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FIRE CONTROL NOTES

A PERIODICAL DEVOTED TO THE TECHNIQUE OF FOREST FIRE CONTROL

FOREST SERVICE • U. S. DEPARTMENT OF AGRICULTURE

FORESTRY cannot restore the American heritage of natural resources if the appalling wastage by fire continues. This publication will serve as a channel through which creative developments in management and techniques may be communicated to and from every worker in the field of forest fire control.

Volume 8 Number 4

FIRE CONTROL NOTES

A Quarterly Periodical Devoted to the

TECHNIQUE OF FOREST FIRE CONTROL

The value of this publication will be determined by what Federal, State, and other public agencies, and private companies and individuals contribute out of their experience and research. The types of articles and notes that will be published will deal with fire research or fire control management: Theory, relationships, prevention, equipment, detection, communication, transportation, cooperation, planning, organization, training, fire-fighting, methods of reporting, and statistical systems. Space limitations require that articles be kept as brief as the nature of the subject matter will permit.

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Forest Service, Washington, D. C.

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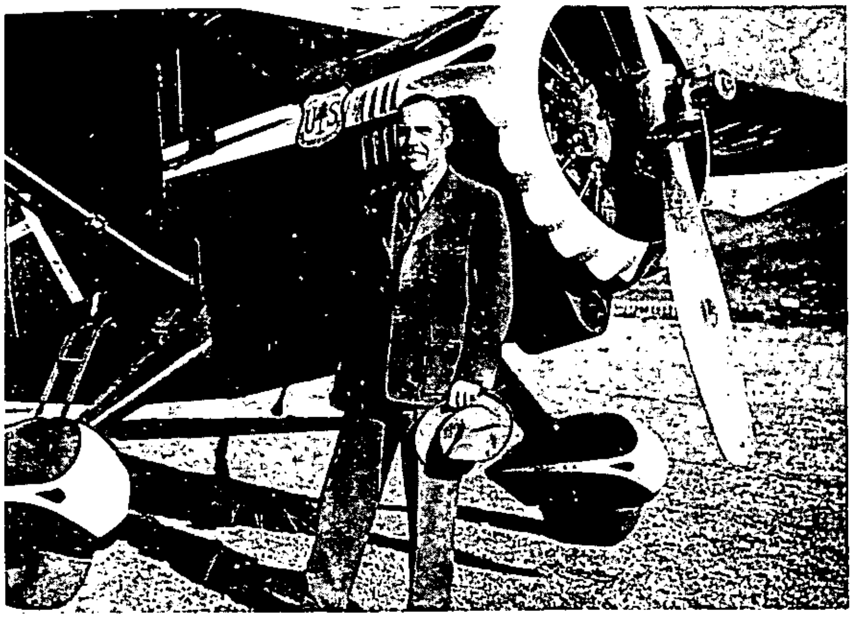
ON THE PASSING OF DAVE GODWIN

G. A. MacDonald

Washington Office, U. S. Forest Service

A few days ago, Art Brown, Chief of Fire Control in the W. O., asked the writer to do "something on Dave Godwin for Fire Control Notes."



"The magazine was his baby, you know," said Brown. "Roy Headley put him in charge after the Fire Equipment Conference at Spokane in February of '36, when it was decided that a medium was needed for the Nation-wide interchange of ideas and developments in fire control. If "Notes" has been a common meeting ground, a clearing house for the creative efforts and observations of fire fighters in all protection agencies and interested organizations, such as it was intended to be, Dave was mostly responsible."

For a periodical that circulates largely among members of a service most all of whom knew Dave personally or by sight, and certainly all of whom knew of his sudden and untimely death in the Blue Ridge Mountains on Friday, the 13th of last June, what remained to be said about the late and truly lamented Chief of Fire Control and Brown's predecessor?

