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FIRE CONTROL NOTES

U.S. Department of Agriculture
Forest Service

FIRE CONTROL NOTES

A quarterly periodical devoted to forest fire control

CONTENTS

INFORMATION FOR CONTRIBUTORS

Please submit contributions through appropriate channels to Director, Division of Fire Control, Forest Service, U.S. Department of Agriculture, Washington, D.C. 20250. Articles should be typed in duplicate, double space, and with no paragraphs breaking over to the next page.

The title of the article should be typed in capitals at the top of the first page, and immediately underneath it should appear the author's name, position, and organization.

Authors are encouraged to include illustrations with their copy. Illustrations, whether drawings or photographs, should have clear detail and tell a story. Only glossy prints or India ink line drawings are acceptable. Captions for illustrations should be typed in the manuscript immediately following the paragraph in which the illustration is first mentioned, the caption being separated from the text by lines both above and below. Illustrations should be labeled "figures" and numbered consecutively. All diagrams should be drawn with the type page proportions in mind, and lettered so as to permit reduction. In mailing, illustrations should be placed between cardboards held together with rubber bands. *Paper clips should never be used.*

When Forest Service photographs are submitted, the negative number should be indicated with the caption to aid in later identification of the illustrations. When pictures do not carry Forest Service numbers, the source of the picture should be given, so that the negative may be located if it is desired.

COVER—This flail trencher is being used to quickly build a fireline.

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DEVELOPING A NETWORK OF FIRE-DANGER STATIONS

JOHN J. KEETCH, *Research Forester (Fire),*
Division of Forest Protection Research,
Washington Office (located at Asheville, N.C.)

Editor's Note: The future availability of automatic weather observation systems will permit the selection of fire danger station locations which were previously not practical. It will be possible to place observation stations at midslope and in critical fuels; they will not be restricted to valley floors or ridgetops. To meet the increased need for guides on spacing between stations, a summary and suggested minimum standards for spacing of fire-danger stations is presented.

Introduction

There is no clear-cut answer to the spacing of fire-danger stations (fig. 1). This article summarizes a few references and a discussion with research personnel at the National Weather Records Center, Asheville, N.C. Because of the complexity of the problem, even the broad agreement in recommended spacing is rather surprising and encouraging.

Recent Opinions

In writing under the heading "*How Many Stations?*" Nelson made the following statement.[1]

[1] Nelson, R. M. How to measure forest fire danger in the Southeast. U.S. Forest Serv. Southeast. Forest Expt. Sta. Paper 52, 22 pp. 1955.

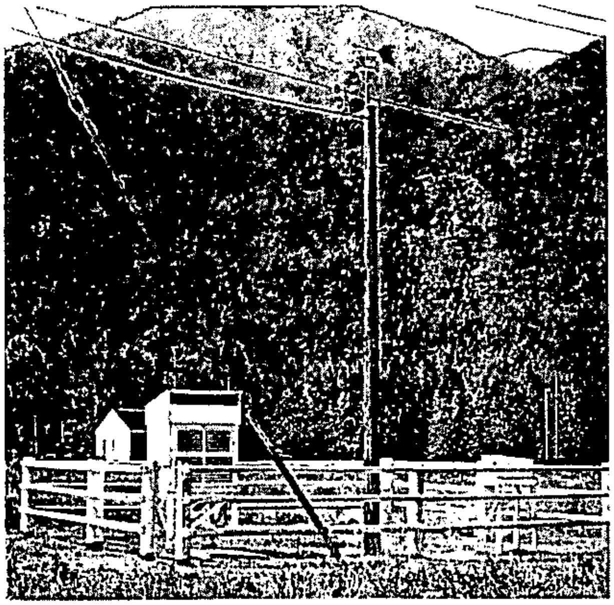

Figure 1.—Fire-Danger Station at Hungry Horse, Mont. (Flathead National Forest).

"There can be no specific answer to the question, 'How many danger stations should I operate?'. Differences in topography, weather, fire occurrence, size of administrative divisions, and patterns of land use are the major variables that have to be evaluated before a sound decision can be reached. Basic to such evaluation are maps of administrative units differentiated into zones of weather, fire occurrence, and danger measurements from well located and operated stations.

". . . In USDA Handbook No. 1, one station was suggested for 150,000 acres in the mountains and one for 300,000 acres in rolling or flat country . . ."

Use of these acreage figures would result in a *desirable* spacing of about 17 miles between stations in mountains and about 25 miles between stations in flat or rolling country. Nelson also suggests that a *fair* network of stations would still be provided if the spacing were about 30 miles in mountains and about 42 miles in flat country.

The results of investigations in Canada on the reliability of danger ratings with distance from station give a little more leeway. In an analysis of fires in New Brunswick, Beall[2] concluded as follows:

a. Within a radius of 25 miles the danger index is highly reliable.
b. At distances between 25 and 100 miles the danger index may be useful, but is not highly reliable.
c. At distances greater than 100 miles weather conditions are apt to be so different as to make the danger index quite unreliable.

Similar conclusions were drawn by Williams[3] in a study conducted in the plateau region of British Columbia. In another recent report Williams[4] states the case as follows:

[2] Beall, H. W. Forest fires and the fire danger index in New Brunswick. Forestry Chron. 26(2). 1950.

[3] Williams, D. E. Fire danger rating and fire experience in the Cariboo. Brit. Columbia Lumberman 47(3): 12, 14, 16, 18. 1963.

[4] Williams, D. E. Forest fire danger manual, Canad. Dept. Forestry Pub. 1027, 28 pp. 1963.

". . . If the earth were as flat as the top of a table, as indeed it is in some areas of our country, a single weather station would provide weather data representative of a relatively large area. On the other hand, in mountainous country, fire weather varies from valley to valley, from one elevation to another, and from one aspect to another. In certain parts of eastern and central Canada, where topographic conditions fall somewhere between these extremes, it has been found that fire danger ratings from a given station are reliable for a *radius* of about 25 miles. For points 50 to 60 miles from the station, ratings, although less reliable, have still proved to be useful. In general, then, each fire-weather station should not be expected to cover an area having a radius of more than 25 miles, and in mountainous country the number and extent of individual valleys will be a better indication of the number of stations needed.

