# FIRE CONTROL NOTES

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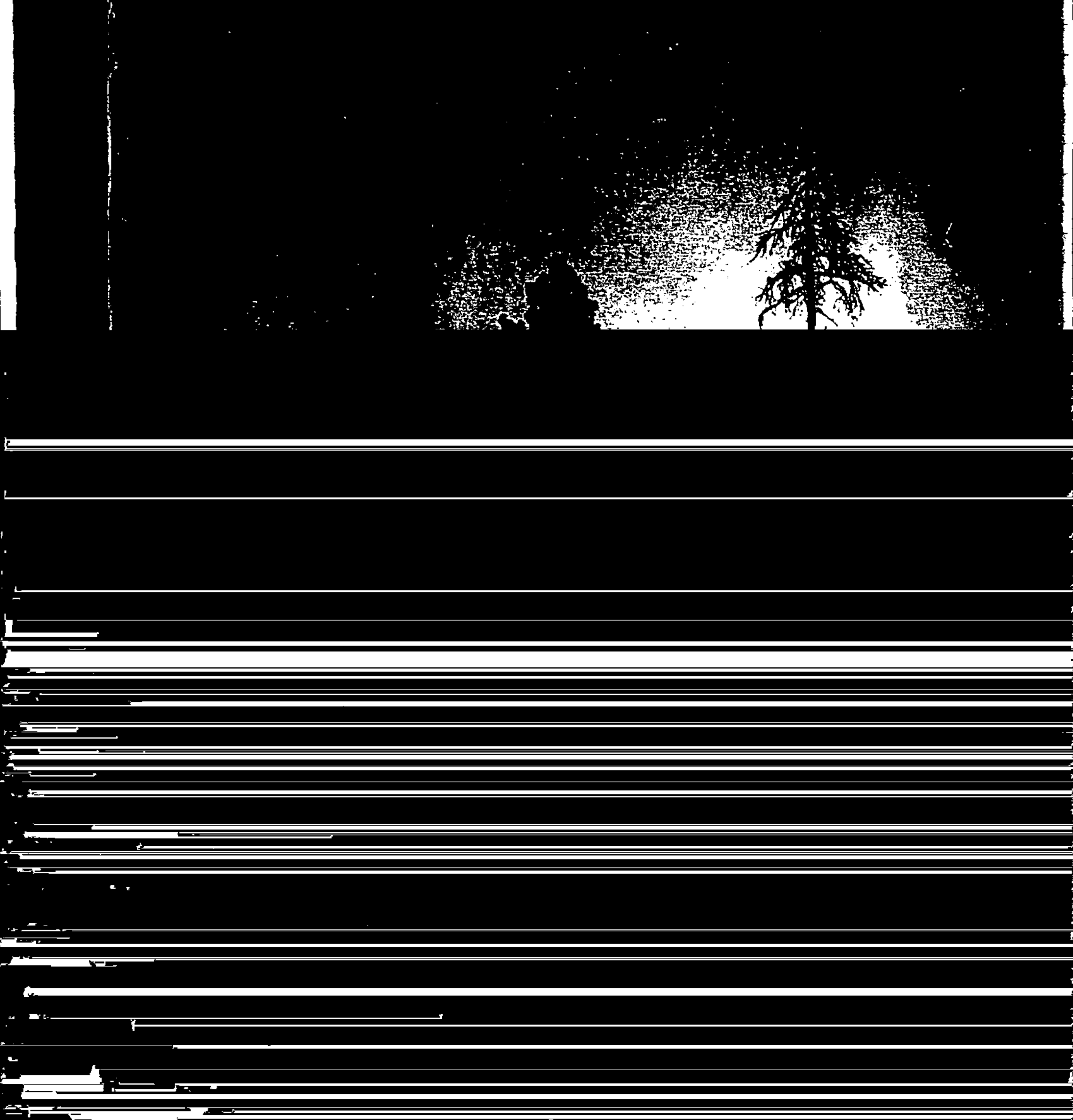

# FIRE CONTROL NOTES

*An international quarterly periodical devoted to forest fire control*


## CONTENTS




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# National Fire Training is 15 Years Old and Still Growing*

*G. E. Cargill*

It is almost 15 years since the first National Fire Behavior Course at Missoula, Mont. Let's put these years of fire training in perspective — where we've come from, where we are, and where we might be headed in fire training during the next few years.

## The Need Was Seen in 1956

Nineteen hundred fifty-six was a bad fire year. It was the year of the Inaja Fire when 11 firefighters were fatally burned. There was a great deal of interregional movement of fire suppression overhead and crews. As a result of the Inaja fire tragedy, a task force was assigned to find out what could be done to reduce chances of men being trapped and burned while fighting forest fires. Finding a need for increased knowledge of fire behavior, the task force accomplished the following: During 1957 and 1958 a pamphlet, "Safe Practices Under Blowup Conditions" was issued; the "10 Standard Firefighting Orders" were written; four new fire control training films were started; a National Fire Control Training Handbook was published; and in 1958 the first National Fire Behavior Course was held in Missoula, Mont. This course was followed by other courses in fire behavior and large-fire management (fire generals) held at various places throughout the country.

During the '60's instruction was designed to help people to learn more efficiently. The challenge to fire control was (and is) to analyze what the training needs are and to adapt new training techniques to meet the needs. It became clear to the Forest Service that a full-time man was needed to help obtain the quality of fire control training desired in the quantity required. As a result, in 1967, the National Fire Training Center was established at Marana, Ariz., with Ed Heilman as Director.

## Three Levels of Courses Available

How does National training fit the overall Forest Service fire training program? There is some variation, but for the most part advanced courses are held at the national level, intermediate courses are given at the regional level, and basic courses are given at forest and ranger district levels. As a region or zone gets enough trained instructors and lesson material, an advanced course can be given in the region, allowing the national courses to tackle new problems.

Training programs at all levels should be based on an analysis of training need. Looking at performance in various activities and analyzing the deficiencies found, we in fire training ask: "Is this a deficiency which training can correct?" We know training cannot solve all of our problems. Since time, money, and available people are limited, we have to train in areas where we have the greatest chance of improving performance.

## Training Packages Developed

We are developing multimedia training packages because we have found that motion pictures by themselves are not very efficient training aids. The most recent training package is a Helitack Training Guide incorporating lesson plans, slides, vugraphs, and other visual aids. Slide-tape programs have been useful, and we are developing more of them since motion pictures cost so much.

A sector boss training package now being developed features a film as the primary aid and includes lesson plans based

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* This article is adapted from a speech given to the National Research Council Associate Committee on Forest Fire Protection, Petawawa Forest Experiment Station, Chalk River, Ontario, Canada, Oct. 26, 1971.

*. . . the fire trainer has to be out in front, anticipating change and preparing people for it*

on it. Unfortunately it takes a lot of time to create, print, and distribute the material.

Publications such as *Equip Tips* and *Fire Control Notes* are important ways to distribute information regarding new products from our equipment development centers. We also need to spread the word about interregional fire training aids.

Magnetic video tape systems (VTR) were used to record instructor presentations at a recent national course. They helped improve the instructor's performance. We have made limited use of VTR for recording classroom lectures to be played back at a later date, but we plan increased use of VTR in our training programs. Lack of industry standards in hardware is a problem for us.

### Training Doesn't Always Make It to the Field

We're still finding breakdowns in transfer of knowledge from the classroom or from programmed instruction to the field. Simulation is one of the effective means we know to improve this transfer, but only relatively few top overhead have had the opportunity to use the large fire training simulator. The 1972 Fire Generals Course will not include a simulator problem because "like real" Class I problems do not require visual simulation. We have occasionally used equipment at quite an expense in relation to training value acquired.

The compact fire training simulator should bring lifelike experience to people in mid-overhead positions and to initial attack firemen. Our problem presently is not lack of technology in simulation or student response; it is developing enough good programs which involve the student and require him to respond to the training. We need to share the few good programs we have.

### Other Problems Remain

What are some of the other problems facing us in fire training? For one, it is difficult to obtain good instructors. It requires about 10-20 hours of preparation for every 1 hour of instruction, and with increased demands on time, we're finding it difficult to find technically competent people who are good instructors and are available to teach.