No doubt, foresters and many others who knew Dave throughout the country experienced the shock which the writer did when, the following Sunday morning, he picked up his Washington newspaper and saw Godwin's photograph on the front page and his name among the air-crash dead. Surely, every Federal forester knew the details of his notably successful career in the Forest Service for those were widely publicized at the time of his appointment to be Chief of Fire Control little more than 6 months before. Surely, most of them read the memorial tribute paid to him as "an outstanding public servant whose record and contributions to the Forest Service and the country were of the highest order," 3 days after his death, by Chief Forester Lyle Watts.

On Monday morning, the writer went straight to Brown's office. Brown had just returned from the scene of the crash where he went to identify Dave's body. As the writer came down the corridor, past foresters' offices, there was a hush over the place; the door of Dave's last earthly office stood open, on the desk was a neat pile of letters, telegrams and memos waiting his return. Brown looked tired and worn. The writer said. "Was he—could you recognize him?" Brown's eyes appeared to retreat into shadow. "Fifteen of the victims were not broken," he said. "He was not among them. It was an experience I hope never to go through again." That was all.

Most everyone knew that only recently Dave Godwin had come back to the neighborhood of beautiful Christ Episcopal Church, Georgetown, and bought a home half a block up the street from this church where he served as a boy. His life had taken him in a wide circle from the time when, in his teens, he ventured west and began his Forest Service career as a guard on the Inyo National Forest in California.

The ability to inspire confidence and liking, the character and integrity that Dave possessed were evidenced by his progress throughout his life. They were strong factors in his rise from forest guard, to ranger, to supervisor on the Mendocino, to fire control planning for the California National Forests. Again, they were evident, in World War I, in which he served 22 months overseas, achieving the rank of captain and being graduated from the Army General Staff College and the Army School of the Line. The war left him with a chronic cough, but it also gave him the respect and friendship of military men that enabled him to bring about Forest Service-Army cooperation in World War II that was of great value to the Forest Service then and promises to be in the future.

For a time after World War I, Dave was in business in New York but the writer knows, more from impressions gained from general comment on Dave's part than from any direct statement, that his years in that highly competitive and materialistic hurly burly were the least happy of his life. On the other hand, while it was still an official secret the writer learned that Dave was to succeed Pat Thompson as Chief of Fire Control. He went to Dave and stuck out his hand, without a word. Dave's handsome face lighted, he took my hand and said, "Thank you, Alan." That was all. but there was about him the air of a man who had achieved the position that he wanted more than any other—Chief of Fire Control in the United States Forest Service.

To an old newspaperman like the writer, Dave had one characteristic that seemed particularly valuable. He had of course a strong dislike for inaccurate, sensational statement, and I think never felt quite comfortable when stories for newspapers were being prepared. Yet for all that he realized the value of publicity—for all its frequent and often unavoidable errors—and he handled newspapermen with great patience and respect, giving of his ideas and time to the utmost whenever required. He was particularly good in this connection when talking about the "smoke-jumper" program, the use of airplanes and other equipment in forest fire control, direct, informative and full of his subject. And in that hectic world of newspapermen he had his accolade. The writer does not know how many men came to him with a word about Dave Godwin in the National Press Club following his death, but there were many. To men who are always talking about "stuffed shirts" and "cheap skates" and "publicity hounds," Dave Godwin was "a grand guy."

Progress Report on Smoke Masks and Goggles.—A study was made of available commercial smoke masks and goggles to determine the most efficient mask for forest fire fighting. The final tests and analysis were made by Engineer E. E. Aamodt. The five most promising masks were used on a peat fire in the fall of 1946. This test demonstrated conclusively that a fire fighter properly equipped with mask and goggles could do a more efficient job and remain on the fire line under conditions that could not be tolerated for long otherwise.

The tests indicate that goggles of any kind are of considerable value. No great difference in the effectiveness of the different types tested could be noted. The chemical stick (pencil) and treated cloth furnished with some goggles to clean and oil the glasses, to prevent moisture condensation on them, had some slight value, and the double lens goggles with the water filler also had some value in retarding condensation. However, not enough moisture condensed on any of the goggles to impair vision more than about 10 percent. The double lens type goggles performed equally well with or without the water filler, and were somewhat better than any of the single lens types.