Since rain is the weather factor most likely to vary from place to place within the area to be served by the station, it is often advisable to measure rainfall at one or more auxiliary locations and to use these rainfall records, together with other required weather readings from the main station, in working out the danger index for additional localities."

Thus, Williams believes that stations spaced 50 miles apart will give adequate coverage in average country and that the network should include additional measurements of the more variable factors, such as precipitation.

The 1960 *Guide to Climatological Practices*,[5] prepared by the Secretariat of the World Meteorological Organization, is of greater interest. The relevant parts are the section on "*Climatic Elements and Their Observation*" and the subsection on "*Networks*." The "ideal" network of stations is described as follows:

"Ideally, the number of stations at which any particular climatic element is observed should be large enough to permit a complete analysis to be made, without resorting to doubtful hypotheses, of the geographical distribution of mean values, frequencies, extremes, and other characteristics of this element.

". . . A sparse network may be sufficient for the study of the atmospheric pressure reduced to sea level but, on the other hand, a fairly dense network will normally be required for the study of the wind regime (exposure) and such elements as maximum temperature, amount of precipitation, and number of days with snowfall, and a very dense network may be required for the study of minimum temperature, frequency of frost, and frequency of fog."

The *WMO* report recognizes the marked tendency for isolines of the values of most climatological elements to be parallel to the major broad-scale geographic boundaries, such as coastlines or mountain chains. A similar but smaller influence is noted in hilly country. For an adequate study of these relationships, the report recommends climatological stations 1 to 6 miles apart if they are alined perpendicular to the coastline, mountain range, or valley bottom, and 12 to 31 miles apart if they are alined parallel to such boundaries.

The report further specifies that in areas where the geographical conditions are fairly uniform, a station per 1,000 square kilometers will normally be sufficient for most climatological purposes. This means a station per 625 square miles, one per 400,000 acres, or one 30 miles from the next station.

I believe that these requirements presented by the World Meteorological Organization are somewhat more rigid than those usually needed in fire control planning. In table 1 I have indicated the minimum stations that I believe are necessary.

TABLE 1.—*Minimum standards for spacing and density of fire-danger station network*[1]

Terrain	Average distance between stations	Average density per million gross acres
	Miles	*Number*
Flat to gently rolling country....	40–50	1
Broken and hilly country..........	30–35	2
Mountainous terrain...........	20–25	4

[1] Depending on local needs, additional stations may be necessary in certain areas, or additional measurements of selected fire-weather factors may be needed.

The station-spacing problem was discussed early in 1964 with Dr. Gerald Barger, Director, National Weather Records Center, and four members of his

Continued on page 6

[5] World Meteorological Organization. Guide to Climatological Practices. No. 100. TP 44. 1960.

EXPERIENCES WITH THE ONE-MAN FLAIL TRENCHER

Francis B. Lufkin, *Aerial Project Officer,*
Okanogan National Forest

Editor's Note: Fire control men are constantly looking for new and better ways of doing their work. For example, mechanized fireline trenchers have been developed, discarded, and redeveloped during the past several years. In this article, Mr. Lufkin writes of his personal experiences with the one-man flail trencher. An interim specification, No. 5100-00370, was adopted by the U.S. Forest Service for this trencher in June 1964. The specification is available on request from the Chief, U.S. Forest Service, Washington, D.C.

The size of our aircraft (Twin-Beech[1]) limits our basic mechanized line building crew to four men. One man is the chain saw operator, the second man cleans up behind the saw, the third man operates the trencher (fig. 1), and the fourth man cleans up, finishes the fireline, and maintains the supply of gasoline, water, and chain oil for the crew. The chain saw man is the most important man in the operation because he sets the pace for the line building operation. However, all of the men should be trained to work at all of the positions.

Mechanical equipment does not have a place on *all* fires, but it should be ready and available for use as needed. Mechanized equipment can be integrated into any size of crew without difficulty. The amount and type of equipment varies with topography and fuel type.

Trenchers have also been valuable in mopup and in cooling hotspots. Exposed fire on logs and stumps is knocked down much quicker with a trencher than it is knocked down with a shovel or chopped off with a pulaski (fig. 2).

[1] Use of trade names is for information purposes and does not imply endorsement by the Forest Service.

Figure 1.—The flail trencher in operation.

CASE HISTORIES OF TRENCHER USE

1. Found Creek fire—Mt. Baker—1959

Our first mechanical trencher was used on this fire. It was equipped with a star blade head of our design. The eight-man crew used it in their mopup. The crew boss said that "although it only lasted 20 minutes, it was doing as much work as the rest of the crew." This was encouraging, so we built an improved head for the machine.

2. Beaver Lake fire—Okanogan—1960

This was a Class E fire which had a heavy lodgepole fuel type, with excessive down lodgepole. We had an 18-man initial attack crew, with four chain saws and one trencher equipped with an improved star blade head. We used 15 men out front to remove the heavy lodgepole downfall. One man using the trencher did nearly all the trench digging, with two men cleaning up behind. The

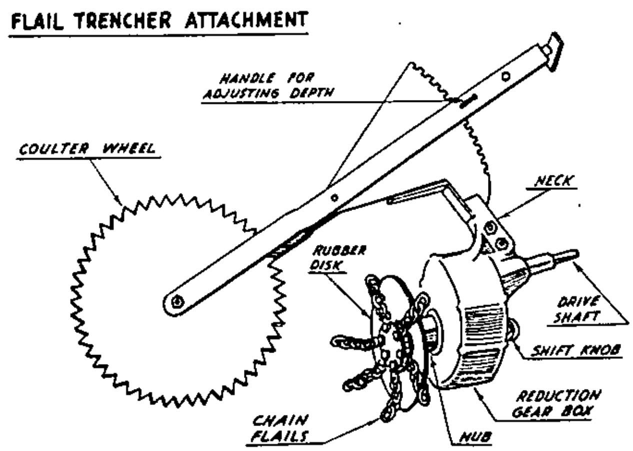

Figure 2.—A diagram of the flail trencher attachments.

crew built about one-fourth mile of fireline the first afternoon and night that the fire burned.

3. Lightning Creek fire—Okanogan—1961

This was a grass fire with scattered pine and fairly rocky topography. We dropped a four-man crew with two trenchers, equipped with the first chain type of flail heads. These four men built more than 160 chains of fireline in about 10 hours. They found that operating the machines in tandem provided the best efficiency.