Another problem is reaching enough people, which is complicated by attrition, transfers to other duties, etc. The problem extends to the ranger district level. In some locations,[1] we are experiencing an 80-85 percent turnover in seasonal work force each year. This means each year we start with individuals who have no carryover experience or knowledge on which to build. We have to refocus our attention on training packages the district and forest can use to teach basic firefighting skills. This year we are doubling the number of trainees at our fire generals course and staggering the classes so each instructor presents his material twice.

Evaluation of training remains a problem. So far, we have depended mainly on subjective reports from trainees after they have completed courses. What is needed are better performance evaluation reports on how men do the job for which they are trained. In other words a "feedback loop" to give direct results of our training. Right now, this is a missing link in the overall training system.

### A Future Problem: We Must Keep Up with Technology

In the 25,000 years of man's existence in North America

[1] "Manning, A Region-3 Report," Div. Fire Contr., Albuquerque, N.Mex.

there have been about 400 lifetimes of 60-70 years each. The first 250 were spent in caves—fire was friend and foe then, too.

Only during the last 70 lifetimes has it been possible for man to communicate in writing what he knew about fire—or anything else. Only during the past six lifetimes did masses of men ever see a printed word.

In the area of fire research, except for a few historic writings, almost all of the existing literature has been published since 1912. Furthermore, about one-half of the entire bibliography has been published within the last 30 years—the span of one career. Of perhaps more significance to the fire trainer is the fact that the number of fire research titles published during the 1960 decade is more than twice that of the 1950's.[2]

#### Technology Is Advancing Like Wildfire

A young man 18 years old going into fire control work in the year 1919, would have witnessed within his own lifetime the introduction of every one of the technological developments in fire management today, from aerial detection (1919) to the infrared "Hot Spotter" (1971).

The present rate of spread in fire control knowledge will probably continue, even accelerate. And when computer technology comes of age in fire control management, it will generate an unprecedented knowledge acquisition capability and an equally unprecedented knowledge distribution opportunity.

[2] 1630 Written Information: Forest Fire and Atmospheric Sciences Research Publications, 1950-1959: 368 publications; 1960-1969: 770 publications.

In order to keep ahead of the information, we are going to have to identify and anticipate those areas where training can improve future performance.

#### Cooperation Importance Stressed

The need for cooperation will continue and become even more important — between Federal, State, and local agencies; between management, research, and scholastic systems; between fire control professionals, land managers, and behavioral scientists; and between nations.

What will be needed in fire control training during the next few years? The result of the Oct. 26, 1971, meeting of fire control training officers is the start of a future forecast group to include technical people, behavioral scientists, economists, and people of diverse backgrounds.

#### The Speed of a Growing Tree Isn't Fast Enough

Perhaps because natural resource management is a long range proposition, we sometimes seem to utilize research efforts and technological developments at about the speed of a growing tree. This is fine insofar as it precludes overreaction to public fads and wild gyrations in land management policy; however, the fire trainer has to be out in front, anticipating change and preparing people for it.

Some mammals now extinct were in trouble when they got their feet stuck in tarpits. Among the tarpits of training are complacency, resistance to change, fear of new ideas, and bureaucratic inertia. Our challenge is to keep the fire manager and ourselves out of those tarpits. △

*Mounted in Place Of Dozer Blade,*

# Crusher-Cutter Efficiently Disposes of Slash

*William D. Shenk and Richard N. Harlan*

Using the Tomahawk Crusher-Cutter[1] has proven to be a cheap, clean method of disposing of slash from logging and thinnings. The Tomahawk is effective in fuel modification in eastern Oregon, particularly with 1-year-old brittle slash. The Tomahawk is effective because of the front mount and even more effective with the blade removed because the operator can see the job ahead of him and maneuver easily around obstacles.

Trailer-type slash cutters are not as maneuverable when working in thinned stands of reproduction and poles.

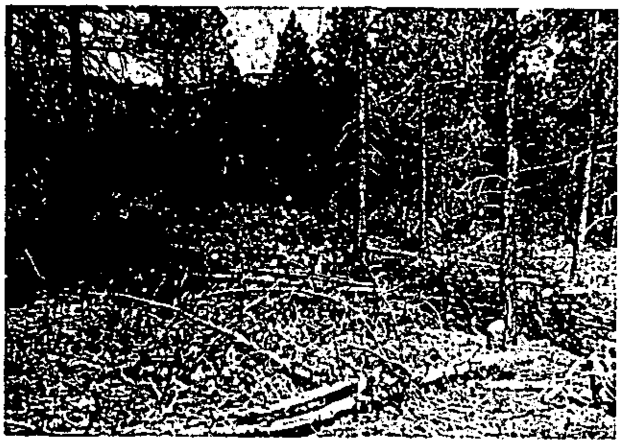
#### Road Crusher Works Well on Slash

Originally developed for use in breaking up and compacting road surfacing material, the Tomahawk shows promise as a tool for fuel treatment.[2] Treatment is most effective when slash is brittle.

The Tomahawk can effectively crush material 4 inches in diameter and less. Also, if thin-

[1] Manufactured by the Young Corporation, 2917 East Marginal Way South, Seattle, Wash.

*William D. Shenk is fire control officer, Deshutes National Forest. Richard N. Harlan is supervisory civil engineering technician, Fremont National Forest.*



*Before crusher-cutter treatment. Note two trees to man's left.*

*After crusher-cutter treatment. Man is now standing between the two trees noted in before picture.*

ning operations must meet specifications of 16 feet and wider spacing, conditions are ideal for an effective Tomahawk operation. One pass over an area is good; two are better, particularly when creating a grid pattern. The Tomahawk reduces hazard ratings very effectively in small limbed logging slash, such as that resulting from cutting lodgepole pine and from commercial and precommercial thinning.[3]

Costs run from $20 to $35 an acre, depending on many conditions such as slope, slash density, or equipment availability. While its use is still relatively new in slash treatment, the Tomahawk has been used in the Deschutes and Fremont National Forests for the past 3 years.

#### Use Hydraulic Dozer

A dozer with a hydraulic system, rather than a fixed blade, is better to use with the Tomahawk because it provides enough pressure to crush the slash. The power of a hydraulic system becomes more important when the dozer blade is removed and the Tomahawk is mounted directly on the yoke with the adaptor.

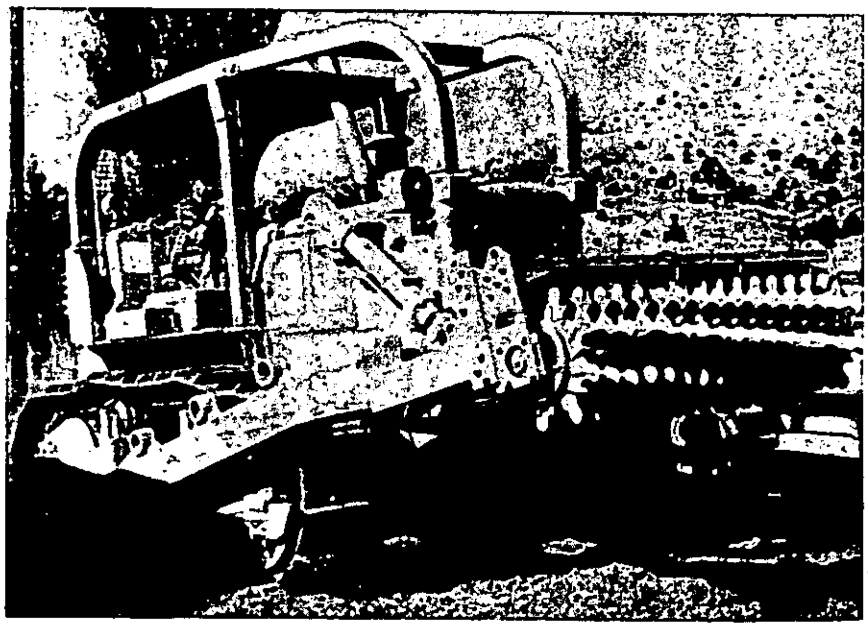
Disadvantages to bulldozer use with the blade on soon became apparent.