The combination goggle and mask is quite bulky and is not as desirable as the separate units.

The Pulmosan mask, No. GR-250, which costs $6.86 with built-in goggles and is equipped with a small chemical can cartridge for absorption, was considered to be the best all-around mask tested. It was superior to the Cover's mask, the Dupor mask, and the Army's M4A1 Carrier gas mask. The ordinary hospital cotton gauze mask, which costs about 20 cents, proved to be about equally as effective as the Pulmosan mask. This gauze mask, kept wet with water, appears to provide all that is needed in a mask by a fire fighter. From a sanitary point of view, it can be thrown away after use. Several can easily be carried in a pocket, and they can be purchased in most drug stores. We propose to adopt the Hospital Gauze Mask as standard for use in Region 9.—J. M. WALLEY, *Fire Control Chief, R-9, U. S. Forest Service.*

THE FOREST FIRE HAZARD IN THE SUNSPOT CYCLE

William M. Morris

Forester, Land Económic Inventory and Land Use Section, Wisconsin State Department of Agriculture

That sunspots affect the weather is no longer a matter of conjecture or debate. Numerous studies have shown that the number of sunspots increase to a maximum and decrease to a minimum in cycles and weather changes occur in similar cycles. The sunspot cycles and the accompanying weather variations can now be predicted with reasonable accuracy. These weather variations materially affect the forest fire hazard. By knowing when the cycles of bad fire weather will occur, the forester can better plan his land management and protection practices to anticipate the periods of high hazard.

This study, made in Wisconsin by the author, indicated that nearly all of the great fires in the State occurred during periods of declining sunspot activity. The relationship between sunspot activity and weather variation in Wisconsin may be different from that in New England or the west coast. Weather records for each section of the country should therefore be analyzed individually. The work reported in this article should be considered exploratory only and subject to revision.

Sunspot Cycles

The occurrence of cycles and their length were demonstrated by a curve made from sunspot observations for 100 years at Zurich, Switzerland. The cycles based on this curve are given from one maximum sunspot year to the next maximum year. Between the maximum sunspot years of 1837 and 1937, nine complete cycles occurred. This makes the average length of a cycle 11.1 years, though the duration varied considerably from 9 to 13 years.

Besides the so-called 11-year cycle in sunspots, which is the common and most apparent one, there are undoubtedly longer trends when sunspot numbers are much above or much below normal over an extended time. Such long cycles seem to be accompanied in Wisconsin by generally cool, wet periods when sunspot numbers are high, and hot, dry periods when sunspot numbers are low. A study of tree rings, varves [1] in lake bottoms, and the various flood stages of the

[1] Varve, as defined by Webster, is "an annual layer of silt as deposited in a lake or other body of still water. As individual layers differ in thickness and character, a succession of such layers forms a characteristic group which can be identified as of contemporaneous deposition in whatever deposit it may be found. It is thus possible, by combining different sections, to measure the time involved in the deposition of the entire group of sediments and to construct a time scale in a manner similar to that employed in the study of annual rings in trees."

Nile River substantiates the possibility of these longer cycles.[2] It may be noted by students of the subject that the longer cycles are nearly always multiples of the 11-year cycle.

Weather Periods

In comparing the records of sunspots for over 100 years with Wisconsin weather conditions for as long as records are available, it is found that there are in general two periods of years, or two quite distinct weather seasons, which stand out in marked contrast to one another when placed in their proper position in the sunspot cycle. In these two weather periods the temperature and percent of possible sunshine received in Wisconsin show the most decided contrast though rainfall and the amount of evapo-transpiration also show distinct trends.

