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FIRE CONTROL NOTES

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FIRE CONTROL NOTES

A quarterly periodical devoted to forest fire control

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COVER—Typical chaparral-covered watershed, Angeles National Forest, Calif. See story on page 3.

(NOTE—Use of trade names is for information purposes and does not imply endorsement by the U.S. Department of Agriculture.)

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WHAT ARE WE GOING TO DO ABOUT THE BRUSH IN SOUTHERN CALIFORNIA?

KEITH E. KLINGER[1] and CARL C. WILSON[2]

The Spanish vaqueros had a name for it—"chaparro"—from which we get the name "chaparral." But more often we call it brush. Like today's firefighters, the vaqueros probably cursed the dense stand of shrubs covering the mountains of southern California. It was an obstacle to foot and horse travel. Though the Indians were using the nuts, berries, and seeds of several of the plants for food and medicine, the early settlers found the brush of little economic value. It was expensive to convert to orchards or pastures. And it burned like tinder. A few early naturalists, however, recognized the unique beauty and watershed value of this plant formation.

We will examine both the assets and liabilities of brush: its value as a vegetation type, and its hazard as a fuel and what we can do about it.

California redwoods are known throughout the world, but few people have heard of what southern Californians call their "elfin forest."[3] This forest consists of some 5 million acres of chaparral—a mixed formation of low, hard-leaved, stunted trees and shrubs. This growth is the result of short, wet, cool winters, and long, arid, hot summers. Chaparral grows slowly—shrubs 25 years old may average only 2 or 3 inches in diameter and 5 or 6 feet in height. It includes more than 150 species of woody plants. Chamise, manzanita, ceanothus, sumac, sagebrush, scrub oak, and buckthorn represent 90 percent of the growth.

In the United States, this type of forest growth occurs chiefly in southern California. Similar plant formations are found along the coast of Chile, in Europe and Asia, along the Mediterranean, in Africa near the Cape of Good Hope, and on the southern and southwestern coasts of Australia and Tasmania.

The chief economic value of chaparral is its ability to control erosion and promote rapid infiltration and thus help conserve ground water. Chaparral also provides food and cover for game animals and birds.

THREE BEST-KNOWN BRUSH SPECIES

The most abundant of the chaparral species in California is chamise (*Adenostema fasciculatum*). It grows almost everywhere throughout the range of the chaparral. Some botanists have estimated that it makes up about one-third of the cover. Chamise grows from sea level to 5,000 feet. It resprouts readily after a fire, and its longlived seeds germinate abundantly under the ashes in the mineral soil. This plant is easy to recognize because of its small, needlelike, olive-green leaves. It blooms late in the spring—after most other brush species have flowered. Then, about mid-June the mountains become white with its bloom. Later, the chamise fields turn a rusty color as the blossoms fade.

The second most common shrub is scrub oak (*Quercus dumosa*). This plant is often dwarfed in stature—sometimes not more than 5 to 6 feet tall. The crooked trunks and branches are stiff and tough, and the thickets are almost impenetrable. In good seasons some pure scrub oak stands bear a crop of acorns estimated at several tons per acre. Scrub oak can resprout from its root crown after fire. This characteristic helps make it one of the more persistent brush species. Hormone brush killers like 2, 4,-D will kill chamise, but scrub oak seems to thrive on brush-killing chemicals and is known as a "hard-to-kill" species.

A third species—California sagebrush (*Artemesia californica*), a sister of the Great Basin sagebrush (*Artemesia tridentata*)—is common in many parts of the chaparral belt. Its ashy, gray-green foliage is similar to its desert relative, making it easy to distinguish from the other shrubs. It is not as aromatic as the Great Basin sagebrush, but it still has a penetratingly pungent odor when one wades through it on a hot day.

THE CHAPARRAL HAZARD

Fire behavior experts say that chaparral is the most flammable brush in the United States. Its litter and dead portions usually are easily ignited, and almost every fire is a crown fire because of the horizontal and vertical continuity of the fuel. Despite many studies of this unique fuel type, there is still much to learn. We have good evidence, though, that chaparral poses formidable problems in fire control.

For example, fuel classification and measurement procedures devised during Operation Firestop[4] showed that representative ovendry weights

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[3] Fultz, Francis M. The elfin forest of California. Los Angeles Times Mirror Press, 267 pp., illus. 1923.

[4] Operation Firestop was a cooperative experimental program conducted in 1954 by fire agencies and research organizations in California. The sponsors were: Los Angeles City Fire Department, Los Angeles County Fire Department, California Division of Forestry, U.S. Forest Service, and Federal and California civil defense agencies.

for typical stands were:

1. California sagebrush (mixed about 50-50 with white sage): Average height of 4 feet and about 5 tons per acre.

2. Chamise (83 percent of the stand): Average height of 4 feet and nearly 7 tons per acre.

3. Scrub oak (99 percent of the stand): Average height of 7 feet and about 21 tons per acre.

Let's examine the fuel values more closely. If we take 20 tons per acre of scrub oak at 8,500 B.t.u. per pound, we find that we have about 340 million B.t.u. per acre. Therefore, only 40 acres of dense scrub oak is required to produce the equivalent of 20 kilotons of thermal energy. That's equivalent to the energy of a bomb that could destroy a major city. Of course, this energy isn't released as rapidly as that of an atomic bomb. However, the Conejos Fire of 1950 in San Diego County burned about 63,000 acres in 63 hours. Assuming 20 tons of fuel burned per acre, that's equal to 25 bombs per hour. That's a lot of energy.

However, the ease of ignition, rate of combustion, and total thermal energy depend not only on weight but also on the arrangement, species, and, very important, on the amount of moisture in the dead and living fuels.

The moisture in light, dead brush fuels is closely related to the current humidity and temperature. However, the moisture of living chaparral in southern California usually follows a definite seasonal pattern (fig. 1). In late winter and early spring the plants put on new growth, and the moisture content of the plant increases quickly to its highest seasonal level. The new growth then matures and becomes relatively dormant during late summer and early fall. The plant's moisture content then remains near the minimum seasonal level until new growth starts again. As an extreme example, living chamise can contain 100 percent moisture in May or June —about 2,000 gallons of water per acre. But by October moisture can drop to 50 percent—1,000 gallons of water per acre. Obviously, the difference in the amount of water in the live brush can have an important influence on fire ignition and spread.

