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Fire Management Techniques for the 1980's

by William C. Fischer

"One thing seems certain about the 1980's—natural resources will see sharply increasing demands which outstrip current supplies of all products and uses under current pricing relationships. At the same time, the 1980's promise to see continuing controversy over inflation, herbicides, log exports, use of lands deemed marginally suited for cost-effective timber production, and the role of fire in resource management."1

Readers may be surprised to learn that the Chief of the USDA's Forest Service considers fire equal to such perennial controversies as inflation, herbicides, log exports, and timber management practices. Administrators and fire managers of several western National Forests are not surprised. They found themselves in the middle of the fire controversy during and immediately after the 1979 fire season.

The gist of this fire controversy is reflected in an excerpt from a "Los Angeles Times" news article (Nelson 1979):

"Forest Service Criticized for Letting Selected Fires Burn: Officials Defend Some Blazes as Beneficial for Environment but blackened Areas Draw Anger."

WASHINGTON—The U.S. Forest Service, which early last year adopted a policy of letting certain forest fires burn rather than immediately extinguishing them, has suffered some painful political blisters as a result.

And some state and local officials are furious about thousands and thousands of fire-blackened acres that the policy has produced.

The Forest Service decided to let selected fires burn because of growing conviction among forestry experts that fires are often beneficial, that they reduce the accumulation of brush and other flammable material on the forest floor, improve wildlife habitats, and increase plant and animal diversity.

Moreover, as the cost of fire fighting mounted sharply in the 1970's, forestry officials began to question whether the resources saved justified the expense in some cases.

Finally, ecology-minded government officials argued that fire is a part of nature's process....

Logical as those reasons seemed, heavy criticism has been leveled at the Forest Service, especially by some political leaders in the Pacific Northwest. These politicians, who grew up with Smokey the Bear's message that all forest fires are bad, have set off their own firestorm.

From Fire Control To Fire Management

The "Los Angeles Times" identifies the underlying cause of the fire controversy: change, but it does not expose agency constraints nor the complex requirements for implementation. Since 1935, national forest fire policy has stated:

"The basic fire control policy on National Forests and National Grasslands is to provide well-planned and executed fire prevention and presuppression programs with aggressive suppression when fire occurs" (USDA Forest Service 1972).

The revised policy states that...

"The basic fire management policy on National Forest System lands is to provide well-planned and executed fire protection and fire use programs that are cost effective and responsive to land and resource management goals and objectives and supportive of RPA outputs" (USDA Forest Service 1978).

The first four words of the two policy statements are the essence of the change in fire policy. The revised policy calls for fire management; the previous policy specified fire control. The fire control policy required immediate and aggressive attack on all fires. Suppression action was guided by rigid standards. If a fire was not controlled by initial attack forces, efforts on each succeeding day were expanded as required to obtain control before the start of the next day's burning period (10 a.m.). Each fire had to be attacked and controlled, regardless of burning conditions or land and resource values. The primary goal of this policy was to minimize the acreage burned.

Forest Service policy allows the fire manager to permit certain wildfires to burn if they occur under preselected conditions in predetermined areas and are achieving desired results.
The current fire management policy requires an appropriate suppression action be taken on each wildfire. Fast and aggressive initial attack is required on all wildfires that threaten life, property or resources. If a wildfire escapes initial attack, subsequent action is carefully considered. The fire’s potential for resource damage is weighed against potential benefits and costs for appropriate suppression alternatives. If, for example, the analysis indicates the escaped fire has a high potential for serious resource damage, an all-out suppression effort might be launched, using every tool and technique available to the fire manager. If, however, the potential for damage is low, the manager may elect to limit the suppression effort to the use of ground crews with hand tools; thereby trading-off acres burned against the cost of using more expensive fire control techniques.

The fire management policy allows the fire manager to permit certain wildfires to burn if they occur under preselected conditions in predetermined areas. Such areas are called fire management areas, and the preselected conditions are specified in a fire prescription for the fire management area. The use of traditional prescribed fire (planned burning) is retained and, in fact, encouraged in the fire management policy.