Weather period I is designated on the chart as the period when sunspots are increasing and at the maximum number, and weather period II when the sunspots are decreasing and at their minimum number. The first period is much shorter than the second, averaging 4.2 years since 1833, as compared with 6.9 years from 1837 to the minimum year 1944. Since 1837 a fourth year of increasing sunspots has occurred three times, and a seventh year of decreasing sunspots four times. These, therefore, have had to be shown on the chart although they do not occur in every sunspot cycle.

Weather Trends for Each Period

This article is confined to comparison of the weather conditions of this section of the country with the various phases of the 11-year sunspot cycle in order to determine if there is a correlation between sunspots and weather, particularly that type of weather causing forest fire hazards. Weather records have been obtainable for a longer period of time in the southern part of the State but the general weather trends for the entire State in the different years of the sunspot cycle are quite similar. For the fall months (especially October), which have proved among the most disastrous in forest fire history, the records have been taken for the past 48 years for the percent of possible sunshine, 27 years for evapo-transpiration, and 29 years for rainfall and temperature. Whether it is annual, summer, or fall weather, when averaged in the various years of the sunspot cycle the trends are similar; that is, cooler with more general rainfall the first few years of sunspot increase, hotter and drier conditions when sunspots are decreasing. At sunspot maxima, however, the summer and fall months in Wisconsin have been somewhat deficient in rainfall and cooler than in other years of increasing sunspots. At about the sixth or seventh year of decreasing sunspots there occur suboscillations in weather with opposite seasonal reactions in the atmosphere to the above general trends. The curves on the chart indicate these opposite reactions clearly. In other sections of the country these conditions may be reversed.

[2] Wood, S. M. THE PLANETARY CYCLES. Ill. Engin. Pp. 5–18. February 1946. Gillette, H. P. WEATHER CYCLES AND THEIR CAUSES. Water and Sewage Works 93: 252–254. June 1946.

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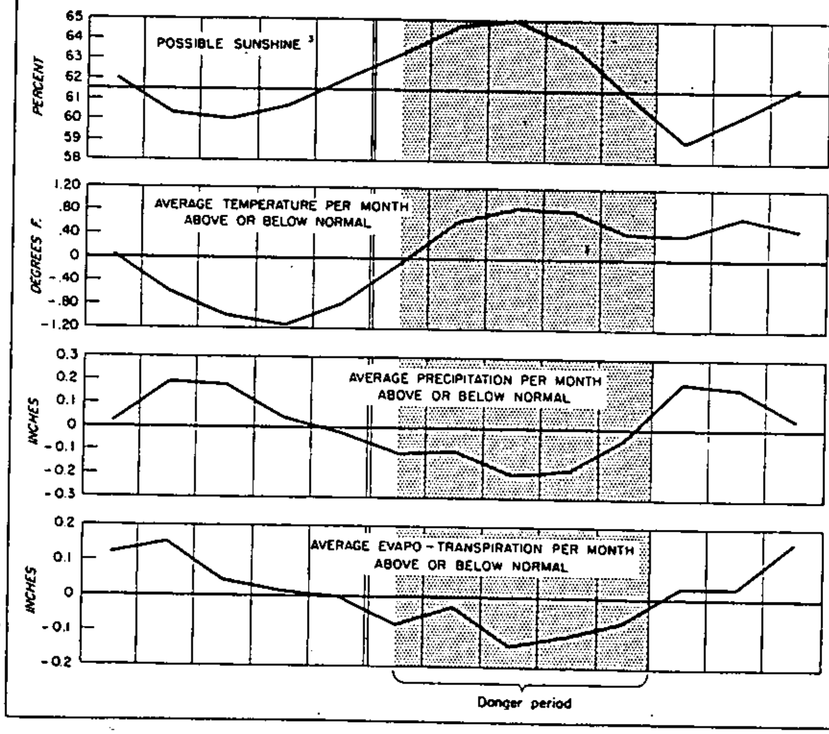
THE SUNSPOT CYCLE [1]

