

Information Needs for Natural Fire Management Planning

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ABSTRACT: The development and implementation of an effective natural fire management program require a clear definition of goals and objectives, an ever-expanding information base, and effective program evaluation. Examples are given from Sequoia and Kings Canyon National Parks.

management programs in the national parks and wilderness areas of the United States have been well documented (Parsons 1981b; Kilgore 1982). In addition, Fischer (in press) has recently outlined six essential elements in preparing a wilderness fire

Introduction

It has been well documented that fire plays an important role in maintaining many natural ecosystems (Heinselman 1978; Pyne 1982). When the policy calls for protecting or preserving a natural area, local managers often must use fire to achieve specific objectives. Although the specifics of such objectives may differ with the goals of the area, they always require a systematic, well-documented management strategy. The development and implementation of a natural fire management program require a clear understanding of the goals and objectives for management of the area, an understanding of constraints, and a knowledge of local fire history, vegetation, fuels, and fire behavior. Continual feedback is required to monitor and evaluate the program's success. Details of some of the earliest natural fire

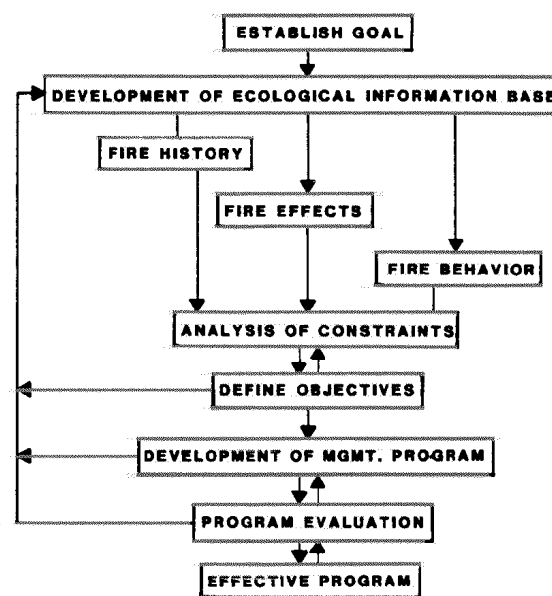


Figure 1. – Flow chart to guide managers and researchers through a series of information needs for natural fire management plan

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management plan. The purpose of this paper is to review the important steps in developing and implementing a natural fire management program with special emphasis on examples

from Sequoia and Kings Canyon National Parks (SEKI). The discussion is based on a schematic flow chart (fig. 1) designed to guide managers and researchers through a series of important information needs.

Establishing the Goal

The first step in developing a natural fire management program is to clearly establish the management goal for the area. Although this step may seem straightforward, it is not always. For example, although U.S. Department of the Interior, National Park Service, Management Policies (1978) talk about preserving "natural processes" and actually state "natural fires . . . must be permitted to influence the ecosystem if truly natural systems are to be perpetuated," recent debate has concerned whether National Park Service natural fire management should be process or product oriented. Bonnicksen and Stone (1982a) have questioned whether renewing the "fire process" is sufficient or even appropriate. They consider fire to be "a tool that is used to produce some desired state in the condition of an ecosystem." More recently Bonnicksen (1983) has even questioned whether national parks should be managed as wilderness. Instead he proposes they be "a museum for exhibiting outstanding natural features."

It is essential that the management goal for an area be clearly established. In natural areas this might include perpetuating natural processes or creating or protecting some identified product. The latter might be a "scene" or "vignette" of primitive America (Leopold and others 1963), a given ecosystem or successional stage, or a rare or desired species.

In SEKI the overall management goal is "to allow natural ecological processes to dictate the character" of the environment (Sequoia and Kings Canyon National Parks 1984). In the case of natural fire management this means allowing fire to burn relatively

freely, playing as natural a role as possible. Where vegetation or fuel loadings have been sufficiently affected by decades of fire suppression prescribed burning² or other manipulative techniques may be used to ameliorate conditions so that natural ignitions may again be permitted. In developed areas, where natural fire cannot be allowed for safety reasons, prescribed fire can be used to mimic natural fire. In the long run, ecosystems should experience the range of fire frequency and intensity with which they evolved. This development of policy to the point of preserving "the forces which cause naturally induced landscape change" has been recently reviewed by McCool (1983).

Unfortunately, even once it has been decided that the goal is to perpetuate natural ecological processes, some questions may remain. In SEKI an unresolved question is whether Indians played a significant role in shaping the local communities and thus should be considered as part of the natural system. If they are considered both significant and natural, managers may be forever simulating Indian ignitions (Lewis 1973), thus injecting considerable subjectivity into the ecological process. These fires are not considered natural or significant (they were prevalent in the area for only 450 to 850 years before settlement by Euro-Americans) (Vankat 1977) and only fires from lightning ignitions are to be allowed, the results may be increased intervals between fire and thus more intense fires than recent fire history records show (Kilgore and Taylor 1978). Although such conditions may represent those under which local communities evolved, they may not always be acceptable because of safety or other constraints. Managers still must strive to achieve as close an approximation to natural conditions as possible.

