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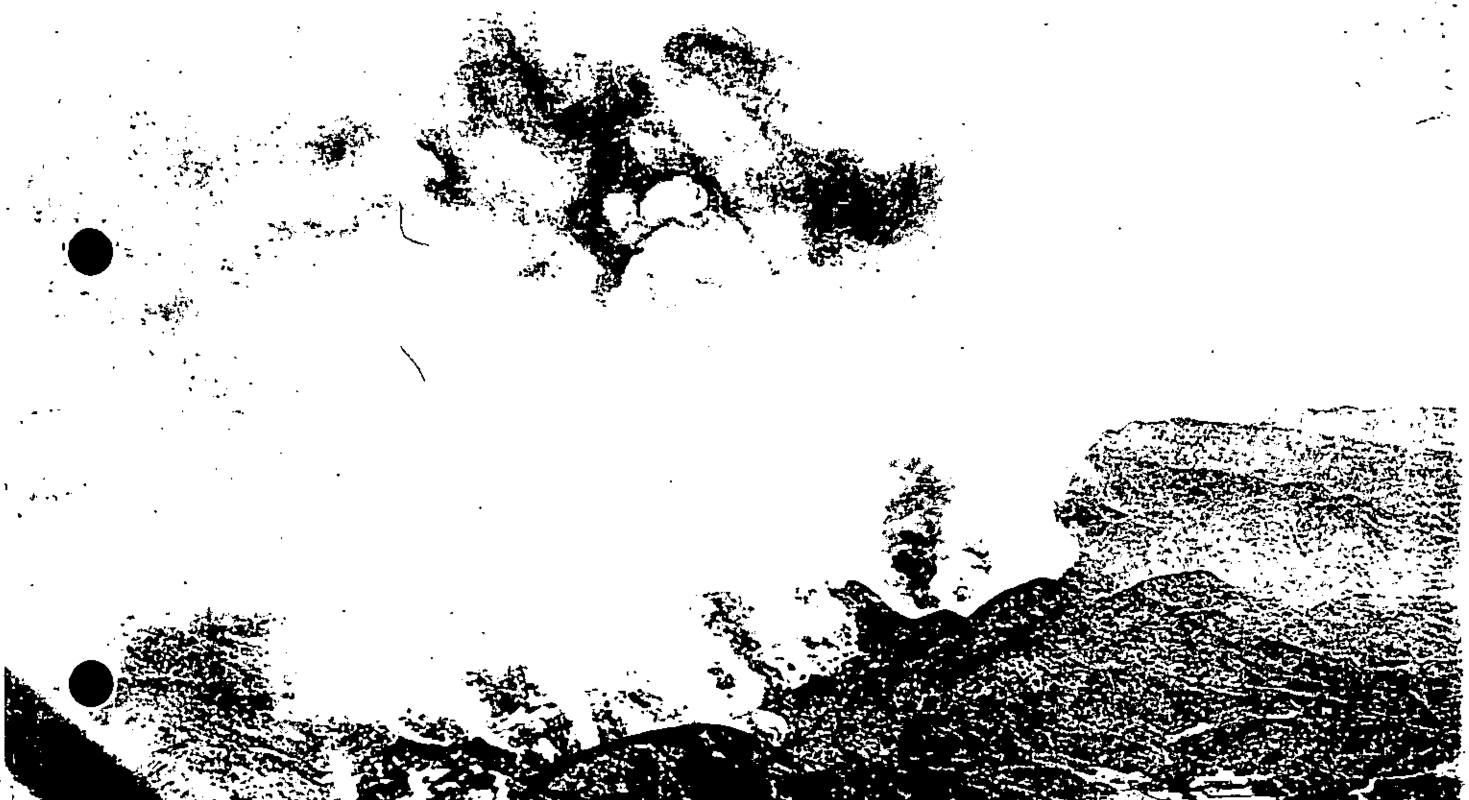
FIRE CONTROL NOTES

U.S. Department of Agriculture
Forest Service



FIRE CONTROL NOTES

A quarterly periodical devoted to forest fire control

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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.

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Cover—Wildfire in southern California: damage to valuable watershed and a threat to homes and other improvements

FIRE CONTROL NOTES is issued by the Forest Service of the United States Department of Agriculture, Washington, D.C. The matter contained herein is published by the direction of the Secretary of Agriculture as administrative information required for the proper transaction of the public business. Use of funds for printing this publication approved by the Director of the Bureau of the Budget (Sept. 16, 1963).

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UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
WASHINGTON 25, D.C.

IN REPLY REFER TO

To Readers of Fire Control Notes

Early in 1936 the participants of the Fire Control Meeting at Spokane, Washington, agreed that a publication was needed to exchange fire control ideas and developments nationwide. Publication of Fire Control Notes began later that year. Since then, the original concept of a national medium for interchange of ideas has grown to international scope. Our distribution list now shows 172 copies being sent to 55 foreign countries.

Time and progress mean change. The traditional size and format of Fire Control Notes is changing with this issue. The new format is much more adaptable; it will do the job more efficiently, allow more illustrations, and provide easier reading.

Fire Control Notes is published to disseminate ideas that will help readers do a better fire control job. Discoveries, new methods and techniques, and different adaptations are vitally needed. No job, no matter how well done, can make its maximum contribution until the story is known by others.

Merle S Lowden

MERLE S. LOWDEN, Director
Division of Fire Control

THE PLACE OF SOUTHERN CALIFORNIA IN THE NATION'S FIRE PROBLEM

M. M. NELSON, *Deputy Chief, U.S. Forest Service*
National Forest Protection and Development

My intent is to draw some contrasts and similarities between southern California's fire problem and that of the rest of the Nation. I hope to show evidence of strong team effort directed toward the fire problem here, and while the Federal investment has been significant, it is a two-way street.

We are frequently asked, candidly and pointedly, what the U.S. Forest Service is doing in southern California. Why do we spend about a quarter of our fire protection money on 2 percent of the National Forest land? It has been said, referring to southern California people, "This is *their* problem—one *they* should solve themselves." To most of us in the Forest Service the very words "their problem" applied to southern California have a strange sound. With Robert Frost we can say "whose woods these are I think I know," for since 1905 these National Forests and their inseparable association with the total environment of southern California have been *our* problem—*ours* as a team member with all other individuals and agencies who accept responsibility for management, protection, and development.