Increasing Sunspots - Weather Period I					Decreasing Sunspots - Weather Period II							
First Year	Second Year	Third Year	Fourth Year	Maximum Year	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Minimum Year
					[2] **1828**	1829	1830	1831	1832			1833
1834	1835	1836		1837	1838	1839	1840	1841	1842			1843
1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856
1857	1858	1859		1860	1861	1862	**1863**	**1864**	1865	1866		1867
1868	1869			1870	**1871**	1872	1873	1874	1875	1876	1877	1878
1879	1880	1881	1882	1883	1884	1885	1886	1887	1888			1889
1890	1891	1892		1893	**1894**	1895	1896	1897	1898	1899	1900	1901
1902	1903	1904		1905	1906	1907	**1908**	1909	**1910**	1911	1912	1913
1914	1915	1916		1917	**1918**	1919	1920	1921	1922			1923
1924	1925	1926	1927	1928	1929	1930	1931	1932				1933
1934	1935	1936		1937	1938	1939	1940	1941	1942	1943		1944
1945	1946	*1947*		*1948*	*1949*	*1950*	*1951*	*1952*	*1953*	*1954*	*1955*	*1956*
1957	*1958*	*1959*		*1960*	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*		*1967*



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[1] Allocation of dates into cycles was determined by observations on sunspots at Zurich, Switzerland.

[2] Severe fire years indicated by underlined bold face figures: 1828, Great fires in Wisconson; 1863, South Shore fire; 1864, Greatest fire; 1871, Peshtigo fire; 1894, Hinkley and Phillips fires; 1908, 1,435 fires in Wisconsin; 1910, Baudette fire; 1918, Cloquet fire.

[3] Curves are based on weather records for May through October for the State of Wisconsin.

The records of the past 109 years in southern Wisconsin indicate that summer rainfall has been average or above 60 percent of the time during weather period I when sunspots are increasing, and 43 percent in weather period II. Summer temperature is average or above 33 percent of the time in period I and 63 percent in period II. Fall rainfall has been above average 50 percent of the time in period I and 37 percent in period II, while temperature has been above average 20 percent in period I and 55 percent in period II. The general trend, therefore, is for cooler and wetter conditions in weather period I and the reverse in weather period II. Many of our hot, dry falls occur in this latter period, and when they follow a similar summer of low rainfall, high temperature, excessive sunshine, and low evapo-transpiration, a forest fire hazard is bound to occur.

The difference in the percent of possible fall sunshine received in these two weather periods is even more pronounced than it is for temperature and rainfall. In period I the percent of possible sunshine received is above the average only 35 percent of the time, while in period II it is above the average 68 percent of the time. This difference in cloudiness in the two periods may account for many of the weather conditions that are produced and has been noted by observers in other parts of the country.

These contrasting weather periods of the sunspot cycle definitely affect the growth of farm crops, such as corn, oats, and potatoes. Corn has produced its greatest yields here in periods of decreasing sunspots, weather period II, while potatoes have done best in the first period with cooler and more moist conditions.

Time of Greatest Forest Fire Hazard

The curves in the chart show a definite period when rainfall and evapo-transpiration are at their lowest and temperature and percent of possible sunshine high. Such a period should produce a relatively great forest fire hazard. This critical time is indicated by the curves as occurring in weather period II from the end of the first, through the fifth year of decreasing sunspots.

It is not true that there is no fire danger at the time of increasing sunspots. However, the danger at this time is usually modified by cooler temperatures. During the third year of sunspot increase, summer and fall temperatures have risen above average in the past, but rainfall and cloudiness were also greater. In 1881, a third year of increasing sunspots, a great fire burned over a large area in Michigan. The years 1880 and 1925 were also bad fire years in Wisconsin, but the fires did not reach the intensity or do the damage of a number of those occurring in the first 5 years of the period of decreasing sunspots. The great Mirimichi fire in New Brunswick and Maine occurred at about the same period of increasing sunspots, but weather conditions in the northeastern region of the country may be the reverse of those in the Midwest. Brush fires which burn so often in the spring with great intensity are usually quite seasonal in their occurrence, rather than governed to any great extent by the definite weather trends of the sunspot cycle.

