The Role of Fire Suppression in Fire Management

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THE history of the western United States and Canada in the 19th and early 20th centuries recalls many large devastating wildfires. In effect a "let burn" policy existed because the early settlers, loggers, miners, Indians and public land managers were unwilling or unable to control wildfires.

Over the past 65 years, availability of firefighters, expanded road access and improved fire control equipment and technology have reduced the number of large fires and the area burned.

The greater effectiveness of fire suppression has caused concern about natural fuel accumulations and the ecological effects on fire climax species. The recognition of the beneficial effects of some fire has stimulated the use of both prescribed fire and prescribed wildfire, sometimes called "let burn."

INTRODUCTION

The concept of prescribed wildfire or "let burn" is considered by some to mean that fire suppression is not necessary, or perhaps less important than in the past. In practice, the integration of fire management considerations such as use of prescribed fire into land management practices (Moore, 1973) does not diminish the need for fire suppression, but may increase it.

In wilderness where a natural environment is to be perpetuated, prescribed wildfire may be planned, still subject to constraints and possible suppression.

In managed forests, there are few situations where wildfire, particularly during fire season months, can be tolerated, making fire suppression imperative. Even where we recognize that fire is needed to reduce fire hazard, control disease and maintain site productivity, the land manager needs to control the timing of the fire, the extent of the fire and the nature of the fire.

Fire protection organizations, whether rural fire departments, State or Federal agencies, are responsible for protecting property, resources and human lives from damage or destruction by wildfire. Where the protection agency is not the landowner or land manager, there is no alternative to immediate fire suppression. The landowner or agency responsible for both land management and fire protection has latitude for using prescribed wildfire where preplanned and approved.

To eliminate the potential for devastating large fires, suppression emphasis must be on small fires. Until reductions in forest fuel volume and flammability are achieved, and because of periodic extreme fire weather, we know that some fires will escape initial attack, requiring large-scale fire suppression to protect forest resources, users and property.

FIRE SUPPRESSION AS A PART OF FIRE MANAGEMENT

We've had many disastrous wildfires and as long as accumulations of forest fuels are subjected to extreme fire weather conditions we have the potential for future disaster fires (Fig. 1).

Fire management does not involve a choice between fire suppression and fire use. Both are substantial parts of what Keith Arnold (1972) called, "The strategies and practices used to maintain an adequate balance of man and fire and to cope with fire when extremes in nature prevail."

Fire suppression is defined as "all the work of extinguishing or confining a fire, beginning with its discovery." Suppression is involved in both fire use and fire protection. The use of fire to achieve desired management goals requires fire suppression techniques and the capability to keep prescribed fire or prescribed wildfire confined