While speaking of mutual interest in mutual problems, I might say that I was keenly impressed at our last budget meeting in the Department of Agriculture by a statement made by our newest Assistant Secretary. He is a Californian. His statement was, "There wouldn't be any Los Angeles, as we know it, if it weren't for the work the Forest Service is doing in the high mountains—and I mean that literally." That may need some explanation. Let's illustrate with this glass of water. Who can tell me where it came from? Did it first fall as rain on the San Bernardino or Angeles National Forest? Just as likely it fell in the high mountains of Wyoming on the Bridger National Forest, the Manti-LaSal in Utah, the Carson in New Mexico, or the Apache in Arizona. Or perhaps it was skied upon while on the Routt or Uncompahgre Forests in Colorado. It could have come from any of these or from many other National Forests. There is sound fact for a sign posted in a pass east of Silverton on the San Juan National Forest of Colorado. This sign reads, "You are now standing on a watershed which supplies water to the City of Los Angeles." So, you see, you have a vital interest in how we protect and manage National Forest resources in much of the West. They play an important part in sustaining southern California.

In order to place southern California's forest fire problem in perspective, let's first take a broad look at the national picture. Last year 115,345 forest fires burned 4,078,894 acres in the United States. This despite the fact that the National Forests were blessed with their smallest burn (85,457 acres) since records were started 57 years ago. Also, the State of Alaska contributed only 29,000 acres as compared with an average yearly burn of over 800,000 acres. Great forest fires of historical record have swept enormous areas in virtually every portion of this country. There are accounts of fires exceeding a million acres in such scattered locations as Maine, Oregon, Wisconsin, Idaho, Michigan, Montana, Kentucky, and West Virginia. As recently as 1957 forest fires on public lands in Alaska blackened over 5 million acres in a month, causing a Bureau of Land Management fire man to state, "Here, we contend with no lookout towers, very few roads, vast distances, long hours of daylight, high temperatures, strong winds, bad terrain, frequent lightning strikes, very little manpower, and next to no equipment—it's really a tough show."

It can be, and has been, a "tough show" in most forested areas when the weather dries the vegetation to a point where fires spread rapidly and conditions are unfavorable to control. Numerous areas have such factors.

There are sections of the country where we can point to rugged, inaccessible mountains, or to great volumes of forest fuels. There are areas with dry climates, having periods of severe fire weather. There are places where masses of people and their activities complicate the control of fires. But there is no single area in this country where factors favoring forest fires combine so frequently and last so long as here in southern California. Also I doubt there is a place more dependent on maintaining balance among elements of environment, such as soil and water. Certainly there is no place where this balance has been more often and disastrously upset by fire. Southern California's place in the Nation's forest fire problem, while small geographically, is large indeed measured by fire's effect on 7 to 8 million people and indirect effect on the Nation as a whole.

Yes, the problem and potential is of national recognition and concern and can be indicated in many ways. Expenditures through the Department of Agriculture and the Forest Service have increased from $886,000 in F.Y. 1955 to $2,744,844 in F.Y. 1963. This year additional $300,000 has been added. Unbudgeted emergency funds for fighting forest fires have totaled $20,691,100 in the last 5 years.

Two of eleven flood prevention projects are located in the Los Angeles and Santa Ynez Rivers. Here, through 1962, $12,900,000 have been spent on improvements and fire protection measures. Under authority of the National Flood Control Act, money is made available to rehabilitate fire-damaged lands where life or property is threatened. Fifty-five southern California watersheds have been treated at a cost of $1,715,000.

Single fires on these National Forests have cost a million dollars or more to suppress, despite strong cooperative support given by State, county, and city fire units.

Men who have fought fire in southern California are acutely aware of a greater stake in these mountains. More than 50 firefighters, many from other States, have lost their lives dealing with intense, fast moving fires—typical of these precipitous watersheds. Yet I have never heard a fireman suggest we resign from the southern California fire team.

Some people, though, wonder aloud "a quarter of the protection money spent on 2 percent of the National Forest area?" Others have added, "Yes, but we are not moving ahead fast enough; losses are unacceptable; we need more research, more equipment development, more hazard reduction, more access roads, more firebreaks; more of everything." I agree and share concern with these people. But for a moment let's view southern California's place in the national fire picture from the inside looking out.

This area has been called a great outdoor fire laboratory, an advanced school for firefighters, a crystal ball in which to view future land management under stress of fires, floods, and population pressures. Certainly it has been a proving ground for firemen and their equipment. Large fires in recent years have names familiar to hundreds of men from many National Forests in a dozen States. Big Dalton, Devils Peak, Refugio, White Mountain, Fish Fork, Barrett, Monrovia, Woodwardia, Waterman Canyon, Stewart, Palomar, Inaja, and many more.

Innovations and progress usually occur closest to the need. Certainly this has been true throughout the southern California area. I think, of course, of the great potential of the new Fire Research Laboratory, but also of many other signs of progress and accomplishment:

The Arcadia Equipment Development Center, soon to move to expanded facilities.

The pioneering at the San Dimas Research Center on effects of fire on watersheds.

The hazard reduction and fuel modification studies called "Fuelbrake" and their application.

Research in human behavior aspects of fire prevention.

Preattack planning involving the construction and mapping of great nets of firebreaks, and facilities, and recording of knowledge needed should a fire start.

Organizing men and equipment for large fire control and interagency coordination.

The procession of new firefighting techniques that evolved from Operation Fire Stop—a most significant interagency effort.

The first use of a helicopter for firefighting and the adaption of techniques learned in the Forest Service smokejumper program to a subsequent fast attack, hard-hitting helitack program.

Major contributions in the use of air tankers and in chemical mixing and loading bases to support them.

Advances in the design and use of fire trucks, for mountain firefighting.

Development and use of mobile, power flamethrowers for backfiring.

Less spectacular, but very significant, studies that led to new land management direction.

In summary, southern California's place in the Nation's forest fire problem is an important and critical one—as a recipient of help from the rest of the Nation, and as a major contributor to fire problem solutions everywhere.

Whereas much progress has been made, there is a long way to go before we can feel we are not living too close to disaster.

All elements favoring fire are here, but so are all the elements we must look for for solution.

All agencies concerned are pulling together to a near unique degree. The disciplines of research and development are serving the men responsible for application.

Lastly, and most important of all, is public understanding and support. These elements combined are destined to solve southern California's fire problem, and in doing so, to establish a lasting place in fire control pioneering.

Presented by Mr. Nelson at a fire meeting sponsored by California State Chamber of Commerce at Riverside, Calif., Sept. 11, 1963.

LIGHTNING DAMAGE TO DOUGLAS-FIR TREES

ALAN R. TAYLOR, *Research Forester,*
Northern Forest Fire Laboratory

Lightning causes more than 10,000 forest fires annually in the United States by igniting snags, live trees, grass, and duff. Field observations have long shown that the lightning may not ignite trees even though it damages them structurally. It is of interest to know why some fuels are ignited while others only receive various degrees of damage from lightning. The author started gathering background information on this problem by studying lightning-caused structural damage to trees that were not ignited. The study was conducted on a portion of the Deerlodge National Forest near Philipsburg, Mont.