More recently, fire researchers have also learned that the highest crude fat content of chamise occurs when the moisture content of the plant is lowest. This is another reason why this fuel is so explosive during extended dry periods.

ACTION AGAINST BRUSH HAZARDS

We have a hazardous vegetative type, but what can we do about it? There are three possibilities: (1) Replace the existing hazardous fuel with "fire-resistant" plants, (2) "light burn" the chaparral regularly, or (3) do selective fuel-hazard reduction.

First, let's take a look at what have been called "fire-resistant" plants. A report of studies by the Los Angeles State and County Arboretum says:

> "The term 'fire resistance' refers to the burnability of certain species in comparison to that of chamise or scrub oak, two common chaparral species. The species being compared must be grown under similar conditions. Otherwise, factors of soil moisture and climate may lead to erroneous conclusions. The studies at the Arbore-

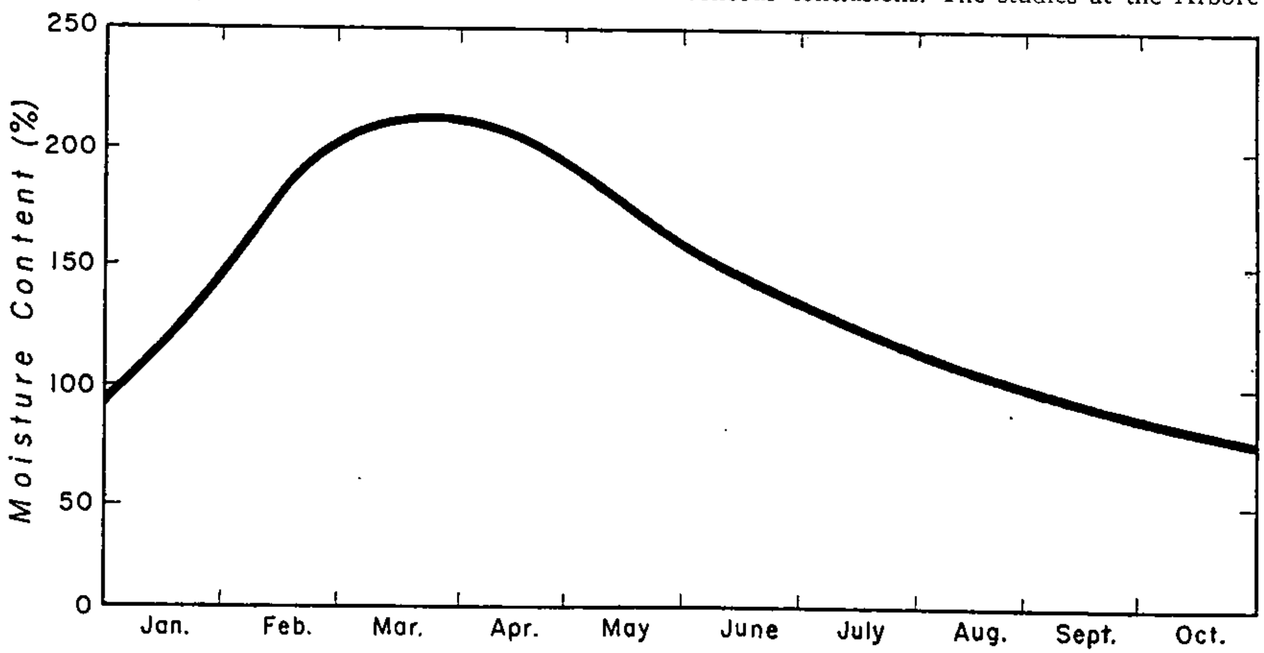

Figure 1.—Moisture content of chamise new growth, percent (typical curve).

tum have been made with this point in mind. And burning tests are made with plants grown under comparable conditions."[5]

Researchers at the Pacific Southwest Forest and Range Experiment Station are conducting limited studies on purported slow-burning plants such as cistus. But they have been unable to identify plants that they can class unequivocally as "slow burning." The Station staff is also looking for plants that are low in stature (less than 1 foot high) and fuel volume, that resist drought and damage caused by animals, and that will control soil erosion.[6] This is not a very simple order.

Our researchers have selected some shrubs to plant on fuel-breaks to test flammability. The most interesting shrubs are a low-growing saltbush (*Atriplex canescens*) and squaw carpet (*Ceanothus prostratus*). But rodents eat the saltbush, and squaw carpet doesn't seem to grow well at lower elevations. We aren't proposing, however, to stop seeking or producing "slow-burning" or "low-fuel-volume" plants. We think there are opportunities here, but we do not believe there is any present possibility that we will be able to replace all the native species with introduced species. Neither nature nor the taxpayer would permit it. In any case, it is highly unlikely that this type of plant will be the panacea for all brush problems in southern California.

What about light burning? Why don't we burn off the brush every few years so that a stockpile of hazardous fuels doesn't accumulate in our watershed?" This question has been asked by numerous laymen and scientists. Here's our partial reply.

In 1954, during Operation Firestop, we measured fuels before and after light burns on three test plots. These burns were conducted in August and September under ideal fire control conditions.[7] Relative humidities were higher than 30 percent, and winds were less than 10 m.p.h. The fires were started with drip torches, and all were set to burn with the wind. Under these easy and safe conditions, only the lightest fuel types burned completely. Burns in chamise were spotty, and scrub oak burned slowly.

The spotty chamise burns actually increased the fuel hazard by killing some plants without consuming them. Also, the heavy fuels, such as scrub oak, which can develop the most intense wildfires, would not burn under weather conditions when safe control could be assured. We think our answer today for the enthusiastic proponents of wide-scale light burning is about the same as it was in 1954: large-scale light burning in southern California straddles a fireline between twin risks:

(a) burns which increase the hazard rather than reducing it and (b) "controlled" fires which cannot be controlled.