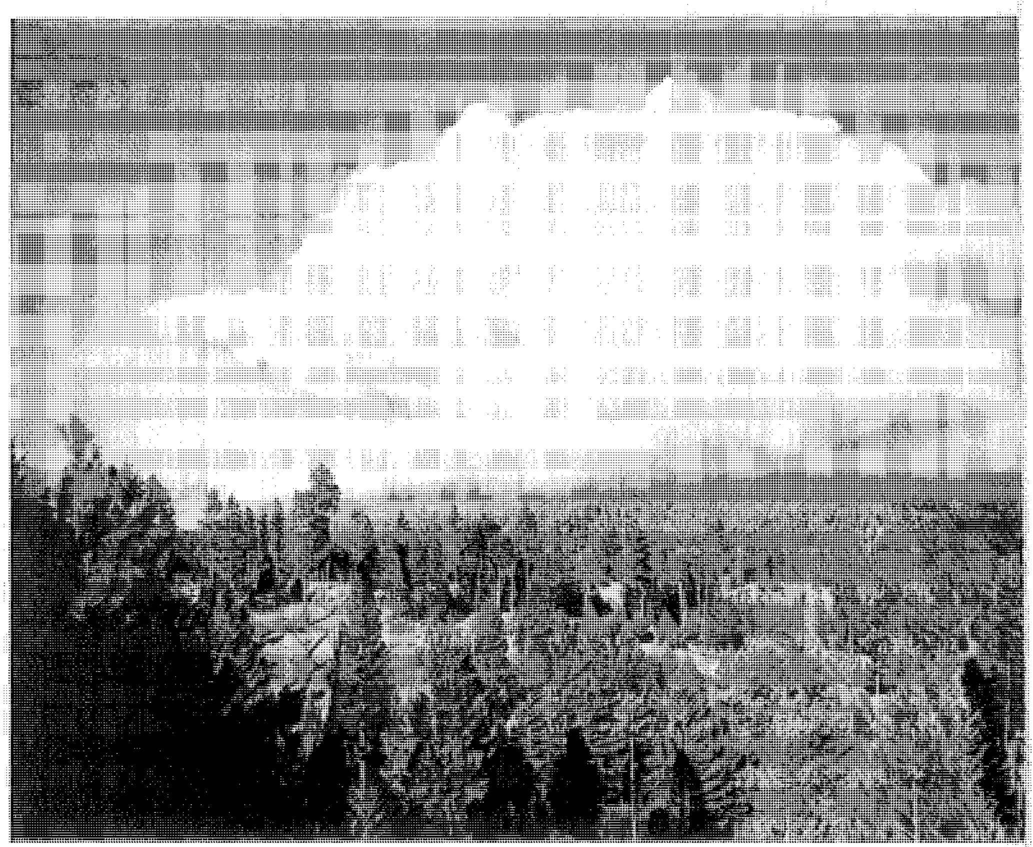

Fig. 1. Large areas of continuous heavy fuels and extreme fire weather conditions combine to create a potential for disaster fires; the Sleeping Child Fire, Bitterroot National Forest, August 1961. U.S. Forest Service photo.

to planned boundaries. Coping with fire requires suppression capability for all sizes of fire when extremes in nature prevail.

During the past 100 years the West has been subjected to fires from lightning and from man's activities such as agricultural clearing, mining, logging, range fires, and Indian-caused fires (Thompson and Smith, 1970). As loggers cut and moved on across the Lake States and into the West, logging slash was burned "accidentally" after logging, or allowed to accumulate until critical weather conditions resulted in the burning of forest lands and sometimes the communities which were in the fire's path.

From 1825 to 1900 a dozen of the larger forest fires burned more than 10 million acres of forest lands across the United States, killing 2,500 people and destroying millions of dollars of property (Guthrie, 1936). In 1910, summer drought, severe dry electrical storms, and man-caused fires resulted in an unprecedented fire season from Oregon and Washington to Minnesota. An estimated 5 million acres burned and 150 lives were lost. Idaho and Montana suffered most, where the fires burned 3 million acres of forest lands and killed 85 firefighters and residents (USDA Forest Service, 1960). The Forest Service bore the brunt of the 1910 firefighting and learned that drastic changes in fire detection, preparedness, and support were needed.

Fire control planning after the 1910 fires led to the gradual development of improved fire prevention and control policies and procedures. The Pete King, or Selway, Fire of 1934, which burned over 250,000 acres of timberlands, was the last of the huge conflagrations in the national forests of the northern Rockies (Moore, 1973).

Expansion of road access, development of equipment such as bulldozers and power saws, and application of updated technology such as helitack and use of aerial retardants have substantially reduced annual burned area.

With increasing success in fire suppression and in spite of substantial acreages of prescribed burning done for slash disposal, disease control, and for cover-type manipulation for wildlife and livestock, many areas are accumulating forest fuels which increase the fire hazard and the potential for disaster fires. The losses from conflagration fires are unacceptable. To avoid them we must have both intensive fuel management and effective fire suppression.

CHANGES OCCURRING IN HOW LAND MANAGERS VIEW FIRE SUPPRESSION

Commonly, the foresters and forestry technicians in government and industry are responsible for both fire control work and the use of fire. They are in fact fire managers; some are oriented more toward suppression and others more toward use of fire. The change in attitudes from fire suppression to fire management has been slow and difficult for many personnel. The first-hand experience of many fire managers with conflagration fires has left vivid impressions of the damage from such fires—the direct loss of timber, loss of young forest stands, loss of wildlife and livestock forage, increased erosion, killing of fish, stream damage from ash and sedimentation, killing of livestock and occasional game animals, and the possible loss of human life and property (Connaughton, 1972).

In some less fire-resistant forest stands after a fire, the standing and fallen snags, tangled ground fuel masses, and low vegetation leave a worse fuel problem than existed in the green stand (Barrows, 1973). Too often, another serious fire follows to clean up both the fuels and regenerating vegetation.