1. The Tomahawk was mounted with clamps to a dozer blade. Bolts used to tighten the clamps tended to shear, creating numerous maintenance shutdowns.

2. The tractor operator could not observe the Tomahawk in operation because the dozer blade obstructed his view of the machine and the ground immediately in front of the Tomahawk.

3. The Tomahawk was designed to revolve as it passes over the material being crushed: when the slash bunched up in front of the cutter and blade and when a chunk became lodged between the Tomahawk

*Adapter-mounted Tomahawk provides compactness and visibility.*



[2] See "Reducing Fire Hazard in Ponderosa Pine Thinning Slash by Mechanical Means" by John Dell and Frank Ward, USDA Forest Serv., Pac. Southwest Forest and Range Exp. Stn., Res. Pap. PSW-57-1969.

[3] See chapter 5150—Fuel Management, Oct. '71, Amend. 35, Forest Serv. Man.

and the dozer blade, the Tomahawk did not operate well.

#### Adaptor All Important

To correct these deficiencies the dozer blade was removed and the Tomahawk mounted directly on the yoke or U-frame. To do this a local welding shop constructed an adaptor for $230. One-inch steel was cut for the adaptor and was welded to fit the specifications of the yoke.

#### Operator Can See

A major advantage of mounting the crusher on the yoke is that the operator can observe the Tomahawk as it crushes.

Much crushing of thinning slash is done among spaced crop trees which must be protected from damage. The crusher on the yoke, blade removed, lessens the overall width of a crawler tractor. Also, if a leave tree is struck by the tractor, the yoke will damage it less than the corner of the blade, which ordinarily protrudes beyond the width of the yoke.

The use of the yoke-mounted crusher is encouraging. The whole crushing operation is faster, more efficient, and given greater maneuverability. And, not the least of considerations, with increased production comes the benefit of reduced per-acre treatment costs. △


*Forester,*
*Munising Ranger Dictrict,*
*Hiawatha National Forest*

Slash accumulations create a fire hazard, a barrier to reforestation, and an unpleasant appearance. The rolling chopper has proven effective in crushing heavy jack pine slash. Fire hazard is reduced; the site is prepared for reforestation; and the attractiveness, wildlife habitat, and general soil condition are maintained.

The slash described in this article was on a 523-acre jack pine timber sale area on the Hiawatha National Forest, Michigan. When chopped, the slash varied in age from 6 months to 3 years. Chopping broke up the slash, placed it close to the ground, and partially mixed it with the soil, where fuel moisture is higher and more rapid deterioration takes place. Larger fuels, over 4" in diameter, were broken and flattened to the ground. Mineral soil was exposed over 40-60 percent of the area, break-

*In many cases, the rolling chopper needs to make only one pass through slash.*

*Mechanical slash treatment permits protection of clumps or individual trees. A variety of species maintain esthetics and provide shelter and nesting sites for some wildlife.*

ing up the continuity of slash. Rate of spread and resistance to control of fire was reduced from an estimated M-H to an L-M rating. Only one pass was required in light to medium slash. In heavy slash accumulations two passes were required to break up the slash.

The topography on the Hiawatha National Forest is flat to gently rolling. Soil is a Rubicon, a well-drained sandy soil with a thin (1"-2") humus layer. In this soil the chopper creates slits and mixes in the slash, improving soil structure and ferility and reducing erosion.

### Trees Grow Again

The chopper exposes a suitable mineral soil seed bed necessary for seeds to begin and continue growth. The area cut and chopped requires supplemental seeding or planting to obtain a fully stocked stand. First year survey shows 38% stocking, and aspen sprout well where aspen trees were chopped. The serotinous cones of jack pine release thin seed at the higher temperatures found close to ground level. So the end result will be a jack pine stand with scattered pockets of aspen.

Opportunities to improve the esthetic qualities occur often. Small patches of aspen, young red pine, jack pine, or shrubs growing in the area can be left. Patches of black cherry, service berry, and white birch may also be present. All these patches may vary in size and location and will break up large openings often created in timber harvest operations. Islands of shrubs and non-coniferous trees reduce the artificial effect of solid rows of planted trees.

### Wildlife Use Openings

The openings created by timber cutting are used by several species of wildlife. Whitetail deer feed on new sprout growth. Sharptail grouse, an important game bird, nest in large open areas. Nesting seasons must be considered to protect game and song bird populations if chopping is to benefit the birds.

### Choppers Work in 'V' [1]

The rolling choppers are pulled in a dual arrangement by an International TD-25. Best results were obtained when the choppers were pulled in a "V" formation with the center back.

Each chopper drum is 7 feet wide and 43 inches in diameter and is filled with fuel oil to avoid freezing. Full weight is 11,000 pounds. The chopper can be used effectively on slopes up to 20 percent. Areas should be reasonably free of boulders, rock outcrops, and swamps. Chopping can be done during most of the season when the ground is free of snow.

Production rate for single chopping averaged 2.1 acres per hour at a cost of $11.49 per acre. A second chopping was needed in areas of heavy slash at an additional cost of $4.71 per acre.

### Rolling Chopper Provides Benefits

The use of the rolling chopper gives the Forest Land Manager an opportunity to reduce fire hazards while preparing a suitable site for reforestation. Changes in soil structure and fertility are not significant. Groups or patches of desired trees and/or shrubs can be left to provide important wildlife benefits and enhance the beauty of the forest.

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[1] See "Disposal of Logging Slash with a 'Rolling Chopper'," S. H. Van and Dale E. Gallagher, FCN, 29:2(7), April 1968. △

*. . . water dropped from helibuckets can provide a short-term fire control line . . .*

# Alaska's Extra Ace: Water Dropping

*Nonan V. Noste and*
*Roy M. Percival*

The U.S. Department of Interior, Bureau of Land Management, initiated water dropping by helicopter in 1968, and information on effectiveness was obtained through a cooperative effort with U.S. Department of Agriculture, Forest Service, during the 1969 fire season. On eight operational drops studied, the water line held satisfactorily on fine fuels. The study suggests that water dropped from helibuckets can provide a short-term fire control line under certain weather and fuel conditions.

The Fire Research Project at College, Alaska, has been studying methods of attacking wildfire, including dropping water from helicopters and helitanks. In 1966, a helitank was purchased, and, in 1967, an exploratory study developed techniques for measuring ground distribution patterns, using a 55-gallon Monzoon bucket slung from a light helicopter. The Bureau of Land Management initiated water dropping by helicopter on an operational basis in 1968. Through a cooperative effort with the Forest Service, preliminary information on the effectiveness of water dropping was obtained during the 1969 fire season. The results follow.

*N. V. Noste is research forester, Forest Fire Research Project, Forestry Sciences Laboratory, Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, College, Alaska. R. M. Percival is fire control officer, Fairbanks District, Bureau of Land Management, Fairbanks, Alaska.*

## Water Line Can Stop a Fire

Water line laid by a helicopter with a 450-gallon helibucket can stop a fire's advance. This was determined by a two-man team obtaining data on eight water drops. In each case, water was dropped from 450-gallon fiberglass helibuckets, cable slung from a helicopter. The ground team located and flagged the centerline of the drop pattern after the operational drop.

The minimum distance from the advance point on the fire front was measured at the time intervals of ¼, ½, 1, and 2 hours. Six of the fires did not advance during the 2-hour period of observation. One fire did advance from 20 feet to within 18 feet of the centerline, and the other fire burned over after holding for 30 minutes. The burned-over line held in the light surface fuels at the edge of a grass-sedge meadow but was overrun by a relatively intense front traveling through the adjoining willow brush.

The effectiveness of water dropping can be judged after considering the burning conditions. The water line held when rate of spread was 2 feet per minute (approximately 2 chains per hour) or less. Winds of 12 miles per hour, contributing to a spread index of 60, did not cause the fire to work its way through the water-treated strip, although utimately the line did not hold. A problem with use of water for permanent line construction is escape of the fire when mopup is not thorough. The observations were made during routine drops on problem fires during an extreme season.