A few successful light burning tests have been conducted in southern California during the past decade. They suggest that light burning may be useful in developing fuel-breaks or safety zones for firefighters, particularly if we modify the fuels prior to burning. But this technique has not been tested enough to warrant extensive use in southern California. More studies are needed to determine the range of weather and fuel conditions under which prescribed burning can be used safely and effectively.

Thus, the most logical of the three alternatives is fuel hazard reduction. Fuel is reduced or removed from areas where fire is most easily kindled—along roads, around residences and structures which are adjacent to or in the brushfields, and where there are vast expanses of chaparral. In the long run, we think this is the best answer.

In line with this, the California fire agencies have been conducting a cooperative research and action program called "Fuel-Break" since 1956. Its primary aim is to modify the brush fuel at strategic locations to break up the large unbroken areas of chaparral (fig. 2). On carefully selected sites, the brush is permanently changed to vegetation of light weight, low fuel volume, or low flammability, or all three. These areas, called "fuel-breaks", are at least 200 feet wide. They facilitate fire control because they can be manned soon after initial attack is started on a brush fire.

Fuel-breaks are constructed to aid in the control of fires under extreme burning conditions that ordinarily hinder control in unbroken brush fields, especially on steep terrain. But unmanned fuel-breaks are not necessarily intended to *stop* a fast-moving fire because spot fires commonly occur well beyond the head of such fires. These prepared breaks, however, can be safely manned for offensive action against headfires, and can help stop the lateral spread of the fire. Therefore, the fires can be confined earlier, and the area burned reduced.

More than 500 miles of fuel-breaks have been constructed in southern California; about 63 percent are more than 200 feet wide. Also, 5,624 acres of brush has been converted to grass for range or wildlife management. These areas, where possible, are tied into existing fuel-break systems. Much more

[5] Findings of Governor Brown's Study Committee on Conflagrations, California. 1965. (Unpublished report).

[6] Green, Lisle R. The search for a "fire resistant" plant in southern California. California Div. of Forestry Fire Contr. Exp. 10, 12 pp., illus. August 1965.

[7] Chandler, C. C. "Light burning" in Southern California fuels. U.S. Forest Serv. Calif. Forest and Range Exp. Sta. Res. Note 119, 2 pp., 1957.

Figure 2.—Grass-covered fuel-break in the North Mountain Experimental Area, east of Riverside, Calif.

needs to be done, and fortunately guidelines are now available.[8]

For the selective fuel hazard reduction program to move ahead rapidly and to be most effective, everyone must "get into the act!" Public utility agencies should study, design, and develop fuel-break systems in their high-risk areas. Planning commissions should consider the use of treated sewage effluent for the irrigation of "green belts," such as golf courses, cemeteries, and fuel-breaks around mountain communities. Public fire agencies must also remain alert to the need for protecting the lives of the millions of people who visit parks, picnic areas, and campgrounds, and who travel along highways in the brush-covered mountains. Safety zones and safe entrance and exit routes should be an integral part of their overall plans. Finally, each resident (1 of 20 Americans now live in southern California) must maintain his own property. He must assume the responsibility for

Continued on page 16

[8] Fuel-Break Executive Committee. Guidelines for fuel-breaks in southern California. Fuel-Break Rpt. No. 9, 25 pp., illus. Pacific Southwest Forest and Range Exp. Sta., Berkeley, Calif. 1963.

THE RESOURCE LOCATOR—A DISPATCHER'S AID

JAMES W. JAY[1]

Dispatchers and fire managers must maintain a constant inventory of available firefighting resources. They must also keep an up-to-the-minute record of mobilization and dispatching actions. Usually logs, notebooks, and clipboards are used to support their memory.

Most dispatchers experience peak periods when these records and their memory are inadequate. Needed data are buried by records of subsequent action. Items are forgotten. Dispatchers are especially handicapped during shift changes—a 1- or 2-hour shift overlap is common during fire busts to permit relief dispatchers to become acquainted with the status of dispatching action.

CRITERIA FOR A SATISFACTORY SYSTEM

A system capable of overcoming these difficulties is needed. Certain basic data should be visually displayed. Storage, updating, and recall of information should be rapid and uncomplicated. The system must be quickly adaptable to various situations and levels of operation. It must be dependable and simple enough to be used with minimum instruction.

Cost is equally important. Electronic computer equipment could probably fill most requirements, but the necessary investments would severely restrict the number of units in use. This would defeat the basic aim—a simple system with widespread applications at all levels.

To be useful, the system must permit some choice of what information is displayed for quick reference, and what is stored for ready recall. The data dislayed should be limited to that which can be readily comprehended and used in making decisions. If every relevant item were shown, the mass of information would be too great to be of value.

THE RESOURCE LOCATOR

A system meeting the general requirements has been developed. While the basic concepts are not new, their application provides a simple yet effective means of maintaining a current inventory and record of the mobilization and dispatching of manpower, equipment, and supplies.

The prototype model consisted of a set of card wall racks and blank cards. Eight racks were used; each had a capacity for twenty-five 5- by 8-inch cards. The racks were mounted in a specially constructed carrying case (fig. 1). Other sizes could readily be designed to meet specific local needs. In dispatching offices the racks could be mounted on the wall. For field use, such as in fire camps or for lookout-dispatchers, a compact model using smaller cards may be more suitable.

USE OF THE SYSTEM

Each resource item is represented by a card. The name, number, etc. of the item is written along the top edge. This is the "displayed" information when the card is in the rack. "Stored" information, including any necessary permanent data (rental rates, specifications, home base, etc.) and current dispatching information are written on the lower portion and back of the card. Color coded cards can be used for the various categories of resources. However, excessive coding may destroy simplicity.

The basic system can be easily adapted to various situations. At a dispatcher's headquarters, the card racks can be labeled "Inventory", "In-Transit", and "Assignment." When resource items are known before they are ordered or dispatched, cards would be prepared and placed in the Inventory rack as a display of available resources.