Developing an Ecological Information Base

An understanding of the ecosystems of the area, including the history and natural role of fire, the

² Editors' note: please refer to the Foreword for comments on prescribed fire terminology.

effects of fire suppression, and fire behavior under various conditions, is essential to Developing and implementing a natural fire management program. Fire history data must include frequency, seasonality, intensity, 3.variation and size, and ignition source for fires as far back as records will permit In SEKI, preliminary fire history studies have been carried out in the mixed conifer forest (Kilgore and Taylor 1978) and in chaparral and oak woodland (Parsons 1981a). Some information is also available on the effects of fire or fire suppression on vegetation (Harvey and others 1980; Bonnicksen and Stone 1982b), soils (St. John and Rundel 1976), and fuels (Parsons 1978). Additional research is needed in each of these areas, as well as on fire effects on wildlife, water, and air quality. Data on fire behavior (spread rate, flame height, intensity, fire weather, and so on) have been collected as part of the ongoing prescribed burning program. Such information is essential to developing fire prescriptions and predictive models of fire effects and behavior.

Analyzing Constraints

An obstacle to meeting the program goal is the presence of unavoidable constraints. These can include limited funding, special land use classifications, area boundaries, visitor safety, administrative facilities, or any other factor requiring special consideration. Analysis and understanding of such constraints are essential when defining program objectives because they will often require compromising the ecologically ideal situation. In SEKI funding constraints, administrative facilities, and area boundaries have played a significant role in determining specifics of the natural fire management program. It is hoped that agreements with surrounding Forest Service wilderness areas will soon permit lightning ignitions to burn across agency boundaries, removing one of the more serious constraints of allowing fire to play a more natural role in these ecosystems.

Defining Objectives

With an understanding of goals, the ecological information base, and constraints its is possible to

develop specific fire management objectives. These objectives should be planned, measurable program results. Fischer (in press) has suggested a number of natural fire management objectives as a function of management goals. The overall objective of the SEKI natural fire management program is to restore fire to its natural, role whenever possible by (1) allowing natural and some human-caused fires to burn if they are in prescription and meet predetermined objectives in designated areas, (2) expanding the prescribed burning program to reduce fuels and to alter vegetative composition to a more natural condition where natural fire can be allowed to burn, and (3) suppressing any fire that threatens people and property, or because of other constraints (Bancroft and Partin 1979). More specific objectives, including quantification of fuel reduction or scorch height, are then formulated for individual prescribed burns. As objectives are further defined or revised, new needs for ecological information are often identified.

Developing a Management Program

All available ecological information, as well as an understanding of constraints and objectives, must be used in developing an integrated natural fire management program. This includes identifying fire management zones, specific burn units, responsibilities, management guidelines or strategies determining what actions will be taken under what conditions, as well as specific burn prescriptions. Fischer (in press) has given considerable attention to detailing definitions and needs for each of these steps and has presented specific examples as well. The final step in program development is to establish administrative guidelines and procedures for assuring smooth implementation.

In SEKI considerable effort has been given to developing and implementing the natural fire management program. The results have been detailed in the Park's Fire Management Plan (Bancroft and Partin 1979). Three major fire management zones have been established; they are based primarily on the magnitude of changes in natural fire behavior and on effects caused by fire suppression. There are three

options in these zones: (1) all natural fires are allowed to burn, (2) natural fires are allowed to burn under restricted conditions while prescribed burning is used to reduce unnatural fuels, or (3) only prescribed burns are allowed, with all other fires being suppressed. Information on vegetation, fuels, and topography is combined with specific objectives to subdivide the lower-elevation zones into prescribed burn units and to develop detailed burn prescriptions and objectives. As additional units, fuelbreaks, or both are burned, the plan calls for allowing natural ignitions to burn under prescribed conditions. The idea is to some day be able to allow most natural ignitions to burn. Even if such a stage can be reached, it is important to recognize that prescribed burns will still be required to simulate ignitions starting outside the park that are suppressed before reaching the boundary. The fire management plan goes into considerable detail in scheduling future prescribed burns, detailing strategies to be followed under varying conditions, and outlining management responsibilities and requirements (Bancroft and Partin 1979). As the program develops, needs for additional basic information will surface, resulting in renewed research efforts.

Program Evaluation

A key part of a natural fire management program is having a means to continually evaluate success, as well as to provide feedback to modify program details. This can be achieved through a standardized monitoring program. In addition to monitoring preburn conditions and fire behavior, it is essential to monitor the short- and long-term effects of prescribed burns on fuels, vegetation, soil, wildlife, and other aspects of the environment. Such a monitoring program should be systematically designed to evaluate the ecological effects of varying prescriptions. An understanding of effects of natural ignitions on ecosystem components is also needed to fully understand effects of fire on natural systems. In addition to increasing the ecological information base, monitoring achieves its major purpose, which is to evaluate the success of the fire management program in fulfilling its objectives and ultimately its overall goal. This also allows evaluation of the extent to which prescribed burns may be able to

simulate natural ignitions. In SEKI, a systematic fire effects monitoring program has recently been instituted and is reported elsewhere by Ewell and Nichols in this proceedings.

Effective Program

If all these steps are conscientiously followed, an effective natural fire management program should result. Such a program will include a continuously expanding data base that includes information on fire effects, fire behavior, and constraints. Objectives, both general and specific, must be clearly defined and realistic. A systematic evaluation that includes ecological monitoring must be used to assess the extent to which objectives are achieved. It must be recognized that such a program continuously evolves. Details of the program will improve with experience and improved information.

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