4. Ortell Creek fire—Okanogan—1962

This fire burned in scattered pine, with a pine-grass cover. The soil was perfect for the flail trencher. We had an eight-man crew with trenchers and one chain saw. We had an excellent line around the 1-acre fire in 30 minutes. We then plowed up the whole burned area. We used the flail to beat the fire off the logs, and then we threw a dirt covering over everything. The fire was reduced to a few smokes in about 2 hours. The trenchers speeded the mopup immensely.

5. Baldy fire—Okanogan—1962

We dropped 19 men on this fire, which was controlled at 100 acres. The fuel type was heavy lodgepole, stacked head high in places. We used four chain saws and two flail trenchers. We built a line approximately two-thirds the way around the fire (approximately 10 acres at this time) before it blew up. The trenchers could be operated by just two men. This was important because the remainder of the crew were free to do the extensive sawing and clearing. Using the dirt-throwing action of the flail, we ran across the top of the fire, cooling it and holding it for some time.

6. Volstead Creek fire—Okanogan—1964

We dropped four men on this 1½-acre fire, along with one chain saw and one flail trencher. The fuel type was scattered pine and pine grass, and the topography was quite rocky. In 1 hour the trencher had gone around the fire twice, and a very good fireline had been built. While the trencher operator built the fireline, the other three men knocked down hotspots and cut snags.

OTHER USES

We have used the flail trenchers on other jobs. We obtained fairly good results by using them to scalp ahead of tree planting crews. We used them in erosion control to cut small drain ditches in skid trails.

Flail-trenchers are effective for building control lines around cutting units prior to burning. Many people on the Okanogan National Forest feel the hand trench has application in prescribed burning because use of the "cat line" causes so much erosion on the steeper areas. These extra projects enable our smokejumpers to obtain good training in handling mechanized equipment while performing useful work.

Fire-Danger Stations—*Continued from page 4*

staff. Dr. Harold Crutcher, Chief of the Science Advisory Staff, reported, as an example, that monthly average temperature correlations rated against Miami, Fla., dropped to 0° F. at 600 miles, but maintained a 95-percent correlation for as far as 100 miles. In the Central United States the 95-percent level was maintained up to 95 miles. However, these limits should be used only where the primary interest is obtaining statistical data, such as broad approximations of seasonal severity. Stations spaced up to 200 miles apart might be useful for this limited purpose, but they would not satisfy daily operational needs.

Personnel of the National Weather Records Center knew of no reports that would provide better clues as to optimum fire-danger station distribution; however, they propose to look further. They thought that the 25-mile radius suggested by Williams was a reasonable first approximation in certain terrain, particularly if supplemented by additional rain-measuring stations.

Conclusion

We have only an approximate answer to the question of fire-danger station distribution. The development of a station network for a fire control organization is largely a rule-of-thumb procedure. The suggested minimum standards should be helpful, but they are not the best answer. Analyses of weather records combined with the results of local climate studies now underway at several experiment stations should eventually provide a sound basis for the optimum spacing of fire-danger stations.

THE NEW BOWLES HELITANK

RALPH A. JAMES, *Assistant Regional Coordinator, Northern California Service Center, Redding, Calif.*

Editor's Note: The Bowles Helitank is designed to attach to the "H" frame adapter developed at the Arcadia Equipment Development Center.

Description

The new Bowles helitank[1] is square, open topped, and constructed of heavy-duty coated fabric. Its capacity is approximately 90 gallons of liquid for small helicopters (Bell G3B or Hiller 12E[2]) without leg extension or 100 gallons of liquid when attached to the above helicopters with leg extension. Recommended gross weight limitations must be followed for each helicopter make and model (fig. 1).

Rigging

The helitank is suspended on the rails of the bomb shackle adapter assembly by parachute webbing. The webbing straps are lashed around the rails of the adapter assembly, and attached by hooking the parachute snaps at the end of the straps into the V-ring sewn to the bag (fig. 2).

[1] The helitank was developed by William Bowles, Supervisory Smokejumper and Master Parachute Rigger, and Ralph Johnston, Helitack Specialist, of the Northern California Service Center, Region 5. Bert Train, Helicopter Operator, and Charles Burgans, Helicopter Pilot, assisted with the development and testing of the helitank.

[2] Use of trade names is for information purposes and doe not imply indorsement by the Forest Service.

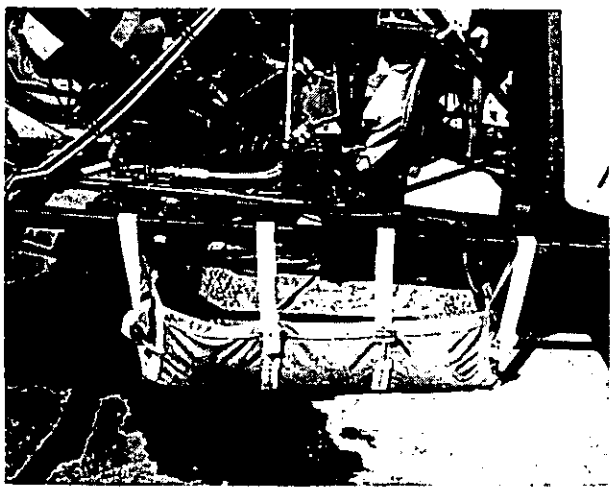

Figure 1.—Bowles helitank attached to bomb shackle adapter assembly on Bell helicopter with leg extension.

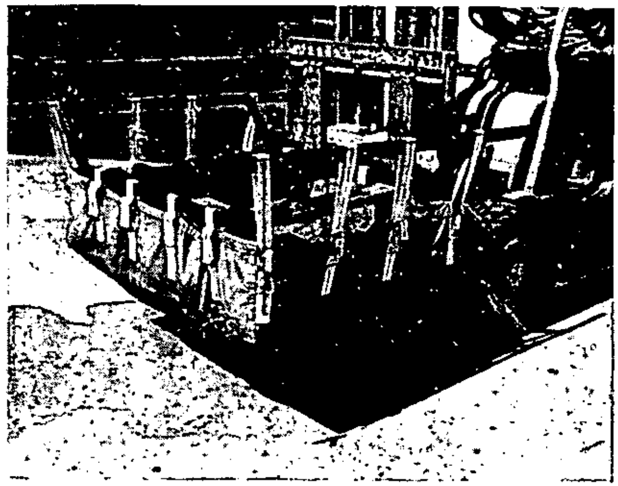

Figure 2.—Bowles helitank showing rigging to bomb shackle adapter assembly.