As a resource is requested or is dispatched, its card is pulled from Inventory, or a new card is made. Appropriate dispatching data (fire order number, time, destination, ETA, method of travel, etc.) would be posted on the lower portion, and the card

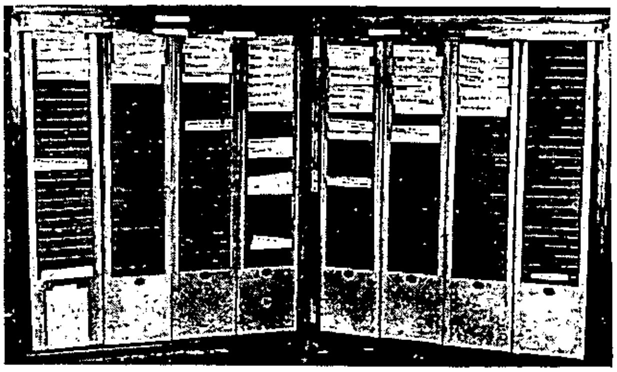

Figure 1.—These eight card racks in a carrying case can display 200 resource cards.

[1] Formerly Fire Control Specialist, Washington Office, Division of Fire Control (Retired).

would be placed in the In-Transit rack. On confirmation of its arrival, the item's card is posted and placed in the Assignment section. This provides a constant display of the resources assigned individual fires, by Forests or other category.

When demobilization occurs, the process is reversed.

The same system, with only minor revisions, could be used at a fire headquarters. Racks could be labeled "Ordered," "In-Transit," and "Assignment." Here, the assignment grouping could be by Sectors, Divisions, day or night shift, etc. Thus, the top fire overhead would have a constant visual display of the current status of all resources relevant to the situation.

The flexibility of the basic system permits it to be used in many individual situations at various levels. However, if too many items are displayed, the value of quick visual reference is lost. Where many resource units are involved, it must be decided whether summaries or only segments of the mobilization should be displayed. If only summaries of the resources are displayed, the detailed data on the resources can be stored on individual cards kept in tub files for quick reference (fig. 2). For example, if it were necessary to maintain a record of a large number of crews, the display would show the total number available, in-transit, or assigned by appropriate category (fire, Forest, etc.). Detailed information on each would be recorded on cards stored in similar sections of the tub file. As the crews were shifted, the summary cards would be updated, and the individual card posted and moved to the appropriate file section.

The resource locator system was tested and used during the 1967 fire season, and personnel were generally enthusiastic. In two cases, the system was set up without card racks—once even by using shipping tags thumbtacked to cardboard cartons when cards are not available.

CONCLUSIONS

Use demonstrated that the system is an effective aid in several operations, and can significantly assist dispatchers and others in keeping control of past and current mobilization action. The basic concept of the system is simple and easily understood.

a. Prepare card identifying each resource item.

b. Post all actions pertaining to the item on the card.

c. Move the card to the appropriate display when the item moves.

By recording and displaying the data in this manner, a permanent record of action is available for quick recall. The chances for double orders, errors, and oversight are reduced, and management and decision making are improved.

ASSEMBLING THE SYSTEM

Standard 5- by 8-inch cards are used for recording the resource item information. Blank cards may be used, with all headings, etc., handwritten at the time of use, or the cards can be printed with a standard format. Gummed labels or embossed plastic tape can be used on the racks to identify resource categories.

The wall racks should provide for 1-inch exposure of the card. Suitable racks can be obtained from office suppliers. Each 25-pocket rack costs about $10.50.

Figure 2.—Tub files can be used to store up to 2,000 cards if the number of items becomes too large for all of the cards to be displayed.

PRECOOKED FROZEN MEALS FOR FIREFIGHTERS

Arthur H. Jukkala, *Forester*
Missoula Equipment Development Center

During the 1967 fire season, many firefighters in the Northern and Intermountain Regions enjoyed hot meals prepared by excellent chefs in modern kitchens hundreds of miles away. This was made possible by several years of testing of military and commercial meals by the Forest Service Equipment Development Center in Missoula.

In the fall of 1965, the Center and the Armour Company began work on precooked frozen meals for firefighters. These meals contain U.S. Choice meats, or Grade A fish and poultry. Menus are scientifically selected in Armour's basic foods laboratory and are prepared by expert chefs. After cooking, the individual food items are vacuum sealed and flash frozen to −70° F.—a big factor in retaining flavor. Before being served, the meals require only heating in boiling water or steam.

Several hundred of these meals were tested during the summer of 1966. Very favorable results were obtained. A larger quantity was ordered for the following season, and in 1967 about 16,000 meals were eaten by personnel of Forest Service Regions 1 and 4 and the Bureau of Land Management—both in firecamps and on the fireline.

In 1967 the following menus were tested:

Breakfast	*Dinner menu 1*	*Dinner menu 2*
Canadian bacon	Sliced roast beef with gravy	Sirloin beef tips with mushroom gravy
Sliced fried potatoes	Peas with butter sauce	Peas with butter sauce
Cherry compote	Bread (3 slices), buttered	Bread (3 slices), buttered
French toast (4 slices)	Potato tots (deep fried)	Potato tots (deep fried)

Meals were packed 12 per case in an insulated carton (fig. 1). Beverages and desserts were not included. Cups, serving trays, and utensils were packed with the meals. Each meal had 1,500-2,000 calories and weighed about 1½ pounds. The aveage cost was $2.70.

At 0° F., the storage life is 2 years. When removed from the freezer, the meals should be eaten within 36 hours (recommended for Forest Service use.) MEDC engineers devised a simple steam heater from a 32-gallon G. I. can. It will hold 33 meals (fig. 2). In field tests the heater proved very practical and efficient.