Water contained the fire satisfactorily in fine fuels during the eight drops (see table). Also when erosion potential exists, a water line would eliminate disturbance of protective surface vegetation. Maintaining the insulating effects of the surface vegetation is important on permanently frozen soil, like that found in Alaska. △

# THIS HUMIDITY BUSINESS: What It Is All About and How It Is Used In Fire Control

*Clive M. Countryman*

Understanding relative humidity and its relation to fuel moisture makes it a convenient and useful tool in wildland fire control activities.

### Relative Humidity Affects Dead Fuels

In the absence of rain, the amount of moisture in dead fuels is controlled to a large degree by the humidity and temperature of the air immediately surrounding the fuel.

On clear days with light winds, the ground surface and the fuels on it become quite hot. It is not unusual for surface temperature to reach 160° to 165° F. when air temperature measured in a standard instrument shelter nearby is only 80° to 90° F. Close to the hot ground surface, the air also becomes warm and the relative humidity considerably less than that of air only a short distance above the ground. In open areas during the summer, the moisture content of small surface fuels may be only about one-half that of fuels exposed a foot above the surface.

*Clive M. Countryman is a specialist in fire behavior at the Pacific Southwest Forest and Range Station, Riverside, Calif.*

### Nights Are Moister

At night the situation can be reversed. The ground surface becomes cold first and cools the air close to it, raising its relative humidity. This condition in turn increases the fuel moisture so that the surface fuels at night may have a higher moisture content than fuels above the surface.

Thus, any condition that results in an air temperature near the fuel that is different from air temperature measured elsewhere also results in a different relative humidity and fuel moisture.

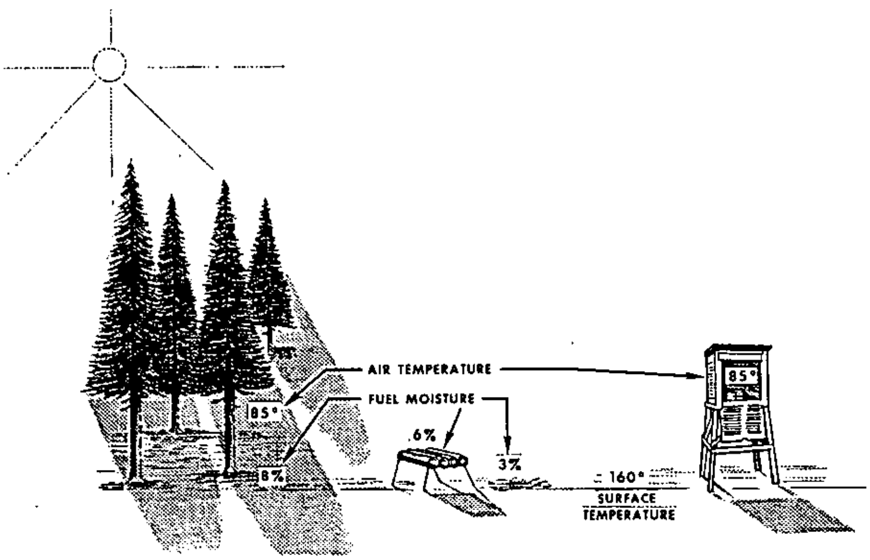
In deep canyons, as compared with exposed slopes, or timbered areas, as compared with open areas, significant temperature and relative humidity differences can be expected.

### Fine Fuels Adjust Quickly

Fine fuels with a large surface area compared with their volume, such as grass, leaves, and small twigs, can reach their equilibrium moisture content in a few minutes, but large limbs and logs take a long time. Limbwood 2 inches in diameter may require up to 4 days at a constant relative humidity and temperature to reach equilibrium; logs may require weeks or even months. Since relative humidity is usually continuously changing, the actual fuel moisture lags behind the equilibrium moisture. The amount of this lag depends on how fast the relative humidity is changing, the size of the fuel, and how well the air can circulate around the fuel: loosely arranged, well aerated fuels will have moisture contents nearer equilibrium values than more compact fuel beds.

### Relative Humidity Guides a Burnout

Suppose a division boss on a



large fire has the responsibility for constructing and burning out a fireline down a spur ridge and along a canyon bottom. The fireline ranges from 2,500 to 4,000 feet elevation. The plan is to construct the line during the day and to fire it out at night when cooler temperatures and higher humidity will lessen the chance of fire escape during the burning-out operation.

#### Records Kept

The winds are light, varying from 6 to 10 miles per hour. Throughout the morning the division boss has been recording temperature and humidity with a sling psychrometer on both the ridge and canyon bottom line locations. He has noted that the canyon bottom air has been somewhat cooler and the humidity higher than on the ridge. He attributes these differences to the taller vegetation and small amounts of water in the nearly dry stream bed of the canyon.

By midafternoon the temperature on the ridge is 90° F. and the relative humidity 15 percent —about what the fire weather forecast indicated for the fire area. But at about the same time, the temperature in the canyon bottom is 84° and the humidity 25 percent. The division boss receives a night fire weather forecast which predicts that by 0200 hours the temperature will drop to 60° to 65° and the humidity will rise to 35 to 40 percent. Wind will be slight.

These conditions will not interfere with burning out the ridge line, but the division boss is concerned about the canyon bottom line.

#### Dewpoint Is Indicator

Consulting his tables on relative humidity and dewpoint, the division boss finds that a relative humidity of 15 percent and a temperature of 90° indicate the dewpoint is 37° while a temperature of 84° and a humidity of 25 percent give a dewpoint of 45°. The night temperature and relative humidity forecasted also give a dewpoint of 37°, indicating the fire weather forecaster does not expect a change in the air mass. If the temperature in the canyon bottom drops to the forecast of 60°, the division boss finds from his tables that the relative humidity will be between 48 and 55 percent because of the higher dewpoint in this location. At this humidity, the burning conditions are likely to be marginal.

But the division boss also knows that because of cold air drainage into the canyon, the temperature there is likely to be considerably colder—probably as much as 10°. If the temperature drops to 50° or 55°, the relative humidity will range from 69 to 84 percent—too high for successful burning.

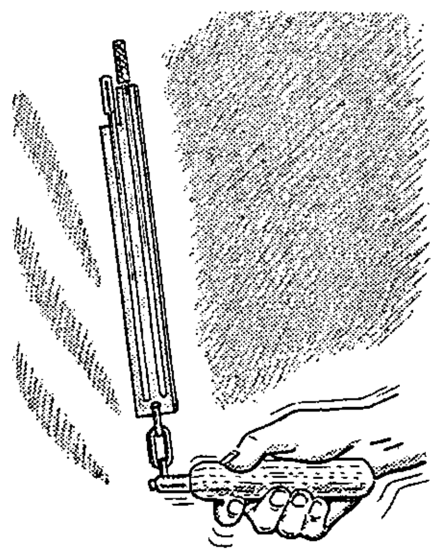
#### How To Burn Decided

The division boss decides he must complete the burning operation early in the evening if it is to be successful. He then arranges for enough crews to complete the job within the time limits.

#### Relative Humidity Utilization Is Simple

Thus, with only a sling psychrometer and a set of relative humidity and dewpoint tables, the fire weather forecast can be localized to fit a specific fireline situation.

This article is adapted from a 1971 Pacific Southwest Forest and Range Experiment Station publication, which is, unfortunately, out of print. △

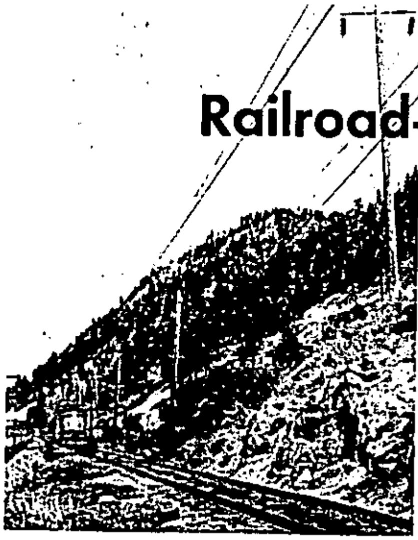


SLING PSYCHROMETER

# Railroad-caused Fires:

## What Starts Them What Keeps Them Going

*Floyd R. Cowles*



*Railroads are responsible for starting thousands of fires each year.*

A study of fires along two railroad right-of-ways in Region 1 reveals brakeshoes as the leading cause. The study also stresses proper upkeep of right-of-ways as the best way to prevent railroad-caused fires.