Forest Service Chief Peterson recently attempted to allay the fears of some fire management critics in a speech before the Western Forestry and Conservation Association (Peterson 1979). He summarized the fire management policy as follows:

“Two years ago we revised our fire suppression policy seeking to provide protection at a reasonable cost. Under this policy, each wildfire ignition requires an appropriate suppression action. In no case are wildfires simply left to burn. Our policy entertains no compromise with the protection of life, property, or resources needed to meet objectives. The policy does provide that when a wildfire is burning under prescribed conditions which meet management objectives approved for that particular area by the Regional Forester, the decision may be to confine the fire to a predetermined portion of the area. Contrary to some reports, we’re not reluctant to fight fire aggressively inside a wilderness when the fire doesn’t fit management objectives.”

Fire Management in Practice

The practice of fire management is more difficult than that of fire control. The job of the fire manager has, consequently, become more difficult. The fire manager of the 1980’s must command the considerable knowledge and skills of the traditional fire control and fire use specialist. The successful fire manager of the 1980’s, must command the considerable knowledge and skills of the traditional fire control and fire use specialist. The successful fire manager of the 1980’s must also possess the knowledge and skills required to evaluate alternative fire management strategies in relation to land and resource management objectives, to delineate fire management areas, to develop fire management prescriptions, and to analyze escaped fires.

Perhaps the best way to illustrate the substance of fire management and the knowledge and skill required of its practitioners is to describe how it has been implemented on the Troy Ranger District in the Northern Rockies. The Troy plan is, however, just one example of fire management practice on the national forests. Other plans specify different means to the same end: well-planned and executed fire protection and use programs that are cost-effective and responsive to land and resource management objectives. Techniques used in all existing plans will undoubtedly change as foresters gain fire management experience.

The Troy Fire Management Plan

The Troy Ranger District of the Kootenai National Forest straddles the Montana-Idaho line just below the Canadian border. The district encompasses an area of about 35,000 acres (131,500 ha) of Federal land and a little over 34,000 acres (13,800 ha) of intermingled State and private land. A fire management plan was developed for the district during 1978 and was approved by the regional forester early in 1979 (USDA Forest Service 1979a). (It is, at this writing, the only Forest Service fire management plan that has been approved for an entire non-wilderness ranger district.)

Fire Management Areas

The fire management area, the basic unit of fire management practice, is a parcel of land with specific boundaries for which fire management objectives are written in support of land and resource management objectives. Twenty-three such areas were identified on the Troy Ranger District. Fire management areas with similar fire management objectives were sorted into five categories for the purpose of developing fire management prescriptions. The fire management categories are described in terms of type of land, resource management and fire management objectives, and fire management prescriptions.

Protected fire management areas— all State and private land, as well as small isolated parcels of Federal land adjacent to or surrounded by State and private land, comprise the single fire management area assigned to this category. The fire management objective is to avoid
all damage to life, property, and resources. Unplanned fires that occur in this area are immediately and aggressively attacked. Wildfire prevention has high priority. During safe periods prescribed fire is permitted for reducing logging, thinning, and land clearing slash, managing vegetation in ditches, and disposing of debris. Less than 10 percent of the Troy district is classified protected fire management area.

Operational fire management areas—seven fire management areas comprising about 70 percent of the district are in this category. These are heavily forested lands managed primarily for timber and big game. Fire management objectives include: 1) minimizing fire-related timber damage, 2) reducing hazards associated with logging and thinning slash, and 4) using fire to prepare sites for tree regeneration and to rejuvenate spring and winter game range. Unplanned fires that threaten resources are immediately and aggressively attacked. When fire danger is low, attack may be modified to reduce costs or enhance crew safety. On big game spring and winter ranges, unplanned fires that occur under prescribed conditions may be allowed to burn as prescribed fires.

Observation fire management areas—six fire management areas in this category comprise about 20 percent of the Troy District. These are lands managed for primitive recreation, wildlife habitat, scenic beauty, and vegetative diversity. Such areas are characterized by high elevations, discontinuous forest cover, sparse fuels, and many natural barriers to fire spread. Fire management objectives include: 1) reducing suppression costs, 2) maintaining fire-related plant and animal diversity, 3) improving grizzly bear habitat, and 5) reducing adverse impacts of fire suppression actions. Unplanned fires are suppressed, but low impact suppression techniques are favored. Unplanned fires may be allowed to burn as prescribed fires to accomplish fire management objectives.