About 1,000 lightning-damaged Douglas-fir trees were observed in the 10,000-acre survey. Detailed descriptions of damage were written for 53 of the most recently damaged trees. This note describes some of the special damage features.

Nature of Damage

Visible damage to the 1,000 trees ranged from a superficial bark scar along the bole to nearly complete destruction of the tree. Figure 1 shows intermediate damage, with loss of top and a deep spiral scar where wood and bark were blasted from the tree. Most trees had shallow, continuous scars averaging 5 inches in width along their boles. About 25 percent of the 1,000 had two or more scars, 10 percent had severed tops, and about 1 percent had been reduced to slabs and slivers.

Damage was estimated for each of the 53 recently damaged trees by measuring scar width and depth at the 17-foot height on the bole. Lightning scars on Douglas-fir tend to be uniform in width and depth, except for slight taper, from about 10 feet above the ground to the upper end of the scar.

Scar Alinement

The 53 observed scars were classed according to whether they were straight, oblique (tending to spiral, but making less than one revolution around the bole), or spiral. It is interesting that:

1. All scars followed the grain of the outer layers of wood.

2. Only 7 scars were classed as straight. Twenty-four were oblique, and 22 were spiral.

3. The straight scars were twice as wide as the oblique and spiral scars. Average widths were 10 inches, 5 inches, and 5 inches, respectively.

4. About one-half of the spiral scars ascended to the right, and one-half to the left. Trees with right-hand spirals averaged 260 years of age and those spiraling left averaged 140 years.

Scar Length

Although lightning travels the entire distance between cloud and ground, lightning scars are seldom found along the entire length of a tree. The following points are noteworthy:

1. The average scar extended along 80 percent of the tree height.

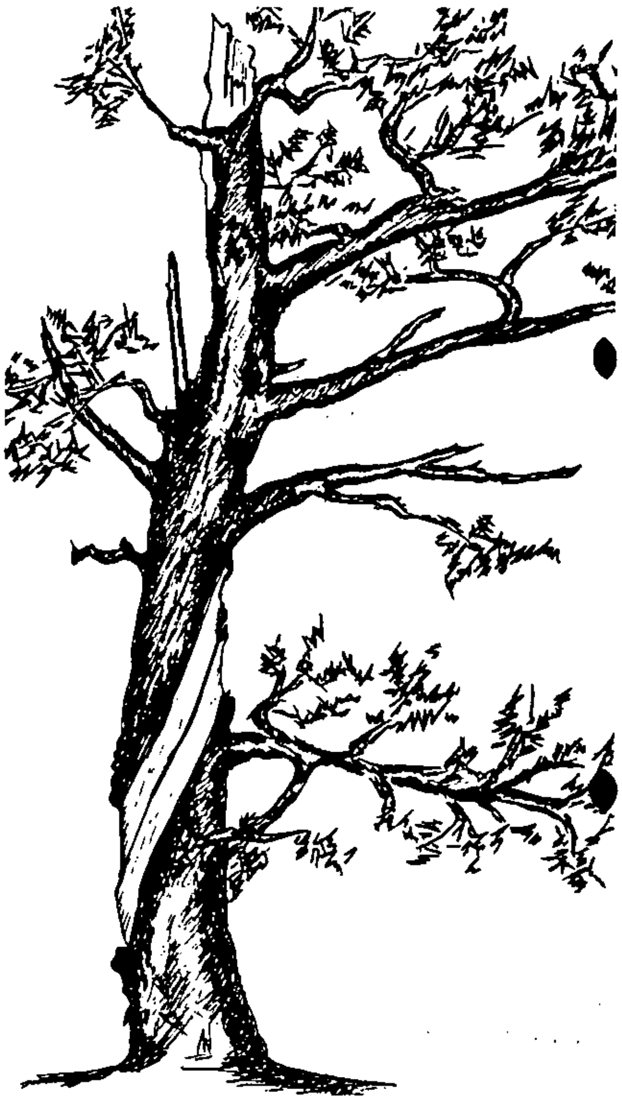

Figure 1.—Douglas-fir showing loss of top and spiral scar with crack along its axis.

2. None of the observed scars extended to the tops of the trees. Distance between the upper end of the scar and tree tip ranged from 3 to 22 feet, with average distance of 10 feet.

3. One-half of the scars extended to ground level. The others reached to within 6 feet of the ground.

4. Upper ends of scars were not tapered to a point, as one might expect, but terminated squarely.

The Lightning Track

Lightning sometimes leaves a narrow strip of inner-bark fibers along the middle of shallow bark-depth scars. This strip was observed on 12 of the 53 trees and usually ran the full length of the scar, adhering to the newly exposed wood surface. Scraping the shredded fibers away revealed a smooth shallow groove about $\frac{1}{16}$-inch wide. The groove was previously reported by McEachron,[1] who concluded that it marked the path of the discharge, which turned the wood along the path into gas.

Perhaps closely related to the groove is a narrow crack, found on 40 of the trees (fig. 1). The crack

1. occupied the same position as the bark strip and groove did on the other trees;
2. separated the two parallel slabs of wood that were blasted from the tree;
3. penetrated to the pith in some trees, as revealed by boring cores taken at right angles to the scar;
4. is a probable result of internal pressure created by the discharge current. It is frequently widened by exposure to the weather, but may eventually be closed or covered as the wound heals.

Bark-Loss and Wood-Loss Damage

On 38 of the trees lightning removed only a narrow strip of bark; on the other 15 it gouged out deeper and wider furrows, causing loss of wood (fig. 2). From 12 of the wood-loss trees lightning blasted the wood in two parallel strips (fig. 2*B*), separated along the crack described above. Several trees lost considerable wood in this manner; for example, from one the lightning ripped a pair of straight slabs, each 8 inches wide, 3 inches thick, and 44 feet long.

Scar dimensions (see tabulation) were, on the average, greater on wood-loss trees than on bark-loss trees.

	Length (feet)	*Width (inches)*	*Depth (inches)*
Wood-loss trees	54	11	3
Bark-loss trees	46	4	1

Wood-loss trees measured in this study were usually older than bark-loss trees and usually of greater height and diameter. For reasons unknown, the larger, older trees apparently were more susceptible to wood-loss damage than the smaller, younger ones.

Based on the author's M.S. thesis, "Lightning Damage to Douglas-Fir Trees in Southwestern Montana," Montana State University, 1962. The study was financed by the U.S. Forest Service under cooperative agreement with Montana State University and the Northern Forest Fire Laboratory, Intermountain Forest and Range Experiment Station, from May 1961 to June 1962.