Great Forest Fires of the Lake States

A study of the greatest conflagrations in the Lake States reveals that all of them fall within the danger period indicated on the chart. A great fire burned over a vast acreage in Wisconsin in the year 1828, a first year of decreasing sunspots. In 1863 the southwest shore of Lake Superior was burned over. In La Crosse, the sun was obscured by smoke for several days and the atmosphere was murky as far as Milwaukee. In 1864 there occurred a very general conflagration, beginning early in the season and growing more intense as the year progressed. The vast pineries of the north were nearly all ablaze. From the Chippewa, St. Croix, Black, Wisconsin, and Wolf Rivers came stories of raging seas of smoke and fire, as well as from Brown, Kewaunee, and Manitowoc Counties. Wausau, Two Rivers, and Neillsville fought off the flames only by the combined efforts of their entire population. Although this was one of the greatest general conflagrations in the State it received scant notice in the newspapers of southern Wisconsin.

The Peshtigo fire, Wisconsin's greatest calamity, occurred in October 1871. Fifteen hundred lives were lost in this fire and 1,280,000 acres laid bare. In July 1894 the Phillips fire killed 300 people and destroyed 100,000 acres of timber. In September of the same year, Hickley, Minn., was destroyed with 12 other towns, 418 lives were lost and 160,000 acres of forest burned.

The year 1908 was a very bad one for forest fires in Wisconsin. In that fire season 1,435 fires were reported burning over 1,000,000 acres, with a property loss of almost $3,000,000. Perhaps the greatest fire year ever experienced in the United States as a whole was 1910. This was the driest year in the records for southern Wisconsin. Fires raged in Minnesota, Idaho, Washington, and Oregon, from July through October. The largest one in the Lake States that year was the great Baudette, Minn., fire of October, which destroyed 300,000 acres of woodland and killed 42 people.

On the afternoon of October 12, 1918, fire started in the timber at Cloquet, Minn., following a shortage of 20 inches of rainfall in the preceding 20 months. Duluth was threatened, and smoke filled the air even in the southern part of Wisconsin. Four hundred lives were lost and property damage reached $30,000,000.

These are nine of the greatest recorded fires and fire years of the Lake States. A check on their position in the sunspot cycle shows that five fall at identically the same location in the cycle, namely, the last part of the first year of decreasing sunspots after sunspot maxima. All of them have occurred in the first 5 years of decreasing sunspots, that is, in the danger period shown on the chart. This relationship can hardly be a coincidence.

Importance to the Forester

In order to predict the periods of greater danger it is necessary to know the years of sunspot maxima and minima. The best authorities are not fully agreed as to the next year of maximum but place it anywhere from 1947 to 1949. On the chart it has been placed at 1948. This should be correct within a year, as also with the other predicted dates. If the maximum occurs in 1947 the dates on the chart should all be shifted to the right one year. Sunspot years and calendar years do not coincide and this accounts for some difference.

Hotter and drier periods should occur from 1949 to 1953 and again from about 1961 to 1965, according to weather conditions of past sunspot cycles. The forester should take advantage of this knowledge of periodic weather conditions. During the longer periods of sunspot decline, when drought and heat are apt to prevail, he should be especially alert for fire hazards and be careful not to create any. Slashings as a result of timber sales would be a much greater hazard in these years than during the cooler and moister years of increasing sunspots. At such times, more rigid rules pertaining to slash disposal and timber sales should be enforced. The forester could also go lighter on forest planting or perhaps not plant at all. At any rate he could exercise more caution and be more painstaking with nursery stock or any forest planting. Especial care should also be maintained before and at sunspot minima which are often excessively dry in the Midwest.