Sometimes many years after a serious fire, when fuels are reduced to a manageable level, with erosion stabilized and vegetation established, the more favorable results of fire become apparent. Brushfields following fire in the northern Rockies have provided habitat for booming populations of whitetailed deer and elk until regenerating timber stands shade out the brush. Fires eradicated stagnated and decadent timber and brush stands and allowed replacement by vigorous young stands over a period of years. The reduction of fuel lowers the potential, for many years, of additional highly destructive wildfires. Limitation of some pests such as mistletoe is another benefit of fire.

Land managers have recognized some favorable results and have applied fire to maintain the browse of some old burns. For example, thousands of acres of game winter ranges in Idaho are burned on a planned basis to retard timber in-growth and to stimulate browse plant sprouting.

As a result of recognizing some beneficial effects of fire, a few public factions are willing to overlook the ecologically and socially undesirable effects of promiscuous use of fire and are pressing for not only prescribed use of fire but extensive "let burn" policies for both natural and man-caused wildfires, with little consideration for when and where they occur.

Dr. Beatrice Willard, an ecologist—now a member of the President's Council for Environmental Quality—and a strong advocate of fire in the environment, recognizes the conflict. She acknowledges that after the accumulation of fuels from nearly 100 years of fire protection in the West it is usually not feasible to let fire burn randomly as wildfire. Instead, ecological objectives must be met in most areas by planned use of fire.

Land managers are increasingly able to establish objectives and goals for the management of wildlife habitat, streams and watersheds, timber resources, livestock ranges, minerals, and the recreation and esthetic resources of forest lands. The manager must integrate the use of planned fire or prescribed use of wildfire into all resource management activities.

Where management objectives dictate that fire should be controlled, it is imperative that suppression action be prompt and thorough, based on values being protected, risk to human life and property, and without expenditures which exceed or contradict the values protected (Brackebusch, 1972).

FIRE OCCURRENCE AND SUPPRESSION

The fire suppression job in the western states is based upon the widespread occurrence of lightning and man-caused fires, primarily during the summer months.

The fire occurrence on national forest protected lands in the western states averages nearly 10,000 fires a year, two-thirds started by lightning and one-third by activities of man. An average of 83,000 acres of national forest lands are burned by wildfire annually, plus another 100,000 acres of other lands protected by the Forest Service. Outside the national forest protected lands another 17,000 fires burn an additional 400,000 acres annually in the western states.

Canada has suffered even more drastic damage. Smith and Henderson state that by 1918 two-thirds of British Columbia's forest land had been destroyed by fire, with 665 billion board feet of sawtimber lost to fire as compared with 21 billion board feet harvested (Smith & Henderson, 1972).

The threat of such a large number of fire starts to forest resources, human life, and property varies within each year and over a period of years by geographical areas. This is illustrated by Arnold's example of a long array of combinations of fuel, weather, and economic variables which on one end will surely produce disaster fires and on the other end of the array fire will not burn at all, or if it does spread it does so with negligible damage (Arnold, 1972). The southern pine regions of the United States have a long array of variables with only a narrow disaster band at one end for conditions which occur only every 5 to 10 years. California has a narrow array of variables mostly in the disaster band.

In the Rocky Mountains, the central Rockies have a wide array of variables with a very narrow disaster fire band, while the northern Rockies have a moderately wide array of variables with a clearly visible disaster band. This is supported by the history of burned area in the two regions. Since 1909 wildfires have burned roughly ¼-million acres on lands under national forest protection within the central Rocky Mountains, while during the same period over 6 million acres were burned in the northern Rocky Mountains.

FIRE SUPPRESSION RESPONSIBILITIES

Fire suppression responsibilities in the West are often related to land ownership. Basically, federal agencies protect lands which they administer and participate in cooperative protection of intermingled lands of other ownerships. In recent years the direction of change has been toward protection by either state protection forces or rural fire departments of lands outside areas of federal responsibility.

The primary responsibility of fire protection forces is to be prepared for aggressive action with the best tools of modern technology to promptly suppress every potentially dangerous wildfire. Where the land managing agency protects its lands, fire management in the broad sense is possible; whereas agencies with only fire protection responsibility have little or no latitude in their action.

THE CASE FOR AGGRESSIVE FIRE SUPPRESSION

The most effective measures for limiting the numbers of conflagration fires are still prevention of fire starts, reduction of forest flammability by preventing accumulation of or treating hazardous fuels, and fast, skillful attack on fires which do start.