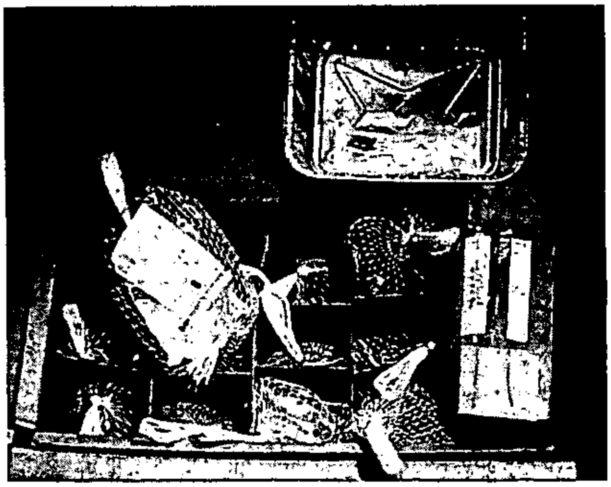

Figure 1.—Twelve individually vacuum-sealed, precooked meals.

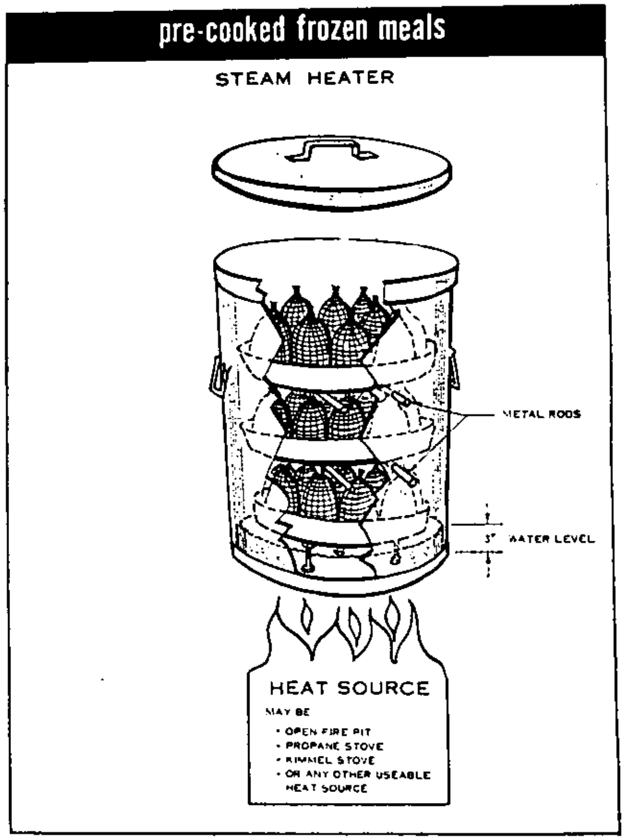

Figure 2.—Steam heater for precooked frozen meals.

Precooked frozen meals have many advantages for feeding firefighters. Since they are packaged in proper proportions, there is little or no waste.

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PENNSYLVANIA'S NEW CUSTOM-BUILT FOREST FIRE TRUCK

E. F. McNamara, *Chief*

Division of Forest Protection

Department of Forests and Waters

The Pennsylvania Department of Forests and Waters received 10 custom-built forest fire trucks in early 1967. These trucks were received as a result of 4 years of work with manufacturers of specialized firefighting equipment (fig. 1).

The chassis is a 1-ton military power wagon with a custom-built body. The standards and design were developed by personnel of the Division of Forest Protection in cooperation with personnel of the Automotive Bureau, Pennsylvania Department of Property and Supplies. Each truck is equipped with the following:

1 300-gal. tank
1 Hale model 20T pump
1 Hale model FZZ pump
300 Ft. of ¾-in. hose on live reel
500 Ft. of 1½-in hose (rolled)
2 Hose laying platforms
1 ¾-in. nozzle
1 1½-in. nozzle
3 10-ft. sections of 2½-in. suction hose
1 10-ft. section of 2-in. suction hose
Miscellaneous hose adapter, connections, and valves
8 Backpack pumps
1 Chain saw
12 Fire rakes
2 Shorthandled shovels
3 Axes
1 Brush hook
3 Sandvig brush axes
1 Backfire torch

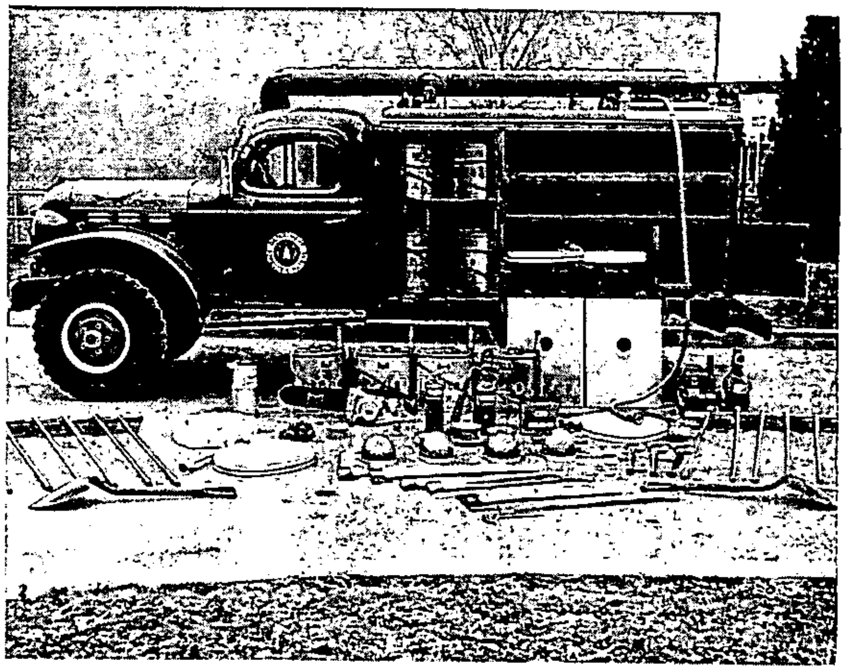

Figure 1.—The new trucks easily carry an assortment of firefighting equipment and 300 gallons of water.

4 Hardhats
2 Fire extinguishers (CO_2 and dry powder)
1 First aid kit
1 Dual-frequency radio transmitter

The vehicles are painted red and are equipped with warning lights. The custom body is made of 16-gage steel, with 11-gage steel bottoms in the tool compartments. The interior of the compartments have wooden slats on the bottom to protect the handtools.