Weather Predictions

The above information as a means of future general weather predictions is based on a study of past weather records as far back as available. These records of calendar years are placed in the various phases of the sunspot cycle and averaged. Curves made from these figures can be used as a basis for future general predictions. They should be worked out separately for various sections of the country.

This work so far is of an exploratory nature only and is subject to revision. Studies in other parts of the world have corroborated its general principles. It will be of great interest, therefore, to check and improve its accuracy by a further study of the weather conditions of the future sunspot cycles. It should prove of value not only in determining the forest fire hazard, but in all branches of forestry such as silviculture, insect control, and forest pathology, as well as in many other walks of life.

A Smoker Fire Prevention Campaign That Paid Off.—Six major logging operations in the Modoc Forest have made the problem of smoker fires in the operating areas serious. In 1943 there were 18 smoker fires on logging operations with 13 of these occurring on the Ralph L. Smith Lumber Co. operating area.

In 1944 Mr. A. B. Hood of the Ralph L. Smith Lumber Co. proposed a campaign for *Safe Smoking*. The company had posters printed at their own expense and carried out a campaign to educate their employees into *Safe Smoking* habits. The campaign emphasized that woods workers should smoke *only* in cleared or posted areas. In addition, the company deposited cooperative prevention funds with the Forest Service to pay for a prevention patrolman. This man worked under the supervision of the Forest Service and made intensive patrols of the logging area and contacted all woods workers to promote the *Safe Smoking* campaign. The results were spectacular with occurrence dropping from 13 in 1943 to *none* for the years 1944, 1945, and 1946.

In 1945 the other 5 operating areas had 13 smoker fires. The operators were contacted by the Forest Service and agreed to follow the *Safe Smoking* campaign in their areas. The results were very good, with smoker timberman fires reduced to 2 for the entire Forest in 1946.

The key to the program is not to deny the woods workers the privilege to smoke but to educate them to smoke *safely* at a cleared landing, dirt road or special cleared area in the woods. This is very effective except for the occasional habitual smoker who might automatically, and without conscious thought, light up and smoke in a dangerous spot.

Legal action against these unsafe smokers is probably the only way to cure them.—Russell W. Bower, *Fire Control Officer, Modoc National Forest.*

ADAPTING THE "WEASEL" TO FIRE CONTROL

E. A. Grant

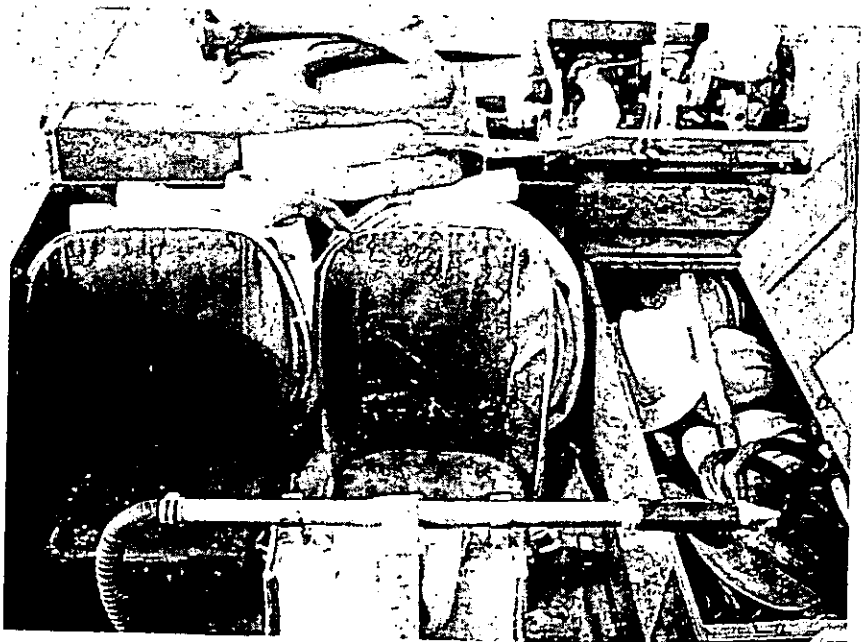
Fire Control Officer, Angeles National Forest

The Army amphibious "Weasel" (Cargo Carrier M 29C) had possibilities for fire control work, but how could it be reconverted?