Wilderness fire management areas—one fire management area, a portion of the Cabinet Wilderness of about 15,000 acres (6,000 ha), falls in this category. These are rugged, mostly high elevation lands with limited access, managed primarily to preserve natural conditions and to allow natural processes to operate. The primary fire management objectives is to allow fire to more nearly play its natural role. Secondary objectives are to use fire to create and maintain plant and animal diversity, to use fire to improve grizzly bear habitat, to reduce suppression costs, and to avoid excessive fuel buildups. Unwanted fires and all man-caused fires are suppressed. Preference is given to suppression techniques that protect the wilderness character of the land. Lightning fires may be allowed to burn as prescribed fires when they are in prescription and will achieve management objectives. Current national forest wilderness policy requires the suppression of man-caused fires and prohibits the use of conventional prescribed fires.

Special fire management area—eight special fire management areas totaling about 300 acres (120 ha) have been established on the Troy District. These are forested areas managed for recreation and education. Most are developed camp and picnic grounds. One area is the Ross Creek Cedar Grove, a stand of old-growth western redcedar, Thuja plicata. Fire management objectives are to protect visitors and their property, recreation improvements and overstory trees, and to reduce hazardous fuel accumulations. Unwanted fires are suppressed preferably with techniques that avoid excessive damage to the site. Unplanned fires may be allowed to burn as prescribed fires when achieving desired results such as fuel reduction. Prescribed fire will be used in spring and fall to reduce fuels.

Fire Management Prescriptions

An unplanned fire is attacked and suppressed unless it is allowed to burn as a prescribed fire. An unplanned fire can become a prescribed fire only if it occurs in a predetermined area, during a predetermined time, under predetermined burning conditions, and is behaving in a predetermined manner. All of these predetermined criteria, and others, are contained in one or more fire management prescriptions for each group of fire management areas on the Troy District. In the Troy Fire Management Plan, the fire management prescriptions are summarized in flow charts to assure that each prescription criterion is properly considered before a decision is made. The flow chart governing action on unplanned fires that occur on big game ranges in operational fire management areas is shown in figure 1. Notice that 11 conditions must be satisfied before a fire can be declared a prescribed fire. The terms, ERC and BI in figure 1 refer to the Energy Release Component and Burning Index, respectively, of the 1978 National Fire Danger Rating System (Deeming and others 1977). Figure 2 shows one of four flow charts summarizing the fire management prescriptions developed for observation fire management areas. Notice the addition of season and elevation as prescription criteria.

I will not discuss in detail the factors that are identified and evaluated in formulating a fire prescription. Fire weather and fire danger records, fire occurrence records, fuel inventories, fire history investigations, advanced knowledge of fire ecology and fire behavior, and practical experience in fire use and control shape the plan. The development of reliable fire management prescriptions is perhaps the most challenging task of modern fire management.

The Fire Management Committee

On the Troy Ranger District, treatment of an unplanned ignition is
Fire Start

- Life / property endangered? Yes - Suppress
  No

Smoke management conditions favorable? No - Suppress
Yes

≥ 30 ERC last four days? Yes
No - Suppress

≥ 28 BI? Yes
No - Suppress

Fire weather acceptable? Yes
No - Suppress

Fire behavior acceptable? Yes
No - Suppress

Forecasted fire weather and behavior acceptable? Yes
No - Suppress

Equipment and manpower available if needed? Yes
No - Suppress

24-hour forecasted ERC ≤ 30? Yes
No - Suppress

24-hour forecasted BI ≤ 38? Yes
No - Suppress

Boundary threatened? Yes - Suppress
No (limited or total)

Allow to burn Continue to evaluate

Management objective satisfied

Contain and allow to burn out

Figure 1. Flow chart for managing fires on big game spring and winter ranges on operational fire management areas (USDA Forest Service 1979a).

6. To set the ultimate size of the prescribed fire and decide when the fire has accomplished its planned objectives, and
7. To order appropriate suppression action on the fire when needed.