Dropping

The pilot may release the contents of the tank electrically or manually (fig. 3). When the helicopter is over the target, the pilot hits the release switch which supplies the current from the helicopter's electrical system to the electric solenoid mounted on the bomb shackle. The solenoid opens the bomb shackle, releasing the spout. The tank empties in 3 seconds.

Flying at 30 miles per hour and 50 feet high, the drop pattern with water is 30 feet wide and

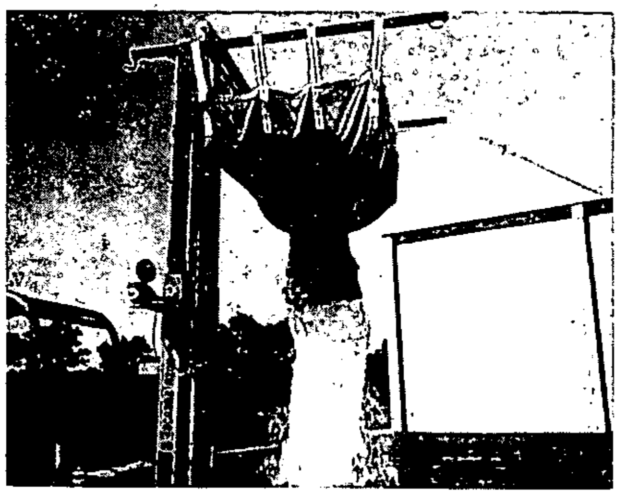

Figure 3.—Static tests of dropping time with Bowles helitank.

100 feet long (fig. 4). After the drop is completed, the tank remains snug against the bomb shackle adapter assembly at cruising speed. Pilots report no adverse effects on flight characteristics before or after dropping.

Advantages

The Bowles helitank has the following advantages over helitanks now in use:

1. *The exchange of equipment.* When helitacks with rigid tanks are made, it is necessary to remove the helitank and attach the bomb shackle adapter assembly if the fire manager decides to use other helicopter accessories such as a helipumper, sling load, or hose tray. This is a 20- to 30-minute job. With the Bowles helitank, the bomb shackle adapter assembly is already in position for attaching other helicopter accessories.

2. *Easier handling and transportation.* One man can easily attach or detach this tank and fold it into a small bundle. It can be kept on the cargo rack of the helicopter. The rigid aluminum helitanks now in use require at least two men to mount or demount and a pickup to move the equipment.

   The Bowles helitank weighs approximately 15 pounds, compared to approximately 50 pounds for aluminum tanks. This reduced weight allows an increase in the helicopter payload.

3. *Less expensive.* The cost of the Bowles helitank is about $60, compared to $500 to $1,200 for rigid aluminum tanks. It is also inexpensive to replace.

4. *More adaptable.* The Bowles helitank can be attached to a Bell or Hiller helicopter adapter assembly regardless of leg height. Metal tanks are not interchangeable without major modifications and resulting expense.

5. *Easier maintenance.* The Bowles helitank is easily repaired if damaged on the fireline.

6. *No certification.* A Supplemental Type Certificate is not necessary for the new helitank since it is attached to the bomb shackle adapter assembly that is certificated by the Federal Aviation Agency.

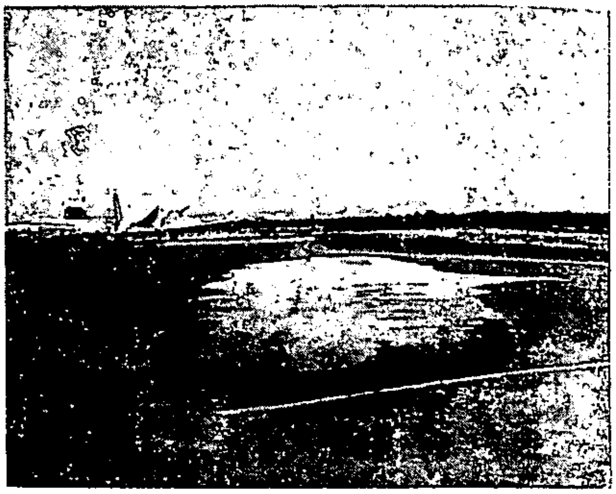

Figure 4.—Drop pattern made with Bowles helitank; it is 30 feet wide and 100 feet long.

Material lists, plans, and specifications are available from the U.S. Forest Service, Northern California Service Center, Airport Road, Redding, Calif.

MATERIALS LIST

Tank

- Material, Herculite 80 coated fabric
- Physical properties:
  - Total weight, 18.1 sq. yd.
- Tensile strength:
  - Warp, 332 lb. per in. width
  - Fill, 338 lb. per in. width
- Tear strength:
  - Warp, 103 lb.
  - Fill, 108

Webbing

- Nylon webbing straps, white
  - Spec. Mil W 4088, type 8, 1¾-in. wide
- Condition (untreated) natural
- Tensile, 3,600 lb.
- Price per 100 yd.
  - Natural, $22.58

Snaps

- Parachute snaps tested to 2,500 lbs.

BRUSH CLEARANCE FOR STRUCTURAL PROTECTION

Harvey T. Anderson, *Division Assistant Fire Chief*
Los Angeles County California Fire Department

Many structures have been lost in brush fires in southern California in 11 of the last 35 years. However, homes amid the worst brush fire can be saved if the surrounding brush is cleared.

Brush fires classified as major conflagrations repeat the same burning pattern on about a 20- to 30-year cycle. While fires of such magnitude constitute less than 3 percent of the total fires occurring in the watershed, they do by far the most damage. These fires can and do occur during all seasons.

Firefighters have worked on the flanks of these fires, reduced the acreage burned, and saved many structures in the paths of the fire, but until the extreme wind decreased or the fires consumed all available fuels, it was impossible to build control lines around them. Most of the structures lost had little or no brush clearance.