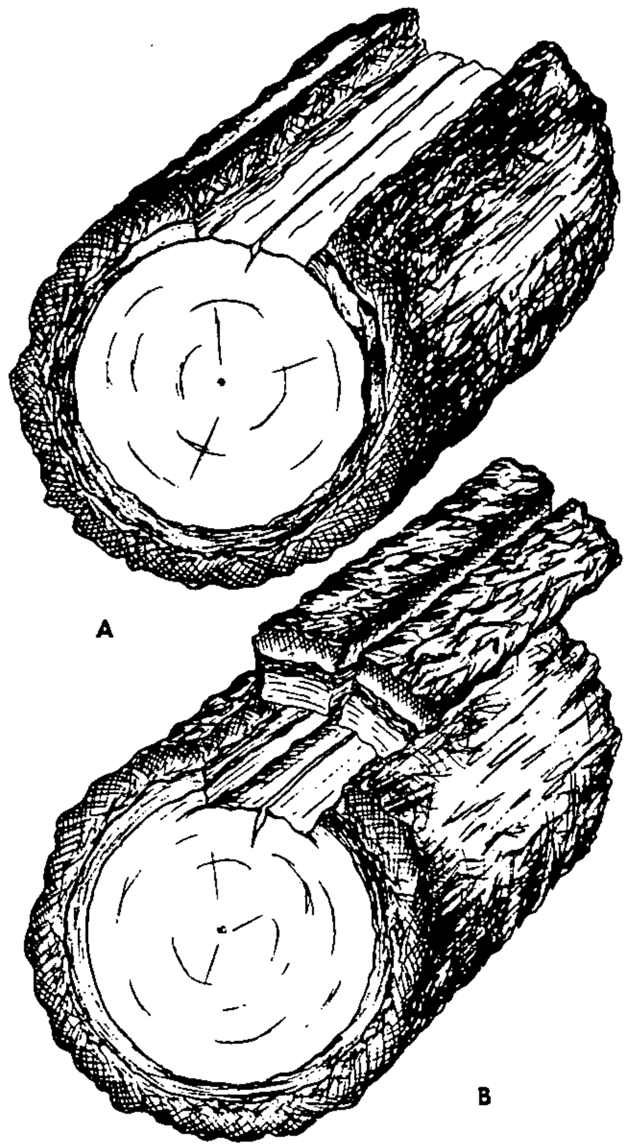

Figure 2.—*A*, Typical bark-loss scar; *B*, wood-loss scar, showing wood and bark removed in two slabs of nearly equal dimensions. Each bole has a crack along the scar axis.

[1] McEachron, K. B. Playing with lightning. 231 pp., illus. New York: Random House. 1940.

FIRE PREVENTION THAT WORKED

Joseph Couch, *Forester, Division of Fire Control*
Southern Region

This article from the South affirms again the principle that specific problem identification in fire prevention is essential for productive results. It proves that effective fire prevention is not beyond the reach of the established field professional who can achieve the determined support of a community.

Although we've made progress in fire prevention nationwide, few of us are satisfied with the present level of knowledge and accomplishment. Who could be when, in 1962 for example, 94,000 man-caused fires burned almost 2 million acres of public and private forest lands under organized protection in the United States?

Experienced fire people know that the formidable number of variables and unknown factors involved in man-caused fires rules out categorical explanations for upward or downward trends. Nevertheless, some examples of successful prevention action may add valuable ideas to fire prevention work everywhere.

USE OF A SPECIALIST

A Ranger District in the longleaf belt was beset by an intolerable annual rate of 193 man-caused fires per 100,000 acres protected. Of the 368 fires that the Ranger tallied for one calendar year, 342 were incendiary! The fires were being set for the usual reasons—such as improvement of open-range grazing; "opening the woods"; reduction of snakes, ticks, and other pests; resentment; ebullience while drunk.

People resent what they don't understand

Careful analysis convinced the Ranger that his prevention program was only nibbling at the problem. The covert defiance of Forest Service authority to manage the land and the neglect of civic responsibility indicated the indifference and hostility often associated with misunderstanding. The Ranger concluded that more man-to-man contact—to increase mutual understanding between local residents and the Forest Service—would accomplish the most in the shortest time.

Finding the right man

Although increasing the amount of contact work done, especially by himself, the Ranger also got authorization to set up a new Fire Prevention Aid position. The man hired was a natural for the job. A likable, rural personality, with the gray-templed dignity of late middle age, this man was a native of a neighboring county, a former sheriff, physically powerful, and unafraid of toughs singly or in groups.

After a period of training that qualified him to explain Forest Service programs, the new man went to work in the District's hottest spot. He didn't miss a single family. By getting acquainted with each adult and many of the children, showing movies and giving talks at the rural school, getting on a first-name basis with the preacher, school bus driver, grocer, and justice of the peace, he gradually built a bridge of understanding and personal regard. People began to ask him questions and to talk out their complaints instead of expressing them with matches. The Forest Service and the National Forest became something they understood.

Understanding works both ways

To the forest officers who'd been fighting the long strings of incendiary sets, backfiring plowed lines all night after a day's work on timber sales, wading around in fire and smoke all day Saturday and Sunday and every holiday when the forest was dry enough to burn, staking out on cold nights to catch a firebug, some of the residents had seemed like hardened criminals, to be dealt with harshly. However, the communication finally established with these people brought deeper understanding and a chance to further apply persuasion and salesmanship.

Result

By the end of the following spring fire season the worst hot spot was totally free of incendiary fires. Man-caused fires on the entire District were down 8 percent. Occurrence the following year was down to 81 man-caused fires, a figure which amazed all forest officers in the Region familiar with this District. Except for normal fluctuations this initial success was never lost.

REDUCING SIZE OF ADMINISTRATIVE UNIT

To intensify management on a District plagued with an annual occurrence of 110 man-caused fires, the Forest Supervisor divided the unit and established a new ranger station in the town that was shopping center and county seat for the hotter localities.

The new office—handy for obtaining permits, buying timber, and hiring local men—increased community interest in the National Forest. The proximity of the hot spots allowed the new Ranger to give them personal attention, to get acquainted with the people, to study the fire problems in detail, and to devise specific measures against the heavy incendiary occurrence.

Following through, District personnel established a small lake and recreation area with the cooperation of county officials and worked with (1) the Extension Service—the County Agent, Home Demonstration Agent, Extension Forester—and the State forest service to create an annual forestry field day for rural adults and children alike, (2) stockmen's associations on grazing problems, and (3) farmers on safe methods of debris burning. Close surveillance in trespass-prone areas quickly turned up many violations. Firm, impartial law enforcement was applied to timber thefts, dishonest and erroneous land line surveys, land occupancy trespass, property damage, and intentional and accidental fire cases.

Result

In 7 years, annual man-caused fire occurrence dropped from an average of over 100 to 19. The following year the total was eight. The occurrence level to date has stayed low.