Since we're many years away from the optimum pattern of no continuous bodies of fuels in which disaster fires can develop, our planning must prepare for fire suppression to stop unwanted fires

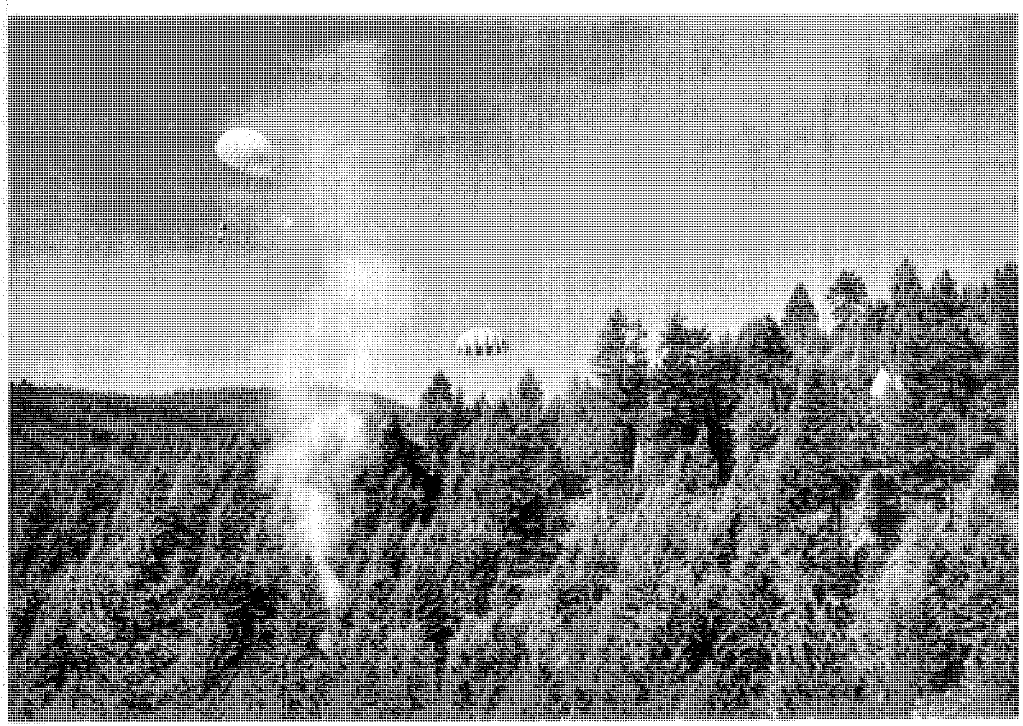

Fig. 2. Many wildfires can be controlled at a small size if adequate forces are readily available. U.S. Forest Service photo.

on initial attack. Before fire suppression action is planned, the land management decisions should provide for reduction of forest flammability and should provide direction for fire suppression and any exceptions to immediate suppression.

Most wildfires at the start are small in size and can be controlled if adequate forces are readily available (Fig. 2). From the start the spread depends upon fuel, topographic factors, and prevailing weather. Fortunately, the vast majority of fires start under conditions and in places where spread is limited by suppression forces to from a few square feet to under 10 acres in size. Some fires in the medium size classes burn for a few hours under conditions favorable to fire spread but drop with a change in any of fuel, terrain, or weather factors. The initial attack action may vary according to the threat to resources or human values when exceptions to immediate suppression have been pre-planned and approved.

A small percentage of fires, 1-3 percent, starting under extreme fire danger conditions, usually during periods of drought, does most of the damage and is responsible for most of the acreage burned. In the western states 97 percent of the fires are controlled under 10 acres in size, but less than 1 percent of the total number of fires burn over 75 percent of the total acreage each year.

When fuels are plentiful and dried by extreme fire danger conditions, most running fires are not directly stopped by man. The windward flanks may be held and spot fires may be controlled. Usually a break in the weather, fuel, or topography must slow the spread until a fireline may be constructed, firing out accomplished, and the fire controlled. Often the fire's run drops at night or tops-out at a ridge, but under the worst conditions it may spread for days. The need for effective initial attack can't be under-emphasized.

When a fire escapes initial attack forces and spreads out of control, the fire manager must promptly re-evaluate the situation and develop a new control plan. He must consider the fire behavior factors influencing the spread, the values threatened, any anticipated changes in weather or fuels and topography ahead of the fire, and must determine control objectives. These calculations of probability steps will enable the fire manager to plan manpower and equipment needs to meet control standards and objectives. It is at this point that any plans for the use of prescribed wildfire must be evaluated and implemented.

