a particular fire management strategy that works toward achieving the desired landscape condition and land management objective, while also articulating key measurable objectives that will help describe the success or appropriateness of the fire management strategy.

Fundamental Elements of the Fire Program Analysis System

FPA requires a shift toward collecting program data that will aid managers and decision-makers in setting program strategies and priorities that deliver desired agency outcomes.

FPA focuses on FMU objectives and translates them into meaningful measures for the analysis model. FPA extracts, documents, and translates fire management objectives from fire management plans for each fire management unit.


The weighting process is based on specific fire management objectives as well as the values to be protected. FPA assigns weights to the objectives for each FMU based on the relative importance of such things as protecting the FMU from unwanted fire, or allowing use of wildland fire to accomplish objectives given limited initial response resources and budget. Most importantly, weighting is assigned through an interdisciplinary and/or an interagency process.

Weights are assigned to FMUs by considering such variables as time of year, and fire intensity levels. Weights indicate the relative importance of managing fire within the FMU from unwanted fire or desirable fire at different fire intensity levels and at different times of the year, assuming limited response resources. Fire intensity level is a rating index that is based on calculated flame length, as well as an indicator for fire danger that categorizes rate of fire spread. Fire Intensity level (FIL) and time of year help model the fire event in terms of the fire's potential for resource damage (See Figure 1).

Weights assigned to the objectives of one FMU are also relative to other weighted objectives found in other FMUs within the planning unit. Example 1: it is more important to suppress high intensity fires in one FMU while maintaining desirable low intensity fires that are managed for resource objectives in another FMU. Example 2: it is more urgent to suppress fire in a wildland urban interface FMU, than in a backcountry or wilderness FMU.

By assigning weights, FPA negotiates these objectives into desired (positive) weights and undesired (negative) weights that result in outcomes. For example, a planning unit may have several FMUs with strategies ranging from protecting communities in the wildland urban interface, or restoring the natural role of fire in wilderness landscapes, or restoring species and species habitat. FPA ranks these outcomes and their associated measurable objectives to produce prioritization of work and needed budget levels to accomplish those objectives (See Figure 2).

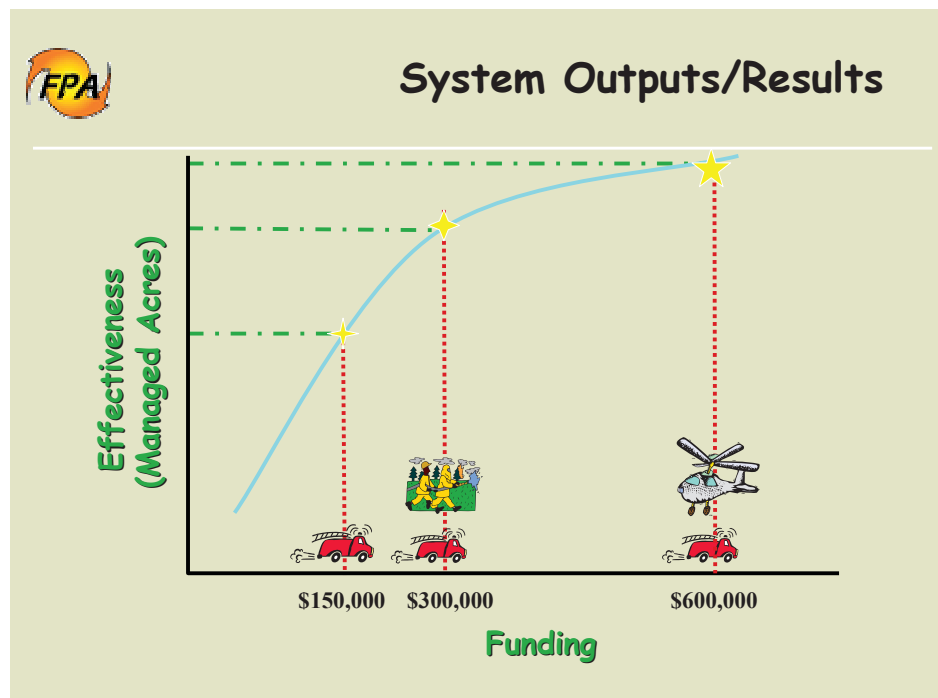
Figure 1--Relationship of Land Management Plan Direction with Fire Management Plans and Fire Program Analysis Inputs (FPA, January, 2003).