Approximately 400 railroad-caused fires occurred along the two study areas during the 1960-1969 period. The Forest Service took suppression action on approximately 20 percent of them. The remainder were suppressed entirely by railroad employees and were not reported by the Forest Service as statistical fires.

Brakeshoes were the leading cause of fires along these study areas. Other fire starters included: exhaust carbon sparks, right-of-way burning, journal boxes, and track repairs.

Fire occurrence was concentrated in areas of heavy braking. For example, 75 percent of one railroad's fires reported by the Forest Service occurred within an area 1 mile east to 1 mile west of six restricted speed zones. Thirteen brakeshoe fires by another railroad were suppressed (1967-1969) within a 4.5-mile stretch near Superior, Mont.

*Floyd R. Cowles is a forester with the Division of Fire Control, Missoula, Mont.*

### Causes of Fires Are Many
### Hot Brakeshoes Are a Hazard

When brakeshoes are pressed against steel railroad wheels, considerable heat is generated. Occasionally hot brakeshoe fragments break off and start fires when fuel and weather conditions are right. These fragments vary from paper-thin pieces, less than an inch in length, to chunks several inches long. Their bluish color indicates they have been heated to temperatures exceeding 1000° F. Pieces of metal of this mass and temperature are effective ignitors when placed in contact with dry fuels and fanned by the turbulence created by moving trains.

- Composition brakeshoes have been developed and are appearing on newer cars. This type brakeshoe holds promise because it does not fragment as easily as cast iron brakeshoes, and it does not retain as much heat.

### Exhaust Carbon Particles[1] Burn

Carbon is produced in the combustion process. Under normal operating conditions (when an engine is running fast with a moderate load and ideal fuel-air mixtures) relatively little carbon residue is produced. However, four conditions promote buildup of excessive carbon:

1. When speed is suddenly increased after engines have been idling for some time.
2. Wherever there are grades and more power or speed is needed.
3. When engines have operated for many hours without proper maintenance and cleaning.
4. When water leaks or other engine malfunctions occur.

Burning carbon particles can be expelled from engine stacks onto adjacent fuels under any of the conditions listed above If their mass is such that they

[1] See related article, FCN, summer 1971: Exhaust Particles How Many Fires Do They Start?

remain glowing (temperature above 400° F.) long enough to reach the ground, and if fuel and weather conditions are right, fires can result. Carbon particles can be thrown as far as 40 to 50 feet.

- In August, 1969, a railroad started using a fuel additive that reduces carbon buildup in engines. Because the company claims that the number of carbon exhaust fires has materially decreased since introduction of this additive, this practice looks promising.

#### Journal (Hot Boxes) Overheat

The ends of many railroad wheel axles rest in a lubricated bearing called a journal box. These bearings are lubricated by a rag (wick) which furnishes oil to the bearing. Malfunctions can cause a bearing to overheat and, on occasion, start fires.

- Railroads are replacing journal boxes with roller bearings, thus reducing this hazard.

#### Truck Repairs (Grinding and Welding) Spark Fires

Rails are in constant need of grinding and welding to keep them smooth and properly fastened together. Sparks from welding and grinding operations are potential ignitors but caused only one fire in the study areas during the 1960-1969 period.

- During grinding and welding operations, maintenance crews should post a lookout to watch for fire starts and thoroughly check for fires before the crew moves to a new location.

#### Right-of-Way Climate Fosters Fires

For a number of reasons, right-of-ways invite and sustain fires. Railroad rights-of-way are necessarily long, narrow openings in the surrounding vegetation. They are generally at least 100 feet wide. In timbered areas, this treeless swath creates a special micro-climate. Shade is removed and wind movement is altered. The addition of steel rails, rock ballast and black ties causes an increase in thermal radiation. Temperatures are usually higher and humidities lower than in adjacent areas. Wind movement is sometimes increased, particularly if tracks parallel prevailing winds.

Temperatures along the rights-of-way are 1 to 3 degrees warmer and humidities 1 to 3 percent lower than those at the respective district weather stations.

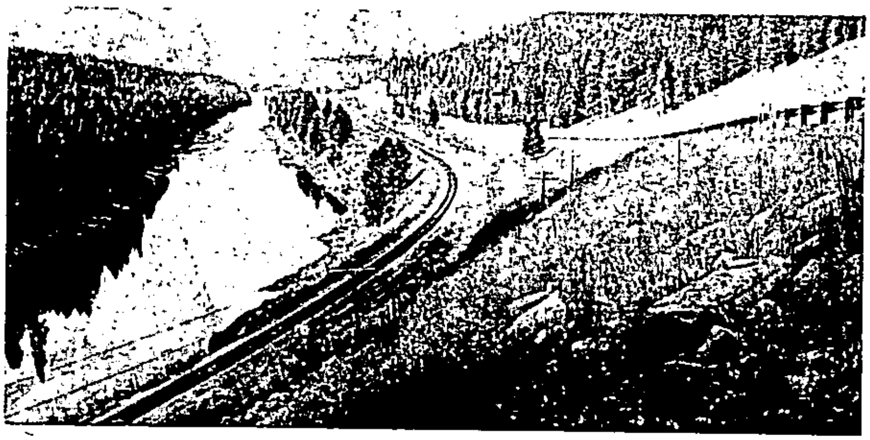
Fuels in these micro-climates are thus usually dryer than fuels in adjacent forested areas. If winds parallel the right-of-way, some tunneling occurs, promoting faster fire front movement. *Since the micro-climate cannot be changed, the only remedy to rights-of-way fires is fuel modification.*

#### Fuel Modification Is the Answer
#### Fuel Break Construction and Maintenance Lowers Hazard

Once a fuel break is constructed (as close to the tracks as is practical) annual maintenance is usually necessary. This usually consists of dozing off any vegetative growth. Since most

*These miscellaneous brakeshoe fragments and brakeshoe slough material were found along the right-of-way adjacent to these ties.*

*Three brakeshoe slough fragments are visible in this photo. Triangles point to two of these fragments. This slough material originates from both brakeshoes and track steel. New fragments are shiny and bluish in color because of heating, but they rust very quickly.*



*A fuel break has been ploughed between track and highway (note berm, broken ground, in left foreground). River and highway serve as firebreaks.*

exhaust fires occur within 50 feet of the track, breaks do not need to be constructed much beyond this distance unless topographic or other factors influence construction.

### Chemical Spraying Puts Damper on Fires

The spraying of herbicides, soil sterilants, or both is quite effective in eliminating vegetation from the rights-of-way. Sections of the study area that had been sprayed recently were noticeably freer of vegetation than sections not sprayed.

The problems with spraying are: (1) it is costly, and (2) growing public resentment against the use of chemicals for vegetation control. Nevertheless, spraying is a good fire prevention tool, and its use should be continued where approved.

If spraying is necessary to protect adjoining areas from fire, the public should be informed. The danger of pollution from right-of-way spraying is small because of the relatively little amounts of chemical used and the length of time between applications. Right-of-way spraying is not like crop spraying, where, if irrigation is used, waters carry the chemicals into streams.

It may be found that if spraying is repeated several years in a row, it will inhibit growth enough so that annual spraying will not be necessary.

### Right-of-Way Burning Cheap and Effective

Burning is used to eliminate hazardous fuels along the right-of-way. It is a relatively cheap method and accomplishes a fairly complete fireproofing job. A much wider fuel break may be treated by burning than by spraying. In general, burning extends from the rail to the edge of the fuel break.

Burning should be started in the spring, as soon as the previous year's accumulation of fuels is adequately dry. This is a good time to burn, because the soil and lower layers of duff are still moist enough to discourage deep burning and less mop-up is needed.

Burning can also be done later in July, after the cheat grass matures. Burning then is effective in eliminating both current and previous year's fuel accumulations. Greater control of the fire is necessary in July, however, as fuels are dryer and the threat of escaped fires is greater. A more complete job of mop-up is usually necessary with July burning.