INTENSIFIED LAW ENFORCEMENT

On another District about 80 percent of the near 100 annual man-caused fires were incendiary. Concluding that the prevention program had successfully reached all residents whom his organization could teach or persuade, and that a small, hard core remained which would respond only to law enforcement, the Forest Supervisor brought in a Ranger who had had professional investigative training and experience.

Regular fire prevention activity was maintained, with emphasis on individual contacts. In addition planned personal acquaintance with possible witnesses and potential violators, before anything happened involving them, placed the new Ranger in an excellent position to cope with subsequent cases. While caution was exercised to avoid the appearance of persecution or of punishment and retribution rather than positive help, the Ranger nevertheless initiated a criminal or civil case for every fire on which sufficient evidence could be found.

Results

The percentage of fires for which cases were initiated rose from 15 to 22 the first year, and at the end of 2 years stood at 54. During the above period man-caused fire occurrence dropped from 91 to 22 annually. Occurrence has remained low.

PERSONAL PERSUASION BY RANGER

Man-caused fire occurrence had been averaging 40 fires annually, mostly from carelessness—in burning debris and in clearing thickets around residences without taking proper fire precautions. By visiting every land occupant prior to the fire season, the Ranger sold the idea of responsibility for guarding one's own burning, and taught safe methods of handling fire.

Results

The next year ended with a total of three man-caused fires. Furthermore, the next 2 years were entirely fire-free!

THE CONFERENCE TABLE

The change from steam locomotives to diesels on the major railroad lines in the Region during the 40's and 50's seemed to end the difficulty with right-of-way fires. The internal combustion engines of the new locomotives were not considered fire risks.

In 7 to 10 years, however, right-of-way fires began to reappear and multiply. Technical explanations pointed to aging equipment. As engine efficiency decreased, carbon accumulated in the exhaust stacks and was ejected as glowing flakes, sometimes as large as a quarter, when the engines labored under heavy loads or climbed steep grades. Attempts by some lines to economize by burning lower-quality fuel increased the carbon deposits, and heavier loadings of freight trains increased the ejections. Also, occasional fires were caused by hot brakeshoe slivers thrown off on steep downgrades or on curves.

To solve this problem by spark arrestors is not simple. Modifications which restrict free passage of exhaust gases tend to cut engine efficiency. The development and improvement of spark arrestors as well as braking systems has continued, but in the meantime the risk of a major railroad fire is ever present.

Cooperating with the State forest service, one Forest Supervisor arranged conferences with high officials of the major railroad traversing parts of his forest. He described the potential fire disaster, if right-of-way fires continued along inaccessible mountain grades, and the company's moral and legal responsibility to take preventive action.

The company's attitude was first skeptical and defensive. However, when a complete analysis of fire data, collected over a 10-year period for the area, was unveiled with maps, charts, and other visual aids, the railroad was convinced. They agreed to act.

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The Forest Service and the State suggested that the company annually burn a protective strip along tracks in areas of high fire occurrence. They also offered to furnish technical advice and to help locate qualified men who might contract with the company to do the burning. The State offered to keep the contractors currently posted about the suitability of the weather. The fireproofing job began.

Results

During the two fire seasons the operation has been in effect, no fires have occurred on the treated sections of right-of-way—despite a particularly severe 1963 spring season. Company officials are convinced that much time, trouble, and money were saved by fireproofing critical rights-of-way.

CONCLUSIONS

Our records contain many other case histories in which aggressive, concentrated, prevention action cleared up bad fire occurrence situations. Taken together, the histories have convinced us that detailed study of a specific fire occurrence problem, careful prescription of approaches and remedies, and hard work in carrying out the plan will get real results.

IMPROVED LUNCH FOR FIREFIGHTERS

EQUIPMENT DEVELOPMENT AND TESTING CENTER

Missoula, Mont.

Furnishing firefighters with enough food to sustain them during initial attack is a major problem in fire suppression planning. The usual sack lunch prepared for the field by local restaurants or mess halls and containing sandwiches, fresh fruit, canned juice or fruit, and candy bars has several disadvantages. Backlogs of lunch orders accumulate during severe outbreaks, and special trips are often made to send lunches after men have been dispatched. Sometimes there are long delays in deliveries and the lunches become stale and less palatable in transit. In some cases the lunches spoil, and firefighters have suffered severe cases of food poisoning.

The Missoula Equipment Development and Testing Center has started a project to provide a more satisfactory lunch. The primary objective is an improved sack lunch that can be prepared and stored at the beginning of the fire season and issued as needed. Other qualities sought for are (1) palatability, (2) enough calories to sustain a firefighter during initial attack, (3) readily obtainable items, (4) easy preparation, (5) food that will remain safe and palatable for a reasonable time, and (6) a container that is easily carried and will not smash like regular sack lunches.

An experimental lunch meeting these qualifications is described in the figure and table. Since the typical firefighter expends approximately 400 calories per hour while fighting fire, the lunch (see table) should sustain him for 12 hours—about twice as long as would the old sack lunch. The carrying case permits firefighters to pack the lunch in comfort, leaving both hands free.

Although the lunches can be refrigerated (not frozen) to extend

Components of firefighters' lunch with box and carrying case.

shelf life, the packing date should be plainly marked on each. At the end of the fire season lunches should be unpacked and items that are approaching their recommended shelf life should be discarded or eaten.

An initial supply of 1,200 experimental lunches was well received by firefighters and used up early in the 1963 fire season. Final specifications will be prepared after firefighters return their questionnaires.

Firefighters' lunch, menu 1

Food item	Package	Weight	Calories	Approximate price per package	Estimated shelf life		
					40° F.	70° F.	90° F.
		oz.			Months	Months	Months
Cheese and crackers	Plastic (2)	1½	296	$0.05	6–12	6–12	6–12
Hot cocoa mix	Plastic (1)	1	80	.05	60	24	12
Spaghetti with cheese	Can (1)	6½	750	.08	48	36	24
Jam, assorted	Plastic (6)	3	164	.08	48	18	10
Catsup	Foil (2)	1	27	.02	48	24	12
Mustard	Foil (2)	1	4	.02	36	18	9
Raisins	Box (2)	3	233	.08	24	12–15	6–9
Caramels, vanilla and chocolate	Cellophane (2)	2	296	.08	12	9	4
Deviled ham	Can (1)	2¼	250	.15	60	48	30
Pears	Can (1)	9	173	.16	48	24	12
Beef goulash	Can (1)	8	320	.15	60	48	30
Sardines	Can (1)	4	384	.19	48	12–24	6–12
Cookies	Cellophane (4)	3	375	.15	48	24	12
Bread, brown	Can (1)	16	1,289	.29	48	24	12
Totals		4 lbs.	4,641	[1] 1.88			

[1] Actual cost of 1,200 units for field testing: $1.56 each, including accessory packet and fiberboard box. Canvas carrying case costs $1.62. A more economical carrying method is being devised.