The hard suction hose is carried in an easily removable hose rack mounted on top of the truck. The spare tire is located on the top of the 300-gal. tank. Two portable spotlights are recessed in rear compartments.

Each of the vehicles has been assigned to a high fire hazard area. The units will respond to any fire call in areas with limited volunteer fire company coverage.

The easily identifiable trucks, readily available for all fire calls, are definite fire-prevention assets and comprise an effective fire-suppression unit.

SIMULATING PRESCRIBED FIRES—A NEW TRAINING TECHNIQUE

Robert W. Cooper[1] and Archer D. Smith[2]

Prescribed burning, now an important forest management tool in much of the United States, requires an adequate supply of trained personnel if we are to realize maximum potential from its use. In past years, however, difficulty in scheduling field exercises during favorable burning weather has limited development of competent trained forces.

The principle of simulation seemed to provide a partial answer to this training problem. In 1966 for the Forest Service-conducted research seminars in prescribed fire at the Southern Forest Fire Laboratory, we decided to use the Fire Control Simulator[3] for the important burning exercises (essential supplements to classroom sessions). The Forest Service Simulator was sent to the Laboratory at Macon, Ga., and Forest Service Southeastern Area and Southern Region personnel developed prescribed fire exercises.

The results justified the effort. Simulation of prescribed fire bridged the gap between classroom and field. After hearing general principles in seminar, trainees were divided into burning and critique teams and faced with a variety of burning situations under certain fuel and weather combinations (fig. 1). Weather was no problem—it was created as needed. Ground rules were laid down, and slides of the problem area and closeups of fuel conditions were projected on the screen. Trainees were also given a sketched map (fig. 2) and briefed on the situation. The burning team's role was to consider and decide on feasibility of burning, proper firing techniques, advance preparations, and control strategy. A day's burning schedule, including planning, preparation, execution, and evaluation, was compressed into a 1-hour exercise through a fast clock—where 15 minutes of exercise time equaled 1½ hours of fuel time. Upon completing the exercise, the burning team conducted an evaluation and critique.

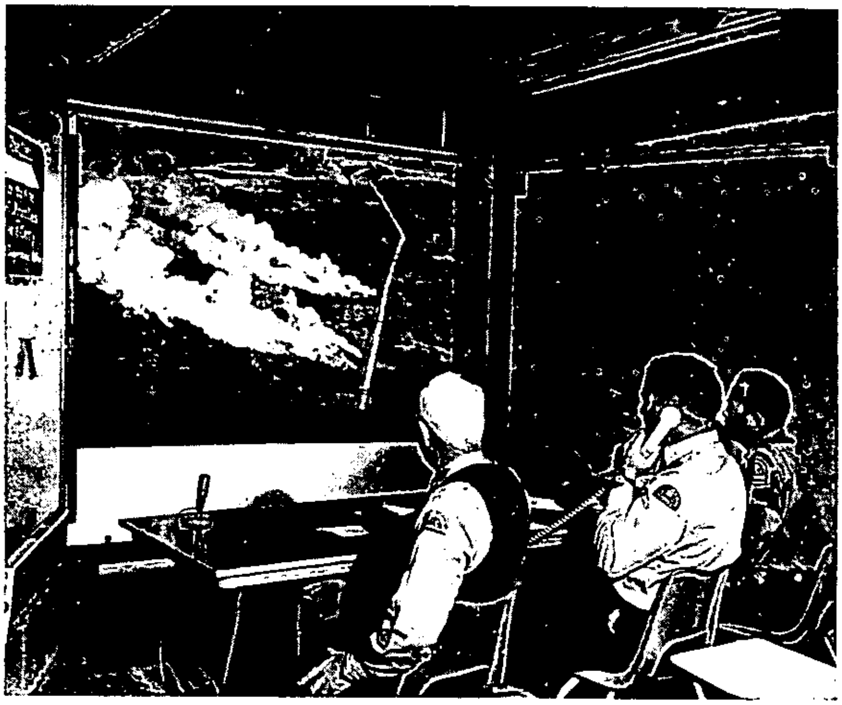

Figure 1.—Trainees make decisions concerning the prescribed burning operation as they observe fire behavior and strategy on the Simulator screen.

The burning team maintained radio communication with the dispatcher and the field crew (Simulator crew) and had a view of the field operations throughout (fig. 3). For training purposes, the dispatcher and the field crew could not contact each other directly.

To keep the exercise moving and to force prompt decisions, the dispatcher and Simulator crew generally ended radio messages with a question. All decisions and instructions were simulated without regard to their applicability. Initial anxiety of the Simulator team about their ability to respond to directives quickly disappeared. As they gained experience and confidence in simulating prescribed burns, they were able to follow dictated actions promptly and precisely, as well as to enliven the exercise with additional stress situations.

The critique team watched from the rear and, after the evaluation and critique by the burning team, discussed the exercise and the decisions made. The Simulator director, or a designate, led the critique. No comments or suggestions were per-

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[2] Forester, Southeastern Area, State and Private Forestry, Atlanta, Ga.

[3] O'Neal, N. C., and Holtby, B. E. The fire control simulator. Fire Control Notes 24(2): 25–31. 1963.