Railroad right-of-way burning problems are not insurmountable. The Forest Service and the railroads have a big job in selling the need for this burning to the public and to State air quality people. The public needs to know that wildfires pollute the atmosphere much more than prescribed fires. If railroad companies do not burn old ties and burn only lighter fuels (brush, grass, and weeds) there should be little threat to air quality. This burning should be done on days when the atmosphere is unstable and smoke disperses quickly.

### You Can Get Study Results

While this study was made on certain sections of track, its results provide general insights into railway fire prevention problems.

Copies of the right-of-way fires report may be obtained from the Division of Fire Control, USDA Forest Service, Federal Building, Missoula, Mont. 59801. △

*The right-of-way adjacent to the ballast area has been treated with soil sterilant chemicals.*

# A Supervisor's Office Coordinating Organization For Multiple Large Fire Suppression Can Work

*D. A. Oliver and R. L. Asher*

*Set up at the direction of a 1970 task force, Region-6's Supervisor's Office Coordinating Organization (SOCO) was put into action in September 1971 to handle three project fires. SOCO, a unit separate from the local forest dispatching operation, was successful, saving time and money as well as reducing confusion.*

Following the 1970 fire catastrophe in Northern Washington, a task force was appointed to develop plans for fire coordinating organizations at the Supervisor and Regional Forester levels. A preliminary plan for these organizations was circulated in the spring of 1971 and Region 6 prepared to try the system if major fires developed.

### Preplanning Pays

About September 12, east wind conditions started developing over the Cascades in Oregon and Washington. Some slash had been burned in several of the Cascade Forests, but these burns had been well mopped up before the winds began.

The morning of September 16, winds began to increase and during the day reached peaks of 60 miles per hour. A number of mopped up slash fires started to show life. The Skyhook Fire, which started in an active logging operation on the Mt. Hood National Forest, spotted ahead several miles, resulting in two campaign fires. Several slash burns in close proximity on that same Forest also grew out of control and resulted in another campaign fire. Almost 3,000 men were deployed in the suppression effort on the Forest. The fires consumed almost 5,000 acres of timber land during the next 8 days.

By late afternoon of September 17, a Supervisor's Office Coordinating Organization (SOCO) was set up at the Mt. Hood Forest headquarters to handle the multiple fire situation which involved three separate project fire organizations (see SOCO TEAM chart).

At the onset, the Supervisor's Office Coordinating Organization assigned a separate dispatcher to each fire team. All dispatching communications were transmitted between base fire camp and the assigned dispatcher for that particular fire.

The SOCO Coordinator, the Mt. Hood Fire Staff officer, headed up the overall organization for the Forest Supervisor. It was his responsibility to coordinate and assign priorities for manpower, supplies, equipment, and aircraft to effectively utilize all available resources.

### Logistic Officers Supervise Dispatching

The logistics officers, one each for day and night shift, were responsible for the supervision of all dispatching activity and worked under the direction of the SOCO Coordinator.

The assigned dispatcher for each fire team worked under the direction of the Logistics Officer, who had the following responsibilities:

1. Receiving fire orders for manpower, supplies, equipment, and aircraft.
2. Screening orders for completion.
3. Advising on availability and estimated delivery time.
4. Separating orders into manpower, supplies, equipment, or aircraft.
5. Channeling the order to the appropriate functional dispatcher (manpower, supplies and transportation, and aircraft) for action.
6. Following up on orders placed.

### SOCO Needs Room

The Mt. Hood SOCO was in-

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*D. A. Oliver is assistant regional dispatcher, Pacific Northwest Region. R. L. Asher is forest dispatcher, Winema National Forest.*

stalled in a 20-foot by 40-foot double wide trailer unit (see general plan: Logistics Team Concept). The aircraft dispatcher operated in the regular Forest Dispatcher's Office due to the location of existing radio communication equipment.

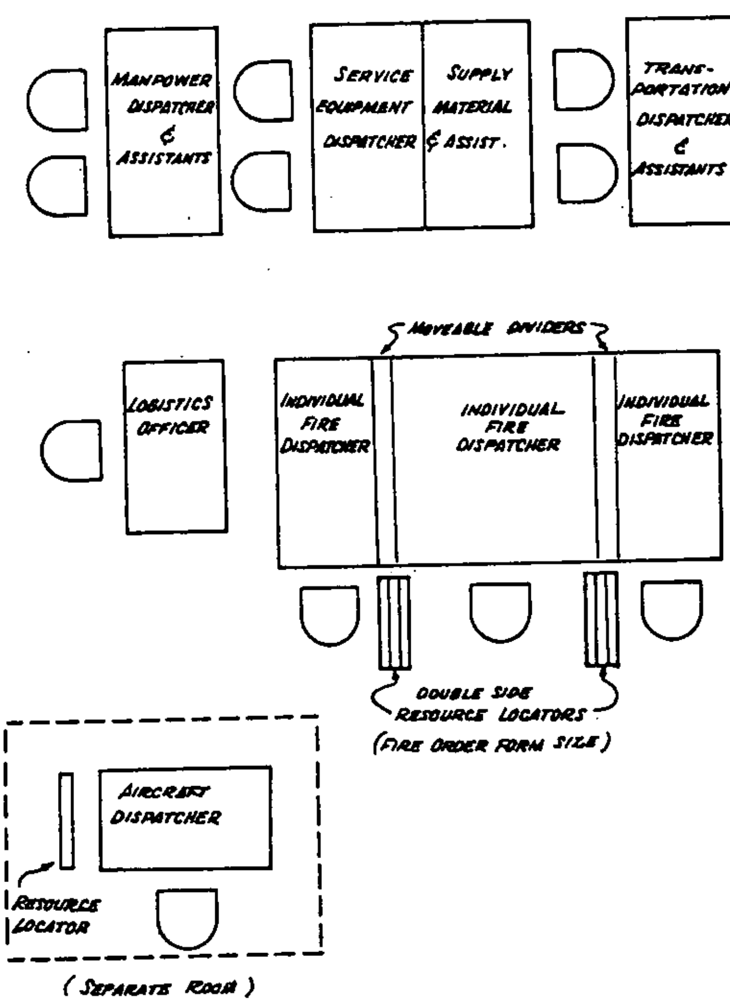
Adequate space is essential, because the SOCO team requires a large working area which should be physically separated from the local forest dispatching operation. The regular forest dispatcher should be able to operate independently on routine forest business and activities.

A "Hot Line" telephone was installed to provide direct communications between the SOCO and the Regional Dispatching Office. This saved time and reduced confusion.

## SOCO Succeeds

SOCO worked very well in this multiple fire situation. With all the dispatchers working under one organization, it was easier for the logistics officer to carry out the priorities that had been established, and to make sure that all manpower, supplies, and equipment were fully utilized. For instance, if one fire camp had too many frozen meals and another was ordering food, the surplus meals could be diverted to the camp in need. This function saved time and money.

LOGISTICS TEAM CONCEPT
FOR MULTIPLE FIRE SUPPRESSION




## Special Teams Assist

During the time of the manpower buildup, a Casual Recruitment Team was added to SOCO. The duty of this team was to recruit and to train casuals for mopup. Although these crews were hastily recruited and trained, they performed very well on the fires. The one-day training course included fire control fundamentals, mopup techniques, helicopter procedures, use of tools, and safety. Instructors were from adjacent forests.

When control of the fires was in sight, a Demobilization Team was organized to provide transportation for released crews and overhead. A Demobilization Center was established at Portland AFB. The air base could accommodate large transport aircraft which were needed for transportation of Southwest Indians and other out-of-Region crews.