The fire management committee lends flexibility to the fire plan. Even the best prescripions fail to reflect the complex interactions between fire and the particular environment in which it burns. On the Troy District, the committee has proved to be effective. When fires occur well within prescription criteria, most decisions are made in minutes.

The Escaped Fire Analysis

Forest Service Policy calls for an analysis of all wildfires that escape initial attack, and for prescribed fires that escape prescription and burn as wildfires. Local fire behavior and resource specialists evaluate logical suppression alternatives on the basis of total cost-effectiveness and the effects of fire on the resources. The analysis is conducted each day the fire burns out of control. Thomas Nelson (1979) provides an excellent example of such analysis for a wildfire that occured on the San Isabel National Forest in Colorado during 1978. The Maes Creek Fire escaped initial attack and burned in steep, inaccessible, broken, rocky terrain above 10,000 feet (3,048 m). The fire was not spreading very rapidly. Evaluation of potential effects on wildlife, timber, range, aesthetics, recreation, watershed, and soils, along with predictions of potential fire behavior yielded the fire control alternatives shown in table 1. The forest supervisor evaluated these alternatives in the light of crew safety, cost, and concern for life and property of local residents. Fire size was not a major concern because of natural barriers to fire spread. The forest supervisor selected alternative E (table 1), which represented a $500,000 savings over the cost of an all-out suppression effort. As Nelson (1979) points out:

"It was a common-sense approach to dealing with the fire cheaply but with adequate attention to the resource objectives and the public concern and safety."

Accomplishments and Prospects

Some skeptics of the revised fire
Fire Start

June 1—September 15? No Refer to flow chart for pre- or post season
Yes

Above 5,000 feet (1,525m)? No
Yes

Life / property endangered? Yes Suppress
No

≤ 53 ERC last four days? Yes Suppress
No

Smoke management conditions favorable? No Suppress
Yes

Fire weather acceptable? No Suppress
Yes

Fire behavior acceptable? No Suppress
Yes

Forecasted fire weather and behavior acceptable? No Suppress
Yes

Equipment and manpower available if needed? No Suppress
Yes

Boundary threatened? No Suppress (limited or total)

Allow to Burn Continue to evaluate

Figure 2. Flow chart for managing fires occurring on observation fire management areas during the normal fire season (USDA Forest Service 1979a).

Policy for the national forest see the policy as a foolish departure from strict fire control—a "let it burn policy." Others agree with the policy's intent but seriously question the capability of fire managers to develop and implement reliable fire management prescriptions. A recent Forest Service report of fire management activity in its Northern Region during the severe 1979 fire season tends to discount these fears (USDA Forest Service 1979b).

The Northern Region administers approximately 37,500,000 acres (15,176,250 ha) of National Forest land in northern Idaho, Montana, and the western Dakotas. About 8 percent of 3,000,012 acres (1,214,100 ha) are managed under approved fire management plans. Lands within classified wilderness areas account for 1,312,252 acres (531,274 ha) of this total. The remaining 1,687,252 acres (682,830 ha) is non-wilderness National Forest land.

The 1979 prescribed fire statistics for Northern Region lands managed according to approved fire management plans are shown in table 2. Of 101 fire starts, only 27 were allowed to burn a total of 32,011 acres (12,955 ha) as prescribed fires even though all the fires met prescribed fire criteria. Also note that all but 600 acres (243 ha) of the total burned area was in wilderness, but that 65 of 91 potential wilderness prescribed fires were suppressed. Elsewhere the same report shows that only 30 percent of the 32,011 acres (12,955 ha) burned in high intensity, stand destroying fires. Almost all of the acres burned in this manner were in the wilderness where the resulting biological diversity will support management objectives.

As illustrated by events in the Northern Region, early results of the Forest Service's fire management policy are encouraging but by no means conclusive. The ultimate success or failure of fire management will most likely depend on how well fire managers master improved fire management techniques and how accurately they can predict fire's long-term effects on forest and rangeland resources. Whatever the outcome, the 1980's will be an exciting and challenging time for those who manage the Nation's wildlands.