**Example:
Suppression Objectives**

Land Mgmt Plan	Resource Mgmt Plan	Fire Mgmt Plan	FPA Inputs - by FMU
<i>General Direction</i>	<i>More Specific</i>	<i>More detailed and quantified objective</i>	<i>Damage threshold - acres by FIL</i>
<i>Suppress all unwanted fires</i>	<i>Protect critical T&E habitat from damaging unwanted fires, especially high intensity fires</i>	<i>For FMU XX, 95% of all unwanted fires in T&E habitat are controlled during initial attack over the next 5 years</i>	<i>-Unplanned ignitions in FMU XX should be kept to less than 100 acres at >FIL 3 during April-June</i> <i>-Weight=8 (high relative importance)</i>

Figure 2--Example Output of Fire Program Analysis. (FPA, January, 2003).



Challenges in Developing Measurable Objectives for FPA and FMPs

The greatest challenge in implementing FPA will be the identification of meaningful measurable objectives and indicators. The key to successful performance measurement is knowing which program indicators have the most significant relationship to desired outcomes. Defining performance indicators is where science and art come together as managers link the logic and rational assumptions of policy and programs with the primary activities designed to produce results.

For every set of assumptions and activities there should be a set of indicators that test whether program logic and assumptions truly deliver intended results. Indicators provide the evidence that program activities are correlated with desired outcomes, by helping to further describe conditions associated with intended outcomes. Fire management specialists know that many of these indicators will be interdisciplinary, ecological measures of resilient and sustainable ecosystems, as well as social and economic indicators addressing the needs of public and community protection. The additional challenge will be to ensure that the aggregated summary of indicators at the national level translate into a defensible and coherent budget structure for congress. The challenge in developing measurable objectives is ensuring that indicators are meaningful to field level fire managers and high-level decision-makers alike.

Summary

Implementing the Fire Program Analysis System will take time. As mentioned, many key indicators and measurable objectives for wildland fire management are long-term outcomes that extend over decades. It will take time and exploration to put into place the short-term indicators that act as interim measures for wildland fire management outcomes. FPA, however, is an immediate important step toward increased accountability in wildland fire management. It also provides congressional decision-makers with performance data about the federal wildland fire program in a manner that considers the success our assumptions, strategies, and program activities achieve.

FPA can not be expected to eliminate conflict inherent in the political process of resource allocation, and final program decisions will need to take into account many factors, in addition to performance.

It will be significantly important for land and resource management plans to develop goals, desired conditions and resource objectives that speak to the appropriate role of wildland fire in the landscape. Stakeholders and the public must be involved in this process at the land management planning level to ensure that management objectives consider social and economic values as well. Critical processes such as activity planning, implementation, and reporting need understanding and support with partners from other government jurisdictions, special interest groups and private land owners.

The FPA process is a long-term commitment and expectations for immediate budgetary impact must be tempered with this understanding. Implementation of FPA moves the federal wildland fire program from reporting of one dimensional output data, toward outcome-based management information; management information that

fire specialists and managers now understand to be vital to making good decisions that stand the test of time in public service.

Associated Readings

USDA FS, USDI. September, 2000. Managing the impact of wildfires on communities and the environment – A report to the President in response to the wildfires of 2000.

UADA FS, USDI. August, 2001. A collaborative approach for reducing wildland fire risks to communities and the environment – 10 year comprehensive strategy. Western Governors' Association.

Western Governors' Association. May, 2002. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment – 10 Year Comprehensive Strategy – Implementation Plan.

Land Management Considerations in Fire-adapted Ecosystems: Conceptual Guidelines. USFS. (1996).

Managing the Impacts of Wildland Fires on Communities and the Environment – The National Fire Plan. USDA FS, USDI. (2001). www.fireplan.gov/references.

Policy Implication of Large Fire Management: A Strategic Assessment of Factors Influencing Costs. USDA FS. (2000). www.fs.fed.us/fire/planning/Large_Fire_Mgt.pdf

Protecting People and Sustaining Resources in Fire-adapted Ecosystems – A Cohesive Strategy. USDA FS, USDI. (July, 2002). www.fs.fed.us/publications.

Blue Print for Fire Planning. Rideout, Douglas B., Botti, Stephen J. (July/August, 2002). Journal of Forestry, Vol. 100, No 5.

Designing Effective Performance Measures. National Academy of Public Administration (NAPA). Washington, DC. (1999).

Federal Wildland Fire Management Policy and Program Review Report. USDA FS, USDI. Washington, DC. (1995). www.fs.fed.us/publications.

Thirty Mile Hazard Abatement and Accident Prevention Plan. USDA FS. Washington, DC. (2002). www.fs.fed.us/publications.

Implementing the Government Performance and Results Act: Performance Measurement in the US Forest Service. Robertson, S. (1998). University of Oregon.