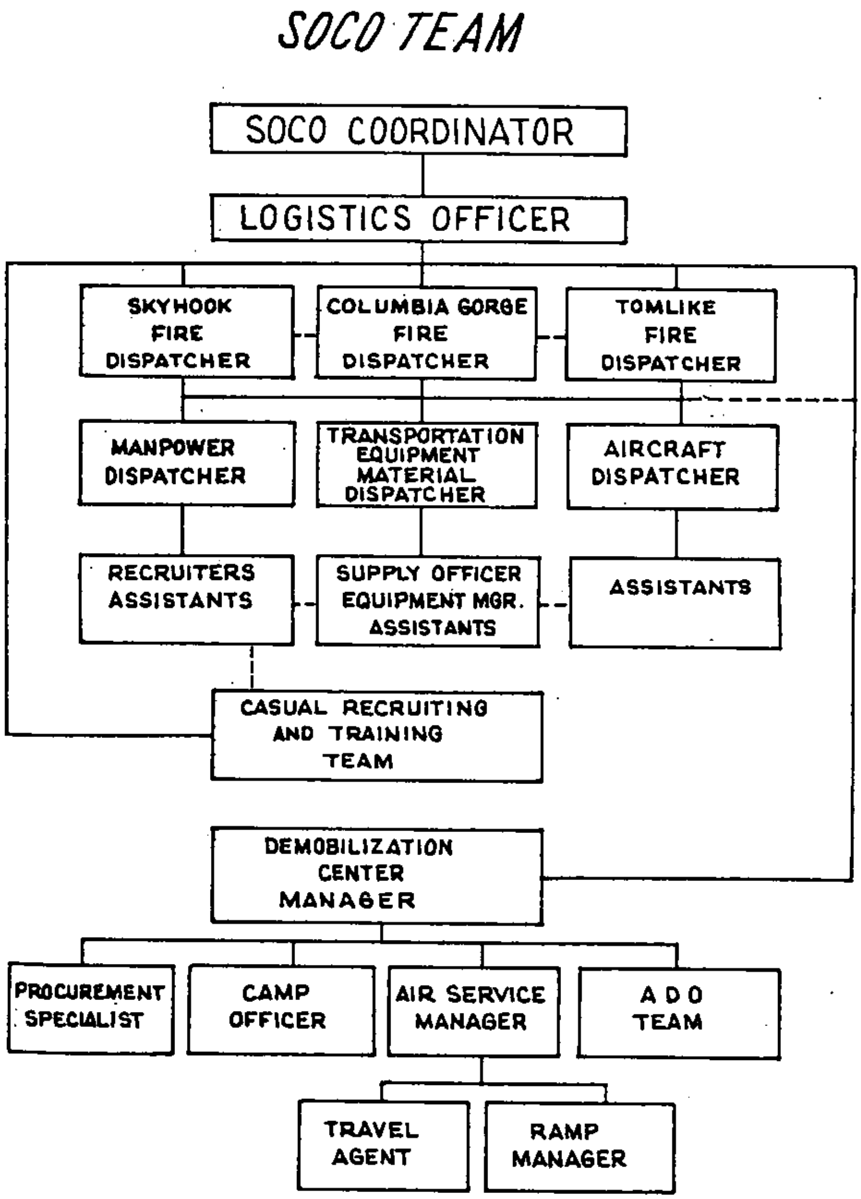
## Problems Few

Problems in logistics were greatly reduced by the SOCO organization. Many of the problems that did arise were due to the SOCO concept being new and a lack of understanding between the fire team and the logistics team. Many of them can be solved through providing better instructions, model plans, and fire overhead training.

It was also felt the SOCO team should have been organized at the end of the first burning period.

The SOCO concept will be incorporated into Top Overhead Training Lesson Plans and simulated exercises for the 1972 fire season in Region 6. △

*Chart of the Supervisor's Office Coordinating Organization (SOCO). The general arrangement of SOCO workers in a double-trailer unit.*




## Tell Us Your Story

What do we want? Articles about communications, equipment and supplies, chemicals, fuel modification, prevention, presuppression, suppression, training, and weather.

Any length article, up to 3,000 words, is welcome. Use any available editorial assistance (For F.S. authors in the Regions, the Division of I & E at Regional Headquarters can help.). Read your article to a friend. W.O. will provide final review and can provide rewrite assistance.

**Preparing Your Article**

The title of your article should be typed in capitals at the top of the first page. Directly under the title, give author's name, position, and organization.

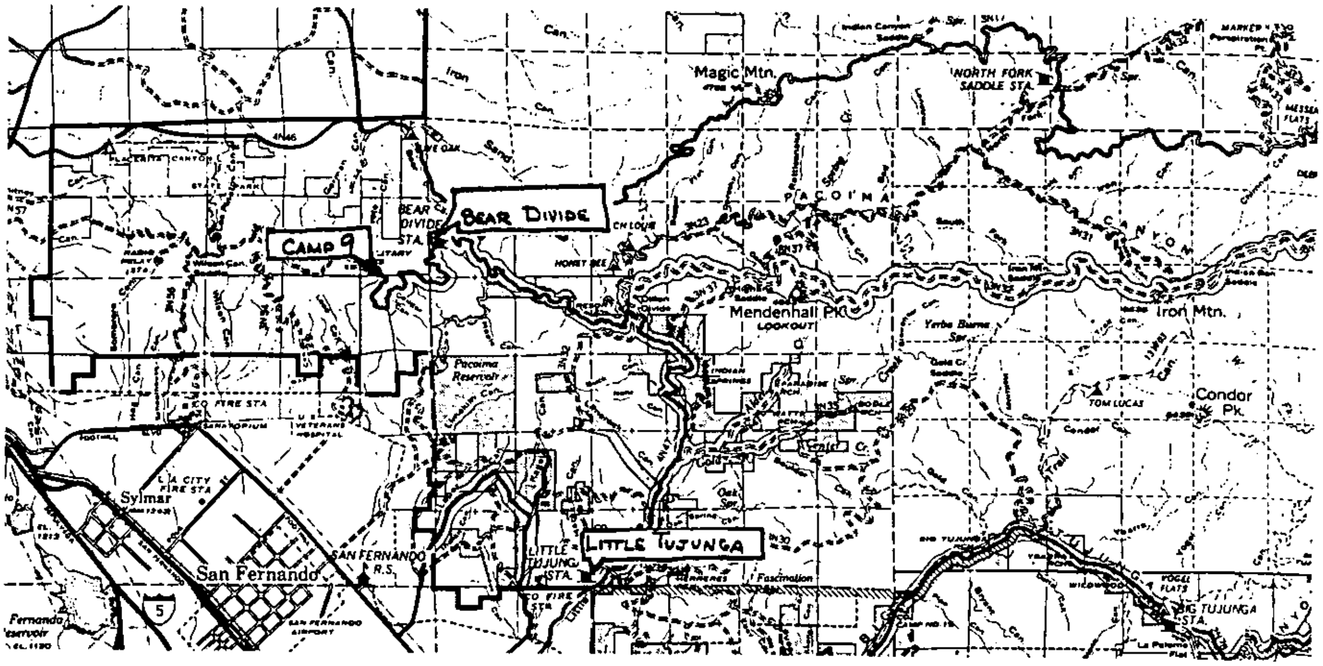
Double- or triple-space your article and allow generous side margins.

You are encouraged to include illustrations with your copy. Drawings or photographs should have clear detail and tell a story. Glossy prints or India ink line drawings are preferred.

Please type captions for illustrations immediately following the paragraph in the text where the illustration is first mentioned. Separate the caption from the text by lines both above and below. Label illustrations "figures" and number consecutively. Drawings should be made with page proportions in mind and lettered to permit reduction. In mailing, illustrations should be placed between cardboards held together with rubber bands; don't use paper clips.

**Where to Send Your Article**

Please send your article to Director, Division of Fire Control, Forest Service, U.S. Department of Agriculture, Washington, D.C. 20250. △




*Angeles National Forest showing heliport locations.*

# County and National Forest Share Helicopter

**John I. Bowser**

During the 1970 fire season the Angeles National Forest and the Los Angeles County Fire Department utilized a Bell 205 A-1 helicopter under a cooperative agreement. This type of arrangement is a first for the Forest Service in Region 5 and may be a first for the country.

The 15-passenger helicopter, paid for in part by the Forest Service, was purchased by the County Fire Department. It was flown by County pilots and maintained by County mechanics. The ground support crew of helitack crew were Forest Service personnel.