One hundred acres of fire in heavy brush releases the same B.t.u.'s as one atomic bomb, Hiroshima size. Nature could hardly have designed a more explosive mixture than the half-dead, oil-filled, finely divided leaves and stems of the vast brush fields of southern California chapparal. Add to this a carpet of dry grass for a fuse, and there is a potential conflagration from any one of a dozen causes.

The Indians put their tepees in the open grass meadows and let the children and dogs wear the ground bare. When the fires approached, they did not burn their homes.

American homeowners have been slow to realize that when the brush is too close to the house, the house is very likely to burn when a brush fire occurs. The Topanga fire of 1958 demonstrated this fact convincingly. In Fernwood in Topanga, 50 homes burned in a dense brush area, while on Big Rock Mesa, where the brush had been removed from around the homes, not one home was lost. This does not mean that homes need not be protected from flying embers or that fire engines are not necessary. It does mean that firemen and their equipment can certainly do a better job of saving homes if the house is not buried in flammable brush.

The fire problem on the average summer day has been solved in most of southern California. With the abundance of pumpers, patrol pickups, bulldozers, airplanes, and manpower, the average fire does not usually get out of control.

It is the fire that starts during high winds and low humidities and becomes large that greatly damages watersheds and homes. This conflagration runs until it consumes all available fuel or the wind abates. Nothing can be done about the wind, so what can be done about the FUEL? For effective fire control under conflagration conditions, reduction and modification of the fuel is needed.

In 1956 there were three big fires in Malibu, all driven by high winds in rough country. These fires occurred in a 6-day period and burned some 37,000 acres. All three practically duplicated fires that burned in 1930, 1935, and 1943.

Civic organizations became incensed and insisted that the fire department do something. The Chambers of Commerce of Topanga and Malibu insisted that the fire services recommend a solution. Interested parties met in 1957 in Los Angeles County Supervisor Chace's office, and as a result of this meeting, the Los Angeles County Brush Clearance Ordinance was adopted.

In 1959, clearing of lots was begun. The County Fire Department tries to get the property owner to make his own 100-foot brush clearance, but if he does not, the County crews clear his property and add the cost to the owner's tax bill. The average cost per lot cleared by County crews has been $100. When the owner can be contacted, an average additional cost of $5 is charged for chemical spraying. These sprays eliminate the need to cut the brush back the following year.

To remove the brush hazard, the Los Angeles County Fire Department uses the authority given by the 1961 Weed Abatement Act, State Health and Safety Code Section 14875-14921. In January, the County Board of Supervisors declares that certain lots are fire hazards and must be cleared. Weed Abatement Section personnel post brush hazard removal signs on these lots, and fire station captains and patrolmen try to obtain voluntary action. If the brush has not been cleared by August, a 30-day notice is sent to the owner, and if the work is not done by September 15, the County crews start cutting. Hand crews burn the piled brush, or if the weather is unfavorable, the brush is run through a chipper and distributed on top of the soil as a mulch.

The Brush Clearance Ordinance has been declared constitutional when owners have tested the law in court. Insurance companies have required up to 400 feet of clearance in some brush areas to prevent a brush insurance surcharge. The insurance companies have helped greatly in getting people to meet the requirements of the Brush Clearance Ordinance.

Instead of telling citizens to clear all the brush off his property, the slogan "Landscape with the native vegetation" is used to promote individual effort.

Some owners have found, after clearing off brush, that they owned more valuable land than they thought. After the 1961 Topanga fire, many personally thanked the Fire Department for making them clear the brush around their homes.

The effort is to reduce the fuel by separating bushes so that fire will not readily travel from one to the other, and to create a pleasing parklike effect. The use of local shrubs, such as manzanita, sumac, holly, scrub oak, or lilac, all native to the dry southern California climate, simplifies the plant problem. The remaining plants will have deep root systems and along with the grass and weeds that will come in will give the erosion protection that is needed.

The use of bulldozers for clearing brush in steep terrain is not advised. Hand clearing is necessary so that the duff and leaf mold will be left to protect the soil. No soil erosion was found after a heavy rain in the first brush area cleared in Fernwood in Topanga Canyon. Where water is available, low-lying iceplants and ground cover plants can be used to protect the soil and beautify the area. The department has a list of suitable plants.

Controlling Regrowth

The new 6- to 8-inch spring growth is treated with a mixture of 50-percent concentrate composed of 1½ oz. 2-4-D, 1½ oz. 2-4-5-T, and 3 gal. of water. Twice this strength was used on 3,000 acres on the Temescal Ranch, and an 85-percent brush kill was obtained. The cost was approximately $14.50 per acre. This figure included the expense of application by helicopter. One good mix for the treatment of 1 acre is 3 lb. of 2-4-D, 3 lb. 2-4-5-T, and 1 gal. of diesel oil; water is added to make 10 gal. of mix.

For sagebrush, 3 lb. of 2-4-D, 1 gal. of diesel oil, and enough water to make 10 gal. of mix is effective. The cost is approximately $7.65 per acre when the mix is applied by helicopter. Application of sprays around houses or cultivated areas must be done with extreme care under conditions of no wind to prevent damage to other plants.

Prescribed burning has been advocated by some as a means of breaking up the large brush areas, but it is not feasible in southern California. It is not possible to both do it safely and obtain a good burn.

However, advantage should be taken of the burns that do occur and the areas treated to prevent regrowth of the brush on main ridges in selected areas. We need to perfect regrowth control methods. Some erosion may have to be tolerated, but it is better to have some erosion than to permit the repetition of the 30-year cycle of devastating conflagrations, the loss of valuable watersheds and homes, and the subsequent disastrous floods and accompanying erosion.

References

The following pamphlets and bulletins may be of help in further investigation of this subject.

Los Angeles County Fire Department.
1960. Can your home survive a major brush fire?
1964. Chemical control of brush around the home.

Murphy, J. L.
1963. Conflagration barriers. Pacific Southwest Forest and Range Expt. Sta., 12 pp.

Pacific Southwest Forest & Range Experiment Station, California Division of Forestry, and Los Angeles County Fire Department.
1963. Guidelines for fuel breaks in So. California. Fuel Break Rpt. 9, 25 pp., illus.

Plum, T. R., Bently, J. R., and White, V. E.
1963. Chemical control of brush regrowth on fuel breaks.
Pacific Southwest Forest and Range Expt. Sta., 41 pp., illus.