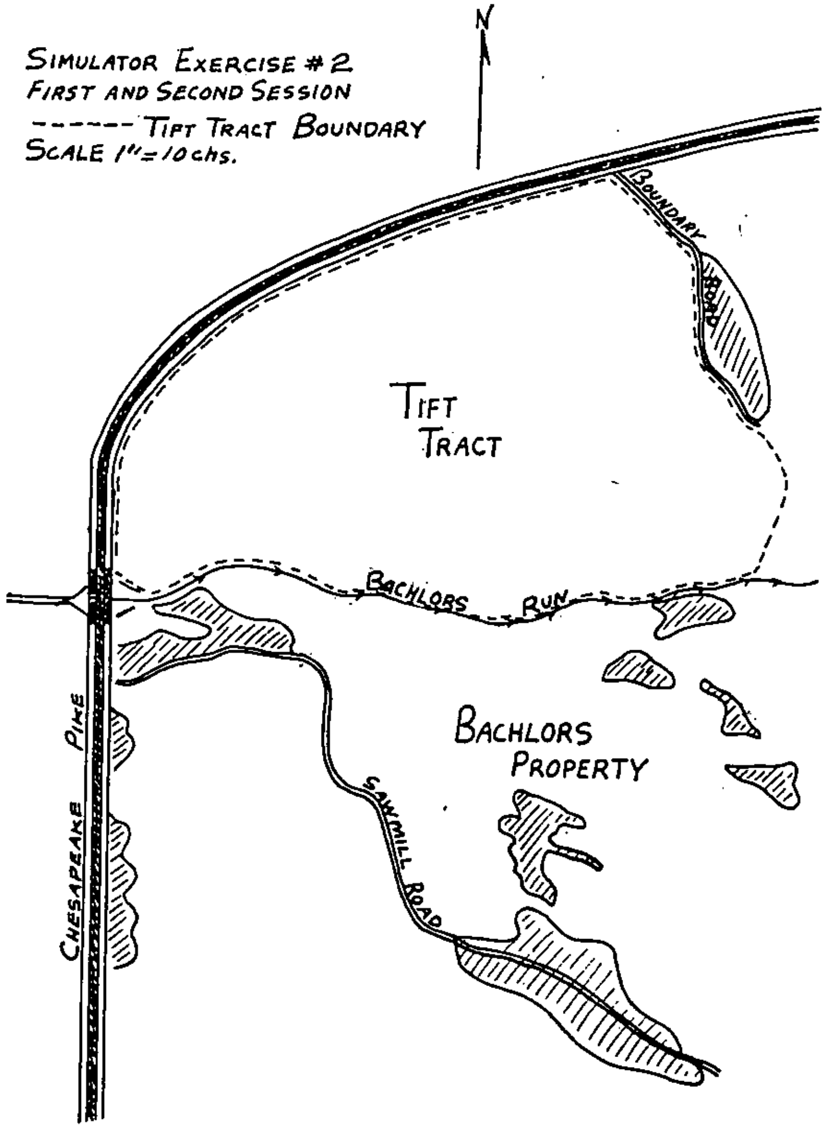

Figure 2.—Sketch of company's holdings (Tift tract) used in prescribed fire exercise.

mitted by the critique team while the exercise was in progress.

The following script is a sample exercise:

SIMULATOR PROBLEM

Hardwood Control—Seedbed Preparation

You are a forester with the Dry Branch Paper Company and are responsible for planning and conducting prescription burns on its land. Your right-hand man is a technician who does most of the field burning under your guidance. In this year's work schedule, a tract of forest land has been set for spring burning. It is now the last week of April. The tract is in southeastern Virginia. It supports a merchantable stand of loblolly pine ready for harvesting, but also has a well-stocked understory of undesirable hardwoods. Regeneration will be by the seed-tree method. You have decided a burn for hardwood control and seedbed preparation is needed before cutting. Today you are in a tower overlooking the area to be burned. You have asked your technician to check it and be prepared to burn if things agree with yesterday's favorable weather forecast. The tract is flat with gentle hills. Free of fire for at least 10 years, it has mostly pine litter fuel—moderate to heavy, 5 tons per acre—with only minor herbaceous material available for additional fuel. The cast of characters includes the forester, technician, dispatcher, and TSI crew leader.

Scene 1: (Explain scale, direction; hand out map. Slides 2, 3, and 4 show aerial oblique and closeup shots.)

Set clock: (It is now 10 a.m.)

Start Exercise

Technician to Forester—This is Al. We'll reach the Tift tract about 10 a.m. You asked me to check in with you before we start any burning. What are your orders?

Fade in Scene 1

Forester—(Would probably ask for onsite weather and fuel conditions. Should check with dispatcher concerning weather—may call technician and tell him where to put lines).

Dispatcher—According to this morning's forecast, we should have northwesterly winds about 8 m.p.h. Afternoon, clear skies, maximum temperature 68° F., minimum relative humidity 35 percent, estimated fuel moisture 10 percent, buildup index 16, and spread index 12. I think this may be the day you've been waiting for. You asked that I send three men and a tractor operator with the technician. Our other four men are out on Jackson's Flat doing TSI. Our other tractor is at headquarters.

Technician to Forester—Things look pretty good. Most of the dew is gone. Winds in the stand are light, mostly from the west—doesn't look like they'll be any problem. It's clear and the air feels dry. What do you want us to do? (If so, where?)