One base of operation was the Forest Service heliport at the Bear Divide station; the other was the County heliport, Camp 9, on Los Pinetos Mountain. Camp 9 is an abandoned Niki site operated under permit from the Forest Service; it housed three 10-man initial attack crews. The Bear Divide station housed the 3-man helitack crew as well as a 5-man tanker crew and one Forest Service patrolman. Both bases, which are located about a mile from each other, are within the boundary of the Angeles National Forest, Tujunga District (see map).

## Standby Alternates

The 205 A-1 alternated standby daily between Los Pinetos and Bear Divide.

A typical fire, the Leona Fire, began on October 10, 1971. It was approximately 1½ miles outside the Forest's boundary but within the mutual aid area of Los Angeles County.

## Helicopter Saves Time

The helicopter was dispatched by the County dispatcher from Los Pinetos. Ten men, besides the Forest Service helitack crew consisting of squad leader and crewmen, were boarded. After the fire crew and helitack crewmen off-loaded at the fire, the helicopter, with the squad leader aboard, left the fire scene to get the second fire crew from Los Pinetos.

After the second crew was enroute to the fire, the squad leader contacted the Little Tujunga Hot Shots who were responding to the fire via ground

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*John I. Bowser is a helitack squad leader, Lassen N.F.*

*Bell 205A-1 used cooperatively by Forest Service and Los Angeles County.*

transportation and set up by radio a rendezvous location. Once the second crew off-loaded at the fire's edge, the helicopter proceeded to the rendezvous and transported the Hot Shot crew to the fire. Eighty-five air miles were flown in 56 minutes. This includes flying and ground time for loading crews and tools.

#### Utilization Goes Smoothly

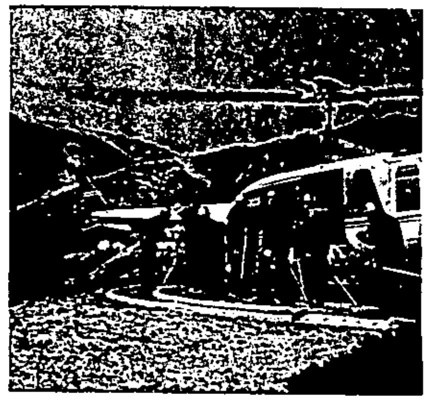
Fifty-six missions were flown with 548 sorties. 3,356 men and 108,225 pounds of cargo were carried between August 6, 1970 and November 24, 1970. A total of 98.1 hours were flown on fire assignments for the two agencies.

This operation ran very smoothly with no major problems in spite of the fact that both fire fighting agencies are separate and highly organized.

In addition to the three County crews mentioned above, the Forest Service maintained a 20-man Hot Shot crew at the Little Tujunga station. Since this was a project and fire crew, most of their time was spent on projects away from any base of operations. Their location was known to the Forest Service helitack crew at all times, and rendezvous could be made when the crew was needed.

#### Both Agencies Dispatch

The helicopter was on fire standby at either base for all fires in Los Angeles County (which includes the Angeles N.F.). Both agencies were able to dispatch the helicopter. Upon dispatch the other agency was



*Crew loading tools before boarding helicopter.*

notified of the fire assignment by the helitack personnel. The nearest available fire crew was boarded and flown to the fire, regardless of whether it was a Forest Service crew on a County fire or a County crew on a Forest Service fire.

Since a retardant drop tank, although being developed, was unavailable for the '70 season, transportation of men, equipment and supplies, and reconnaissance were the only jobs carried out. △

## Proceedings of Symposium On Prescribed Burning Are Available

April 1971 more than 400 people attended a symposium in Charleston, S. C., to discuss the environmental impacts of prescribed burning on the forests of the Southeastern Coastal Plain. Copies of the proceedings of this symposium are now available free of charge.

The 160-page proceedings contains papers on the effects of prescribed fire on vegetation, timber species, wildlife and range habitats; and on the physical and chemical properties and the microbial and faunal populations of soils. The impact on aesthetic and recreational values—the landscape, outdoor recreation, and tourism—and the influence of public pressures and legislative action was also covered. Finally, the broad environmental aspects were discussed from the ecologist's view of prescribed burning and its impact on the forest ecosystem.

Single copies of the proceedings are available free of charge as long as the supply lasts. Write to: Director, Southeastern Forest Experiment Station, Post Office Box 2570, Asheville, N. C. 28802.

## *Environment Is Emphasis Of Symposium*

The United States hosted an international symposium on "Fire In the Environment" held in Denver, Colo., May 2-4, 1972. Sponsored by the North American Forestry Commission. Fire Management Study Group, speakers from Mexico, Canada, Australia, and the United States participated.

For further information contact Mr. W. R. Tikkala, Symposium General Chairman, Forest Service, U.S. Department of Agriculture, Washington, D.C. 20250. △

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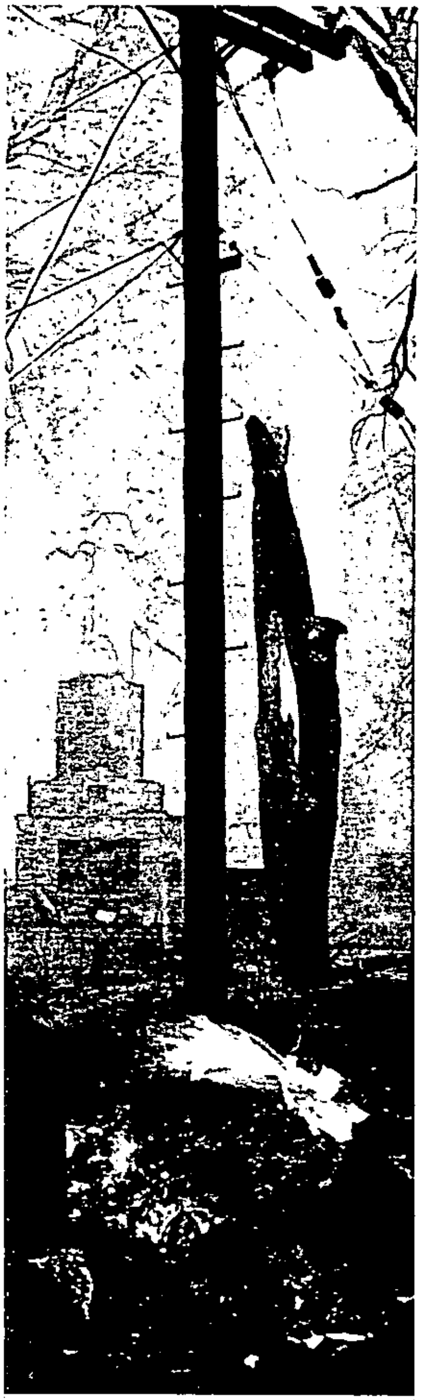
# A Look At What Killed 12,200 People Last Year

What with all the efforts to do something about "bettering our environment"—which is really a catchphrase for making our surroundings safer and healthier—there is a tendency to overlook one of the oldest people-killers known to man: fire. Somehow, maybe because it's too obvious to become a trendy environmental topic, public concern about fire safety has never amounted to much more than a set of seasonal campaigns that draw token civic support.

But last year, fire killed 12,200 people in the United States—and about one-fourth of these victims were children. The total also includes 210 firefighters. The property damage figures are shocking, too: an estimated $2.845 billion caused by the more than 2½ million fires in 1971. Of this total, about $2.3 billion represents damage to buildings and their contents; the rest is attributed to forest fires and damage to aircraft, ships and motor vehicles. The President's National Commission on Fire Prevention and Control, which compiled these statistics, says the principal causes of building damage were defective, misused and overloaded electrical wiring and equipment; defective or overheated heating and cooking equipment; and careless use of smoking materials.



Obviously, safety slogans haven't done the job, and new ways must be found to improve the nation's ability to prevent, detect and control fire. This is the challenge currently being undertaken by the presidential commission, which will begin a series of public hearings on the subject here this morning at the old Senate office building. The commission, which includes Cabinet members, engineers, insurance executives, experts in firefighting and four advisory members from Congress, is doing a two-year study of the nation's fire problems and will submit a report of its findings and recommendations in June, 1973.

While no simple solutions are likely to spring forth from the public hearings, this serious attempt to come up with some new thinking deserves public attention and support, as a significant—and extremely difficult—examination of an age-old environmental problem. △

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