HELMET RACK

PHILIP E. CLARKE, *Supervisory Smokejumper*

Bureau of Land Management, U.S. Department of the Interior, Fairbanks, Alaska

The Alaska smokejumper unit was established in 1959, on a trial basis, to increase the efficiency of forest and range fire control in Alaska.

In growing from a 16-man contingent in surplus quonset huts to a well-equipped 50-man fire suppression organization, we have encountered many problems, some *unique* to Alaska, some common to all growing smokejumping units. One problem which has plagued all loft foremen is how to store smokejumper helmets so they will be orderly arranged and safe from damage while in storage.

To meet this problem we have constructed a simple and efficient helmet rack. The helmets are placed on the rack; the ear vents are inserted onto a welding rod hook (fig. 1). The individual racks are spaced to allow easy accessibility to each helmet when the rack is fully loaded (fig. 2).

The racks are made of ¾-inch thin-wall conduit and 5-inch pieces of ⅛-inch steel welding rod. The racks consist of 5-inch pieces of welding rod placed at 10-inch intervals starting 12 inches from the bottom of the rack. The welding rods are bent upward to a 60-degree angle to give the helmets a stable resting position (fig. 3).

In addition to improving the appearance of the storage area and decreasing the storage damage of the helmets, use of the helmet rack has increased the available shelf space.

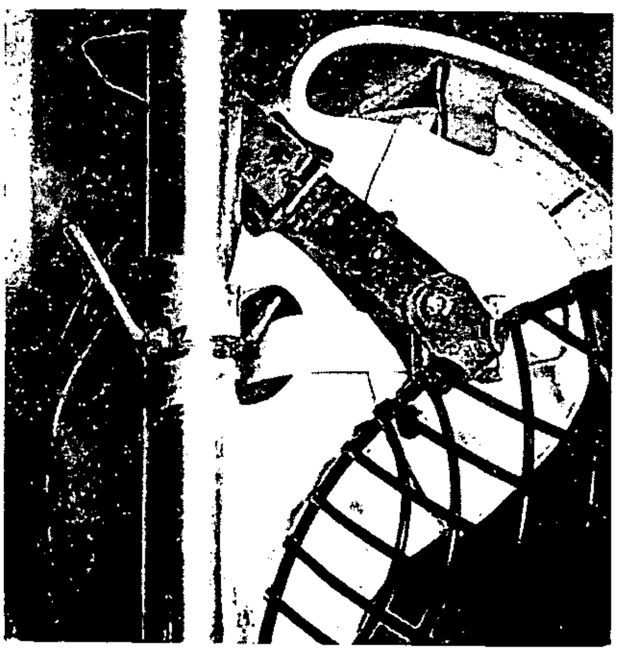

Figure 1.—Smokejumper helmet in storage on helmet rack. (Photo courtesy of U.S. Department of Interior, Bureau of Land Management.)

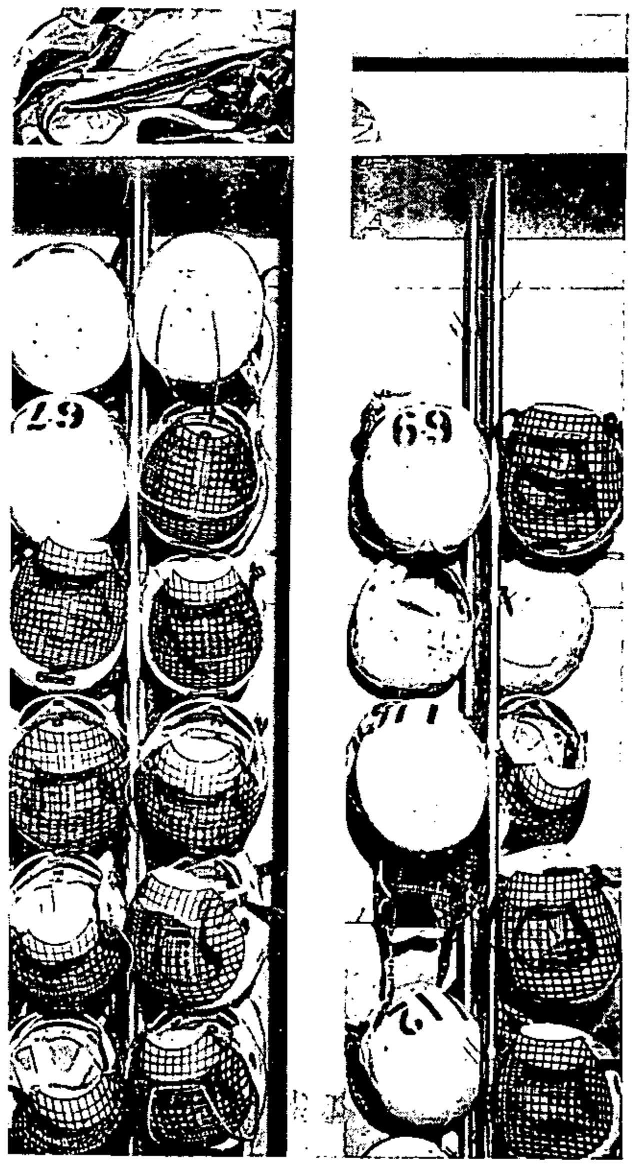

Figure 2.—Helmet rack installed in parachute loft. (Photo courtesy of U.S. Department of the Interior, Bureau of Land Management.)

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STABILIZATION OF SLASH FUEL SAMPLES

S. J. MURARO, *Research Officer*

Forest Research Branch, Department of Forestry

Victoria, British Columbia[1]

In fire research, sampling of highly diverse fuels such as slash is difficult, particularly if preservation of the spatial distribution is desired. One method of sampling such fuels is to stabilize them in their original state by using Vibrafoam.[2] It is a rigid polyurethane foam similar in appearance and physical properties to styrafoam.

Vibrafoam is marketed as a two-package viscose liquid; part A contains the prepolymer and part B, the cross-linking agent, catalyst, and blowing agent.[3] Combining the liquids in the ratio of 11 parts B to 10 parts A by weight or 8 parts B to 7 parts A by volume produces a foaming liquid which rapidly hardens to form a porous, white mass. Two quarts, one of part A and one of part B, yield approximately 3.3 cubic feet of foam at a cost of about $10. Larger quantities are available at lower prices.