Forester—Yes, I think things look okay. We can go ahead with

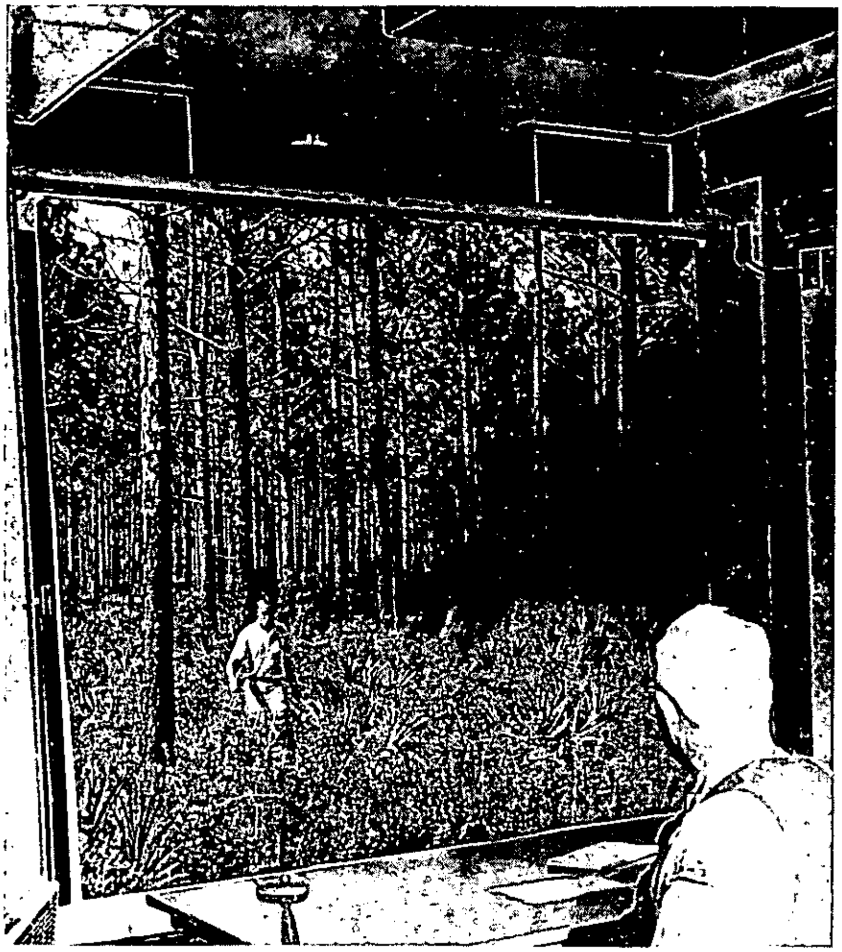

Figure 3.—Closeup slides of fuel conditions and firing techniques kept viewers abreast of onsite developments.

the operation. (He proceeds to tell the technician where to put the lines or whatever he wants done, and how to fire.)

Dispatcher to Forester—You remember that Sug was replacing the tracks on our other tractor. He reports that it's ready to go now, but wonders whether he should make the 100-hour overhaul today while the Cat is in the shop.

Forester—(Should say no—keep it on standby).

Dispatcher—TSI crew just called in and said that the surface wind had picked up on their area to the extent that the mist blower wasn't doing much good. I told them to secure operations there and move over to Route 49 where Freeman is grading—there are some culverts there that need cleaning out. Okay?

Forester—Okay. (Might suggest to dispatcher that he keep in touch with this crew in case it's needed. Probably should ask for a later weather report. If asked for forecast, dispatcher will say that he hasn't anything beyond the 10 a.m. prediction—should he ask for a special forecast? Forester should say yes. Special forecast should indicate winds of 10, gusts to 15.)

Forester—(Should call technician and tell him about the special forecast; ask him how the fire is doing. If forester doesn't ask for forecast, technician should call in.)

Technician to Forester—Looks like the wind is picking up here. Has the forecast changed?

Forester—(In one way or the other, he gets special forecast from dispatcher).

Technician—This wind has really started to blow. My strips are beginning to crown—we may have trouble.

Technician to Forester—That last strip jumped. We've got something going in Bachlors Plantation (6-years old) and it may give us a run.

Forester—(Probably will ask technician if he can manage it or whether he needs help.)

Technician—Think we need help. Is the other tractor ready to go?

Forester — Believe so — will have dispatcher get it on its way right now. Do you want the crew, too?

Technician—Yup, looks like we can use 'em.

Forester—Crew is on its way.

Technician to Forester—We may be able to plow around this spot before it moves out or we might better go back to the sawmill road, plow it out, and backfire from there. What do you think?

Forester—(Makes a decision on plowing and firing technique.)

TSI Crew Leader to Forester—This is Ernie. We're here on the Tift with the TSI Crew and the tractor. What do you want us to do?

Forester—(Gives orders to TSI crew leader.)

Control Action Is Successful

Technician or TSI Crew Leader to Forester—Fire is controlled! What about mopup and patrol?

Forester—(Suggests action.)

Exercise Complete

The prescribed burner has had to learn his trade the hard way. As with the wildfire control specialist before the days of the Simulator, this has required years of experience and sometimes in-

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U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON. D. C. 20250

OFFICIAL BUSINESS

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POSTAGE AND FEES PAID

Brush in Southern California—*Continued from page 6*

reducing the fuel hazard outside his residence as well as inside it.

CONCLUSIONS

Well, what about brush? We enjoy seeing the chamise fields in full bloom, in smelling the pungent fragrance of sagebrush on a summer's day, and in watching the dark green scrub oak reclothe the bare hillsides following fires. But this brush-covered watershed is undoubtedly the most treacherous forest fuel known to man. Under some conditions the chaparral is virtually impossible to ignite; under other conditions a tiny spark can turn it into a nuclear bomblike holocaust.

In conclusion, there is no single, simple, inexpensive way to solve the southern California brush problem. Prescribed burning may be appropriate under some fuel and weather conditions. But it is generally too risky, and the results are unpredictable. Low-growing and slow-burning plants may also be promising. But they must compete with the hardy natives and withstand the ravages of drought and animals. Selective fuel modification (fuel-breaks) along roads, around residential areas, and on ridgetops and in canyon bottoms appears to hold the most promise at present. Meanwhile, much more research needs to be done to obtain the best solution to the overall problem of chaparral management in southern California.

Meals For Firefighters—*Continued from page 9*

Needs are easily estimated. Since the food is free of bacteria and is not touched during preparation, contamination is unlikely. Labor and equipment needed for preparation are minimal; the meals can be served easily, even on the fireline. Transportation costs, particularly by air, are reduced because meals are light and compact.

Precooked frozen meals cannot replace all methods now used for feeding firefighters. But they do offer a method for furnishing hot, well-balanced, tasty meals quickly, easily, and economically.

Improvements planned for the 1968 fire season include a serving tray with compartments and the addition of frozen juice, desert, instant coffee, and powdered milk. Three breakfast and six dinner menus will be offered.

Training Technique—*Continued from page 13*

volved costly mistakes. When training burns were scheduled the weather all too often failed to cooperate and little was accomplished.

Simulation now offers an excellent method for quick, inexpensive, and realistic training in the use of prescribed burning. As simulation technology improves, training procedures will be refined.

Fire Simulators are becoming available in most of the United States, with State forestry agencies assembling their own units and intending to make them accessible to interested parties. Instead of outdoor training sessions at the mercy of the weather, we can now by means of simulation create our own weather to fit the training need. Hundreds of fire control personnel have experienced lifelike situations in handling wildfire through simulation. The same opportunity exists for prescribed fire training, and use of the Simulator for this purpose will enable better advantage to be taken of its capabilities.