A TECHNIQUE IN TOWER ORIENTATION

James E. Mixon
State Forester, Louisiana Forestry Commission

Obtaining accurate cross outs on fires has presented a problem since the early days of fire detection. Several things can contribute to inaccurate cross outs of fires. One is the incorrect orientation of the fire tower from using the wrong magnetic declination for its longitude. Another is any error in the preparation of the cross out or district maps. However, since the same map with its errors is common to all towers within a parish and district, the greatest contributor to error is the difference between the azimuth circle of the tower table and those of the cross out maps.

To eliminate these causes of error, the Louisiana Forestry Commission has devised and instigated a program of tower orientation by districts. The program, by chain reaction, will result in correlation of all towers of the State. A brief explanation follows.

From the tower cross out map for the parish a known point, such as a section corner or a road intersection, is selected between two or more towers. From this point a balloon 6 feet in diameter, filled with a mixture of air and helium, is released. It is controlled from the ground by a light nylon line and allowed to rise to a height of from 200 to 300 feet. Because of its yellow or orange color it can be detected from 5 to 7 miles away, depending upon weather and keenness of sight. The towerman is told of its approximate location by radio and asked to get a reading on it. The cross out readings from the towers have previously been recorded by the orientation crew. When tower alidade readings have been reported, any difference between the alidade reading and the map cross out reading is readily noted; and the table azimuth circle can be corrected to coincide with the cross out map azimuth circle.

When the difference is sufficient, correction is made by having the towerman take another close reading and pinpoint or mark the point of his alidade just off the edge of his table azimuth circle. He then loosens the screws of the azimuth circle and rotates it to make the reading coincide with that of the cross out map.

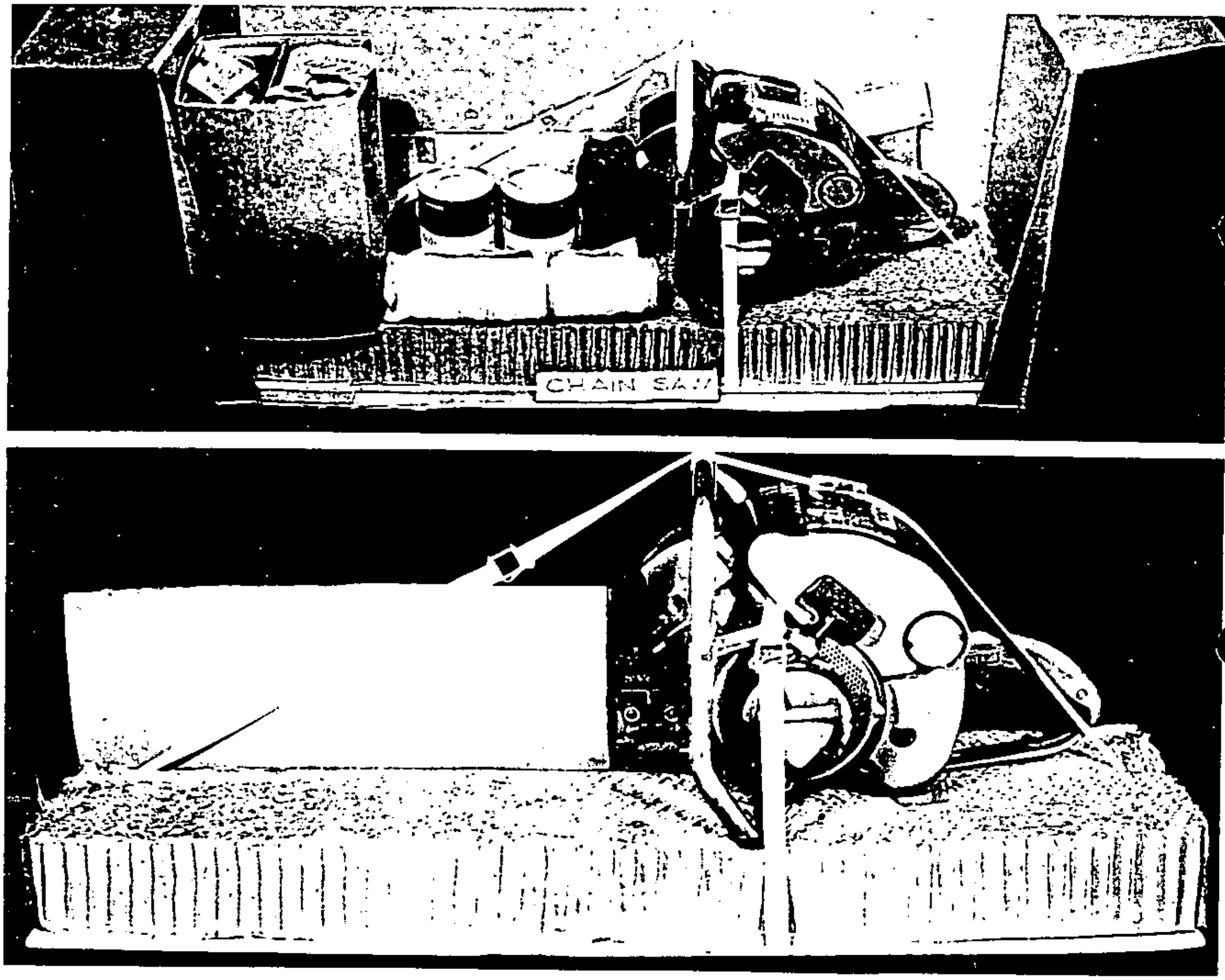
PAPER PACKAGING FOR AIRDROPS

DIVISION OF FIRE CONTROL
U.S. Forest Service

Smokejumper Dale A. Crane, working on the Carabou Ridge Fire on the St. Joe National Forest, reported an unexpected result of an airdrop malfunction. A power saw dropped by parachute broke loose when a cargo ring failed during opening shock. The free-falling package hit a 15-foot western larch, removing all the branches from one side prior to impact with the ground. Expecting the worst, Crane retrieved the package and found the power saw intact with no damage to accessories. Oil and gas cans had not ruptured. Luckily the box landed right side up and the honeycomb paper absorbed the free fall impact.

The saw was packed in a multiwall fiberboard box and protected with paper honeycomb cushions. Similar parachute failures in the past have resulted in complete loss of the saw, fuel, and accessories. The fiberboard container for this saw was developed by the Missoula Equipment Development and Testing Center under a special project to explore the use of low-cost energy-absorbing materials for protective packaging of cargo. In this instance a $2 box saved a $350 piece of equipment. Usually power saws are packaged in comparatively expensive handmade, heavy, cleated wood boxes. The latter weigh more than the saw and are frequently damaged beyond repair.