Small quantities of the two liquids are combined in the appropriate ratios and mixed with an egg-beater or by rapid hand stirring in a polyethylene mixing bowl. (Polyethylene lessens adhesion of solidified foam to the mixing vessel.) Within 1 minute the liquid will expand to form a yellowish froth. This froth is poured through voids in the slash to form a mound of froth at the base of the fuel. Further expansion of the froth incorporates fuel components both vertically and horizontally until the action of the blowing agent is exhausted and hardening commences. This procedure is repeated until a mound of rigid foam incorporates the desired portion of the fuel complex. Safety precautions furnished by the supplier should be observed, especially regarding fume inhalation.

Within 30 minutes the foam solidifies, and a sample (fig. 1) may then be obtained by making four vertical saw cuts along the borders of the desired sample. The complex of Vibrafoam and entrapped slash is easily cut with a handsaw, but if the incorporated fuel components are large, a chain saw may be required. Attempts to cut similar samples of slash without the benefit of a stabilizing medium have been time consuming and difficult.

Figure 1.—Fuel sample stabilized with Vibrafoam.

The method of evaluating the incorporated fuels will depend on the fuel information desired. Average density of a fuel sample may be calculated by determining the difference between (a) the density of foam plus incorporated fuel components and (b) the density of an equal volume of solidified foam. The total weight of fuel is the product of the difference in densities and the volume of the sample.

If a finite description of the distribution of fuel sizes and types is desired, the sample may be sectioned to isolate specific zones. Figure 2 shows two facing sections cut from the sample shown in figure 1 and the larger fuel components which were later extracted from the sample.

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[1] Department of Forestry, Canada, Forest Research Branch Contribution No. 462.

[2] Use of the trade name, Vibrafoam, is solely for information purposes, and endorsement by the Forest Service is not implied.

[3] Anonymous. Naugatuck Chemicals Technical Data Bulletins, P_1, P_2, and P_5, Naugatuck Chemicals. Elmira, Ontario.

Figure 2.—Adjacent sections of the sample shown in figure 1. The larger fuels taken from each section are shown below.

To allow examination of the incorporated fuels, they must be separated from the foam by breaking the section and removing the larger fuel components by hand. Smaller fuel components, such as needles, grass, and fine twigs, may be separated by dissolving the foam in a solution of equal parts of acetone and dimethyl formamide or in methyl alcohol. Each fuel component can then be dried and weighed to permit a description of the fuel complex in terms of the spatial distribution of weight, or in terms of fuel surface area.

VIRGINIA HARD HIT BY '63 FOREST FIRES

Fires destroyed 44,744 acres of Virginia's forests last year, the State Division of Forestry reported. It was the worst year for forest fires since 1952, when 111,000 acres of forest land were burned over.

Hardest hit was the Northern Piedmont section of the State, where 545 fires burned 9,529 acres.

TRAGIC FIRE TOLL ITEMIZED AT MEETING

[From the DALLAS TIMES HERALD, *Dallas, Tex., May 19, 1964.]*

Percy Bugbee, general manager of the National Fire Protection Association, detailed the toll of human suffering and waste caused by fire in his report to the organization's 68th annual meeting in Dallas, Tex., in May 1964.

On an average day, 32 people will be killed by fire, more than 1,500 homes will be hit by fire, costing homeowners nearly $1 million. There will be fires in 14 schools, 17 farms, 3 hospitals, and 8 churches. Fire will disrupt operations in 135 factories and 120 stores.

"These are not just numbers," said Mr. Bugbee. "These are people and their possessions and their jobs—all casualties of needless fires."

He emphasized that practically every fire is needless.

"Dig into the story of every fire and there is some human failure or act of carelessness which allowed the fire to happen.

"Fire cost 11,800 lives and more than $1.7 billion in property damage in 1963 in this country, and it may appear we are losing ground.

"However, our growth in population during the past 25 years means there are many millions more people exposed to the hazards of fire. Likewise, there are tens of billions of dollars' worth of additional property available to burn. So actually we have made progress in holding losses to their present levels.

"But in the final analysis, it is people who cause fires. When all of us acknowledge that fires are not only wasteful but avoidable, and then go on to reform the habits and remove the hazards that cause them, we will see real progress," he concluded.

DRAFTING TABLE FOR FIELD PROJECTS

Clement Mesavage, *Research Forester*
Southern Forest Experiment Station

A combination drafting and light table that can be placed on a desk prior to use or stored when not in use has been constructed (figs. 1, 2).

A 32- by 40-inch drawing surface is attached to a 28- by 36-inch base, 7⅜ inches high. The table's height is 9⅛ inches; this dimension can be altered to suit the user. A full-length piano hinge is installed at the front. This allows the user to tilt the table at various angles. Casement sash adjusters are used at the rear corners to lock the table in place at the desired angle.

A 24- by 30-inch frosted plate glass is recessed flush, centered in the surface of the top. Even illumination is provided by two fluorescent fixtures, each containing four 20-watt tubes. A sheet of chromed brass set under the tubes reflects light upward.

The tabletop was made from a solid-core veneered door, 1¾ inches thick, and faced with birch (maple or another close-grained hardwood would be equally suitable). An opening, 23¼ by 29¼ inches, was sawed out, and then a ⅜-inch ledge was routed deep enough for flush mounting of the glass. The glass was fixed in place with a glazing compound. A 36-inch parallel rule was attached.

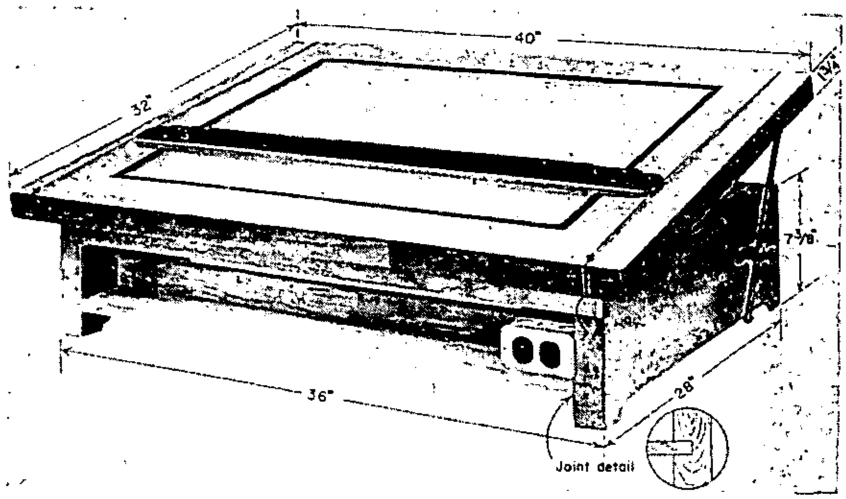

Figure 1.—Completed drawing table.