Publications Cited


USDA Forest Service. 1979b. Preliminary Fact Sheet: Prescription fires in the Northern Region. Northern Region, Missoula, Mont., 8 p.
### Table 1. Escaped fire analysis summary, Maes Creek Fire, San Isabel National Forest, July 5, 1978. (Nelson 1979)

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Total Suppression</th>
<th>Partial Suppression</th>
<th>No Suppression:</th>
<th>No Suppression:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A-Total</td>
<td>B-Total</td>
<td>C-Partial</td>
<td>D-No</td>
</tr>
<tr>
<td></td>
<td>Suppression</td>
<td>Suppression</td>
<td>Suppression</td>
<td>Suppression:</td>
</tr>
<tr>
<td></td>
<td>within 6 days</td>
<td>within 21 days</td>
<td>within 3 crews</td>
<td>monitor status</td>
</tr>
<tr>
<td></td>
<td>with double</td>
<td>with 3 crews, 1</td>
<td>plus support</td>
<td>with 1 crew</td>
</tr>
<tr>
<td></td>
<td>present resources</td>
<td>helicopter plus</td>
<td></td>
<td>and 1 helicopter</td>
</tr>
<tr>
<td></td>
<td>(18 crews and</td>
<td>support</td>
<td></td>
<td>and support</td>
</tr>
<tr>
<td></td>
<td>support)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated control date</td>
<td>7/14/78</td>
<td>7/16/78</td>
<td>7/30/78</td>
<td>8/10/78</td>
</tr>
<tr>
<td>Size (acres)</td>
<td>2,300</td>
<td>2,300</td>
<td>2,400</td>
<td>2,400</td>
</tr>
<tr>
<td>Suppression cost</td>
<td>$694,000</td>
<td>$547,000</td>
<td>$210,000</td>
<td>$225,000</td>
</tr>
<tr>
<td>Rehabilitation cost</td>
<td>$14,000</td>
<td>$14,000</td>
<td>$14,500</td>
<td>$14,500</td>
</tr>
<tr>
<td>Estimated total cost</td>
<td>$708,000</td>
<td>$561,000</td>
<td>$224,500</td>
<td>$239,500</td>
</tr>
</tbody>
</table>

### Table 2.—Summary of prescribed fire activity on National Forest lands covered by fire management plans in the Northern Region during 1979 (USDA Forest Service 1979b).

<table>
<thead>
<tr>
<th>Name of area</th>
<th>Fire starts</th>
<th>Fire suppressed</th>
<th>Allowed to burn</th>
<th>Acres within fire perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaconda Pintler</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beaverhead National Forest</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bitterroot National Forest</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Deerlodge National Forest</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cabinet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kootenai National Forest</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Scapegoat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lolo National Forest</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Selway-Bitterroot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearwater National Forest</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>Bitterroot National Forest</td>
<td>16</td>
<td>7</td>
<td>9</td>
<td>14,900</td>
</tr>
<tr>
<td>Nezperce National Forest</td>
<td>59</td>
<td>49</td>
<td>10</td>
<td>16,300</td>
</tr>
<tr>
<td>Wilderness subtotal</td>
<td>91</td>
<td>65</td>
<td>26</td>
<td>31,411</td>
</tr>
<tr>
<td>FIRE MANAGEMENT OUTSIDE WILDERNESS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Troy fire management plan</td>
<td>1</td>
<td>0^1</td>
<td>1</td>
<td>600</td>
</tr>
<tr>
<td>Lolo N. F. revised policy</td>
<td>5</td>
<td>5^2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bitterroot fire mgmt. plan</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Non-wilderness subtotal</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>600</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>74</td>
<td>27</td>
<td>32,011</td>
</tr>
</tbody>
</table>

^1Eighteen fires suppressed, did not meet prescription; modified attack on five fires.

^2Of 302 ignitions on Lolo N. F., 297 were outside prescribed fire management areas and were suppressed. Of the latter, 5 were not attacked immediately but were put out the next morning to eliminate overtime payments and enhance crew safety.

### Footnotes

1. Research Forester, USDA Forest Service, of Intermountain Forest and Range Experiment Station, Northern Forest Fire Laboratory, Missoula, Montana.

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