A report from cargo droppers at the Redding Air Attack Base in northern California states that a single experimental fiberboard box of the same type has been used five times in dropping power saws to fires; however, the parachute opened on each drop.



Box and honeycomb cushion for airdropped powersaw.

THE LARGE TANKER—EXTENDING ITS USE

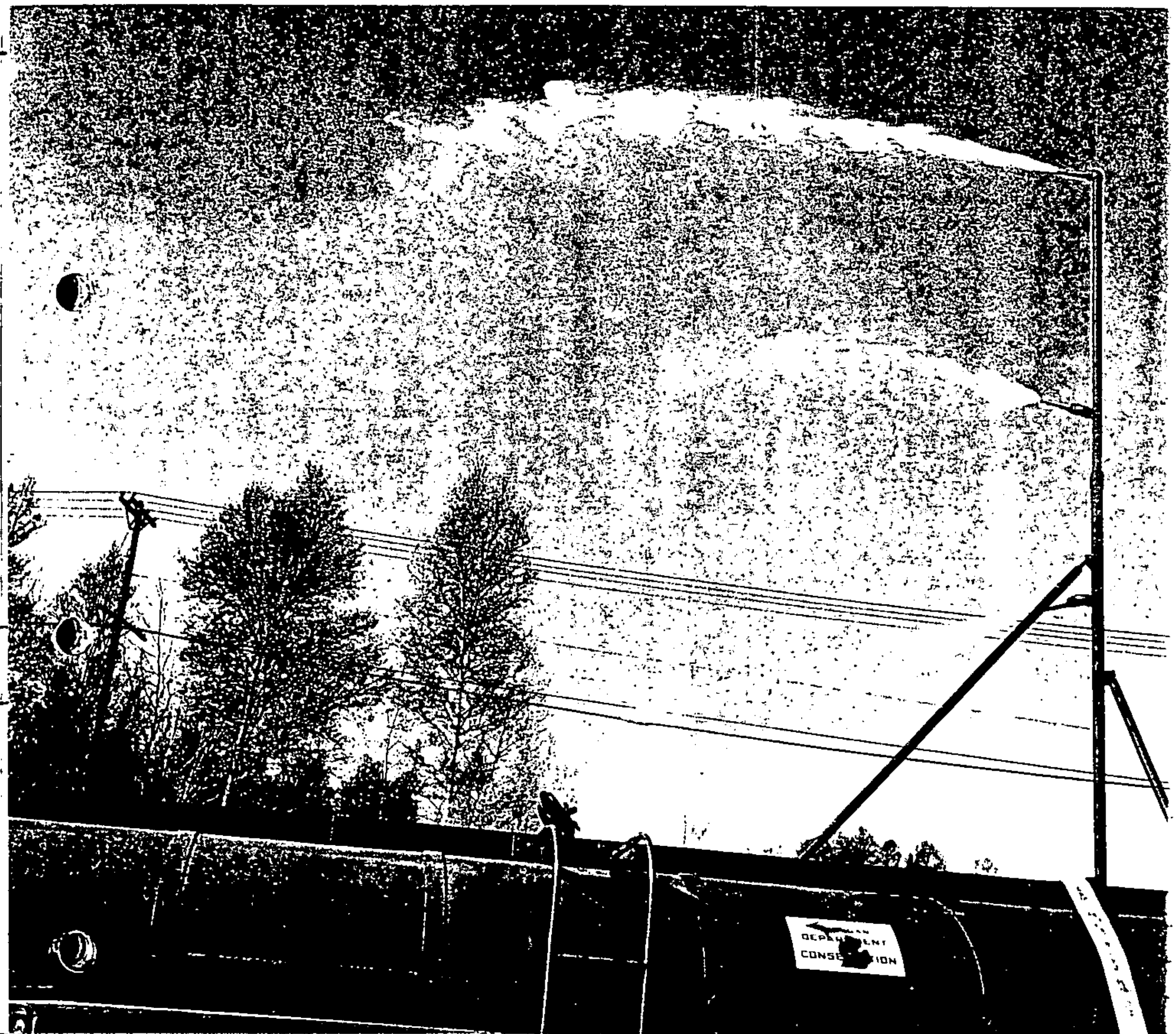
JOHN A. ANGUILM, *Assistant Regional Supervisor, Region 1*
Michigan Department of Conservation

The large water tanker, primarily used to supply smaller units on the fireline, can serve an additional purpose if equipped with a simple water boom and adequate pump.

In 1962 Al Jackovich, Region 1 mechanic, fabricated such a water boom assembly on our 2,000-gallon semitrailer tank unit. The purpose of this addition to the normal uses of a large tanker is to permit application of a large volume of water quickly to a planned control line in the path of a fire.

Fire behavior studies, field experience, and table-model demonstrations have shown that even minor variations in temperature and humidity have a surprisingly great effect on fire ignition and movement.

Water-dispensing boom mounted on 2,000-gallon tanker (photo courtesy of Michigan Department of Conservation)



This understanding triggered a method of creating, along a control line, a microclimate that might bring crown fires out of the treetops. Then effective attack with conventional control equipment would be possible.

In situations where advance deployment of forces can be made, some lessening of the intensity of the fire head may result even when complete success is not achieved.

Crown fires moving in natural or planted stands of red, white, and jack pine constitute an immediate and growing fire control problem in the Lake States. Openings of 50 to 150 feet wide provided by roadways, power lines, and fire lanes provide little hindrance to progress of such fires if the cover burns to the border of the opening. Flaming brands of cones and branches blow freely across the open; updrafts carry burning materials for substantial distances across the openings. Many of these brands rise vertically from intensely burning fuels and are carried aloft and over the tops; however, many more are cast horizontally and only short distances.

Using components on hand, a 200-g.p.m. pump powered by an 80-hp. industrial motor was installed. The boom was fashioned from 2-inch black pipe, and nozzles were attached with orifices of ¼, ½, ½, and ⅝ inch from bottom to top. In position, the boom reaches 22 feet above ground and provides an even water coverage to a depth of 80 feet against a light wind. Facing a strong wind, the water breaks into a mist and approximately 50 percent drifts downwind across the line of travel, resulting in lesser coverage in the direction of discharge. The tank capacity (2,000 gal.) is dispensed in 12 minutes at a rate of 170 g.p.m. through the four nozzles. Experience indicates effective coverage can be gained over 140 rods of control line at vehicle speeds of 2 to 3 m.p.h.

Experiments to date with the described unit encourage us to seek more maneuverable vehicles with enough water capacity for effective water applications to openings other than roadways. Heavy-duty, multidrive vehicles available from time to time from the Federal Excess Program provide opportunities heretofore unavailable for such developments.