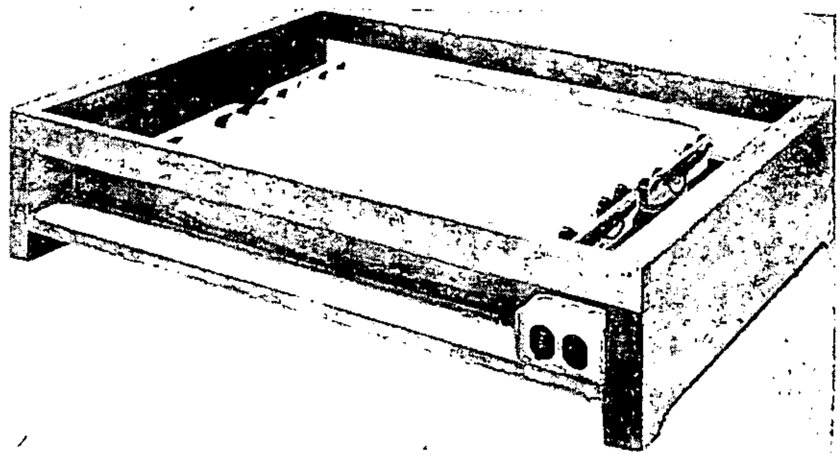

Figure 2.—Top removed to show installation of light fixtures.

Sides of the base were ripped from the material removed for the opening. The bottom is ¾-inch plywood, 28 by 34 inches, set in a groove ¾-inch deep in the sides of the base. This bottom piece provides a mounting surface for the light fixtures and full-length shelves at the front and back of the table. Exterior edges were banded with a veneer to improve appearance. The light fixtures were wired into a toggle switch attached at the front of the unit.

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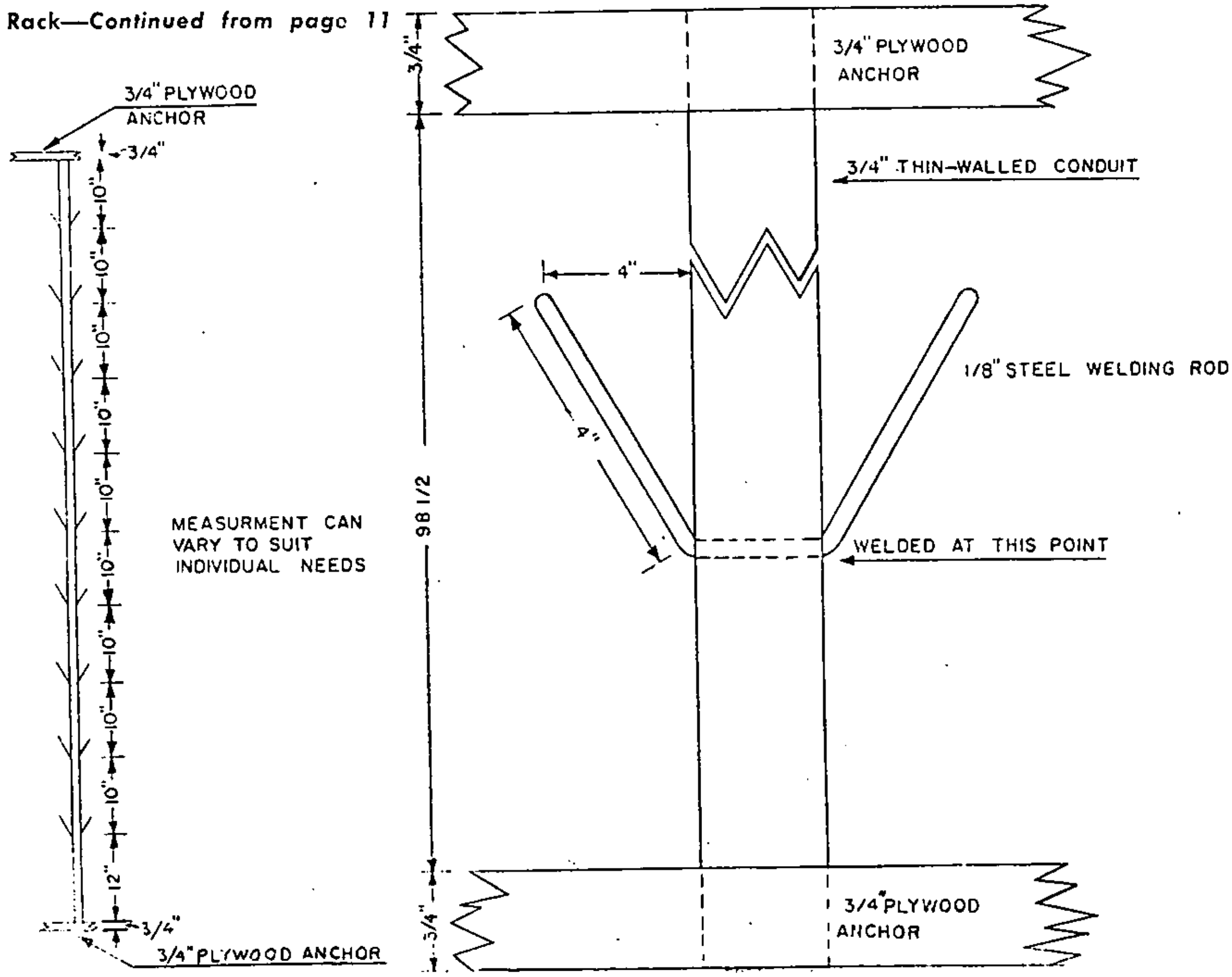

Figure 3—Specifications for smokejumper helmet storage rack. *(Photo courtesy of U.S. Department of the Interior, Bureau of Land Management.)*