If the pre-planning for control does not fully consider when and where suppression may be feasible, the action may result in expenditures exceeding the values protected. Proper planning and fire management avoids the desperation measures such as aerial tanker assault on the head of conflagration fires or buildup of ground forces beyond what can be effectively used.

WHAT'S NEW IN FIRE SUPPRESSION

We recognize that there will be fires started under conditions where the best fire management is prompt, aggressive initial attack and suppression action using the most effective tools available. We should take a look at what our changes in technology have been since the shovel-, axe- and, grub hoe-days of 1910.

We've had improvements in field fire-weather and fuel moisture measurements and National Weather Service fire-weather forecasts which are the basis of the National Fire-Danger Rating System. The latest step is automated calculation of the fire-danger rating.

Fire detection has progressed through fixed lookouts and aerial observers to infra-red detection. Combinations of detection methods to do the job include reliance on local cooperators to report fires in many areas. Radio communication advancements have enhanced detection, ground and air suppression effectiveness, and safety. Progress has been made in disposal or modification of fuels before a fire starts to capitalize on the one fire behavior factor which can be controlled by man—forest fuels.

Other advances have been made in more reliable lightweight ground tankers, development of fixed-wing aerial tankers, conversion from steel barrels to fiberglass helicopter buckets, better hand tools such as power saws, frozen meals, food-catering services for fire camps (Fig 3), and continuing improvement of bulldozers and fire plows.

Training of personnel from smokechasers, special fire crews, and air attack personnel on through top fire-overhead personnel has improved efficiency and work safety. The interagency and even inter-

Fig. 3. One of the most recent advances in fire control technology is the large, multi-engined air tanker. Here 3000 gallons of chemical fire retardant is being dropped from a pressurized system flown in a Lockheed C-130. U.S. Forest Service photo.

national scope of the Forest Service National Fire Training such as "Fire Generalship" and "Fire Behavior" has done much to strengthen training programs of all fire protection organizations.

Research has brought about understanding of fire behavior, remote sensing systems for mapping and detection, fire retardent chemicals and delivery systems, and guidelines for smoke management. Developments nearing the application stage are command and control systems utilizing information storage and retrieval, prediction modeling and simulation to support the decision-making requirements of fire command (Kourtz, 1972).

EXCEPTIONS TO SUPPRESSION OF WILDFIRE

This seminar is based in part upon the understanding that fire may have either near-term or long-term beneficial environmental effects just as it may have devastating effects. Every year during the dry season a significant fire is possible in some cover types like cheat grass and ponderosa pine (Mutch, 1972). When ecological objectives are known and when fire is needed to attain the objective, either prescribed fire or wildfire may achieve the desired results.

When any fire is used, the planning must consider the possibility of escape and the potential for damage to resources. The fire-weather forecast must be evaluated and the vulnerability of forecasts to change must be considered to prevent prescribed-fire burning under extreme conditions.

It is possible to pre-plan the use of wildfire to burn fuels within prescribed, natural, or other control boundaries to meet management objectives.

Other exceptions to immediate, complete control of wildfire occur at times and places when fire suppression is unsafe or where suppression costs would be excessive and resource damage potential is low. When the fire danger is moderate rather than at more critical levels, fires in unsafe areas, such as on cliffs or in talus slides, may be allowed to burn out and fires in low-value areas may be allowed to burn to natural or logical barriers. Again, where a protection agency does not have land management authority, prompt suppression is required without exception.

SUMMARY

As fire management is integrated into land management, the decisions made will determine how, when, and where fire will be used or suppressed.

The most pronounced changes in the direction in which fire management is moving are the reduction of accumulations of forest fuels capable of generating conflagration fires and the use of wildfires to accomplish part of the fire management objectives.

The optimum fuel condition, where no large or continuous blocks of hazardous fuels exist to support large fires, is years ahead and will depend upon intensive land management and utilization as well as sound fire management on wilderness lands.

During the foreseeable future, the role of fire suppression will be to protect resource values, property, and human life from uncontrolled fires which conflict with management plans by using the most effective technology available.

Suppression capability is also a valuable part of the prescribed use of fire to contain such fires within natural or logical control boundaries. We must continue to recognize that conducting wildland fires is dangerous (Wright, 1971).

Fire managers are anxious to function as Eco-Pyrologists—Ecologists using fire, but not as Pyro-Ecologists—someone who feels fire is always good, or as Dr. Varley described him, "the sort of idiot that burns his house down" (Varley, 1970).

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