We believe such efforts offer a good chance of success under conditions less than extreme, and on areas where the stand is without firebrand material of the white birch and hemlock stub fuel variety.

SUMMARY OF FIRE LOSSES IN ALASKA

BUREAU OF LAND MANAGEMENT
U.S. Department of the Interior
Anchorage, Alaska

Year	*No. of fires*	*Acreage burned*
1946	130	1,436,597
1947	159	1,429,896
1948	134	33,676
1949	53	17,933
1950	224	2,057,817
1951	271	219,694
1952	136	73,801
1953	285	466,748
1954	262	1,389,920
1955	190	23,582
1956	225	467,721
1957	403	5,034,554
1958	196	288,616
1959	286	586,535
1960	157	85,240
1961	116	5,440
1962	102	38,923
Total	3,329	13,656,693
Average	191	815,094

Since 1940, the Bureau of Land Management has been responsible for protecting 225 million acres of public land from forest, range, and tundra fires in Alaska. This area now includes the 8 million acres recently selected by the State of Alaska.

There are no lookout towers in Alaska—and very few roads, bulldozers and fire trucks. Here, firefighting is mostly a job for aircraft and men on foot. Vast distances, long hours of daylight, high temperatures, dry fuels, frequent lightning strikes, bad terrain, limited equipment and manpower, all combine to make BLM's task of protecting the public lands from fire one of the toughest assignments of its kind in the United States.

FIRE CONTROL NOTES

Information for those who bind Fire Control Notes: A cumulative index for the period January 1956 through October 1963 will be printed in the old style size and format and distributed to subscribers in the near future.

REPORT ON AERIAL FIRE DETECTION STUDY

Louis L. Davis
Forester, Ouachita National Forest

Early in fiscal year 1963, the Ouachita began investigating the possibility of establishing a ground-air detection system. The present system consists of 26 primary and secondary lookouts on a gross area of 2,541,000 acres of which 1,543,413 acres are National Forest land.

Several factors prompted the investigation:

1. The topography makes ground detection difficult. In spite of the large number of towers 22 percent of the area remains unseen. This is due to the system of long narrow ridges, uniform in height, with few prominences high enough to overlook adjoining ridges. Many towers would be necessary to adequately cover the protected area.

2. Public use of the forest is booming and the corresponding risk increasing. Land values, already high, are increasing.

3. Each year it becomes more difficult to find competent men to replace the lookouts that are retiring, and costs of training and actual manning are high.

4. Maintenance of lookout towers is expensive, and most of the towers need rehabilitation to bring them to standard.

Study Plan

It was decided to make a study before coming to a decision. Past records were researched and a study plan made. The object of the study was to determine (1) if air patrol could effectively eliminate enough tower manning to be economically practical and (2) the effect on control time standards. The following organization was used: dispatcher, observer, communications technician, and pilot. The study was to be carried out for 1 year on approximately 1 million acres of the east part of the Ouachita National Forest.

Operations

The study occurred during the second year of drought. Fire occurrence in 1962 was twice that of 1961, and the trend continued through the period. Rainfall was approximately one-half of normal for the period and the previous 4 months. Chances to fly on low danger days in lieu of primary tower manning did not materialize. Due to high buildup primaries were manned on all class 2 days. The plan became active on January 10, 1963, with the letting of a contract for rental of aircraft and pilot based at Hot Springs, Ark.

From March 13, after preliminary flights to determine patrol routes and time required, to June 30, 1963, 85 flights were made on 66 days. Altitudes varied from 1,500 to 2,500 feet above terrain. Two flights were cancelled on notice from FAA of extreme turbulence, and two were cancelled because of low ceilings. Almost all flights encountered low to moderate turbulence, but none were aborted due to airsickness. Visibility from the towers was poor during most of the period. Visibility from the air proved better from just above the haze layer than at lower elevations.

Smokes were scouted from as low an altitude as considered safe by the pilot. Forty-four smokes that probably would have required false alarm runs by ground personnel were checked out. In fact, no false alarm runs were made while the observer was airborne. This was important to rangers, as they were engaged in APW work with deadlines to meet.

Residents soon learned that any burning they started would be checked closely from the air. Observer and pilot made three reports of circling unattended meadow fires until the farmer came and waved them on. This year the number of land clearing and meadow fires in the patrol area is less.

Results

Results thus far indicate that one plane with skilled pilot and observer and 5 lookout towers provide better detection at reduced cost than an all-ground system of 14 towers. Additional, uncalculated savings result from prompt scouting and reduced attack and control time through accurate location with nearest access route. Significantly, the largest of 74 fires in the patrol area burned 177 acres. On the other half of the forest there were several class E fires during the same period.

Air operations

Days flown	66
Flight totals:	
Number	85
Hours	254
Fires detected:	
In flight	[1] 24
By lookout and others	57
False alarms checked in flight	44

[1] Includes seven State and Corps of Engineer fires.

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

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF AGRICULTURE

AERIAL STUDY—*Continued*

Supplementary Data

Air unit operating costs

Airplane and pilot	$4,089.33
Observer	1,324.13
Radio technician	68.00
Mileage	373.61
Total	$5,855.07

Lookout costs

Primary	$5,389.41
Secondary	54.20
Total	$5,443.61

Estimated savings

9 secondary towers, not manned, 42 days	$4,868.00
Travel, 30 miles per tower per day	1,134.00
Communications maintenance, 9 towers, 2 trips each [1]	288.00
Inspection, training, and supervision; $37 each	333.00
6 months maintenance	300.00
44 false alarms	1,100.00
Total	$8,023.00
Less air unit cost	5,855.07
Net savings	$2,167.93

[1] Includes only such mileage as could be estimated from regular schedule. No special trips from base. No dollar value is given for scouting, guiding crews, etc.

TABLE 1.—*Number of fires and fire days by class of d*[illegible]

[March 13–June 30, 1963]

Time of origin	Fires Class of day— 1	2	3	4	5	Total
0001–0800	2	1	4	4	1	12
0801–1000	1	1	1	3	2	8
1001–1200	1	1	4	7	0	13
1201–1400	0	0	3	3	0	6
1401–1600	1	0	2	0	2	5
1601–1800	1	1	2	5	2	[illegible]
1801–2000	0	1	2	4	0	7
2001–2400	0	0	4	4	4	12
Total fires	6	5	22	30	11	74
Total fire days	30	32	26	17	5	110

Number of fires by size class and cause

Size class:	
A	7
B	41
C	23
D	3
E	0
Cause:	
Lightning	14
Recreation	4
Smoking	6
Land occupancy	6
Incendiary	42
Forest utilization	1
Miscellaneous	1

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