This track laying, amphibious unit should be able to carry crews or equipment across relatively still bodies of water as it was so designed originally. Such a problem faced the Angeles Forest last summer, when water was backed up by a flood control dam in the San Gabriel River. The high water blocked off a road up the East Fork of the river threatening a suppression crew on the west side of the main river with a 30-mile drive with tanker equipment to reach a possible fire just across the canyon. The weasel offered a solution.

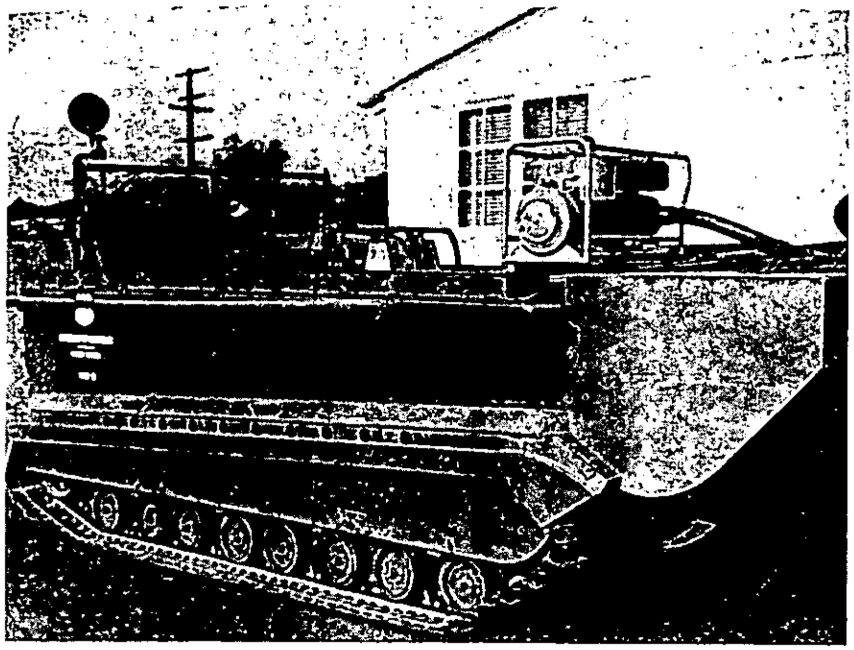
After careful thought and several tryouts in another nearby flood control lake, the equipment was selected and distribution of weight was promptly made to allow the weasel to float level in the water.

To meet fire control requirements, the unit must carry the necessary hand tools, canteens, and back-pack pumps. Then, to make it thoroughly useful, and to take advantage of the water it would be used in, a portable pump and sufficient hose to reach a lakeside fire were needed.



Tool arrangement on weasel.

When resting in water, the weasel has a freeboard of only 8 inches from the water surface to the top of the passenger and engine compartment. Possible swamping of the unit is ever present. Life jackets were obtained for personnel protection. As safety of personnel was more than just to prevent drowning, a box was required to hold the tools. The entire equipment was weighed item by item, and the weasel passenger compartment was stripped of miscellaneous fixture, such as one steel bucket seat, miscellaneous brackets, and so forth, to offset the equipment weights and to keep the lowest possible gross weight.



Portable pump mounting on weasel.

Equipment carried in the tool box included two double-bitted axes, two ladies' shovels, two brush hooks, two Pulaski tools, two McLeod tools, and four safety helmets. A back-pack pump was mounted on a bracket in front of the two bucket seats, while a 5-gallon can of oil mixture for the portable pump was placed in front of the tool box. Two hundred and fifty feet of hose was placed behind the bucket seats.

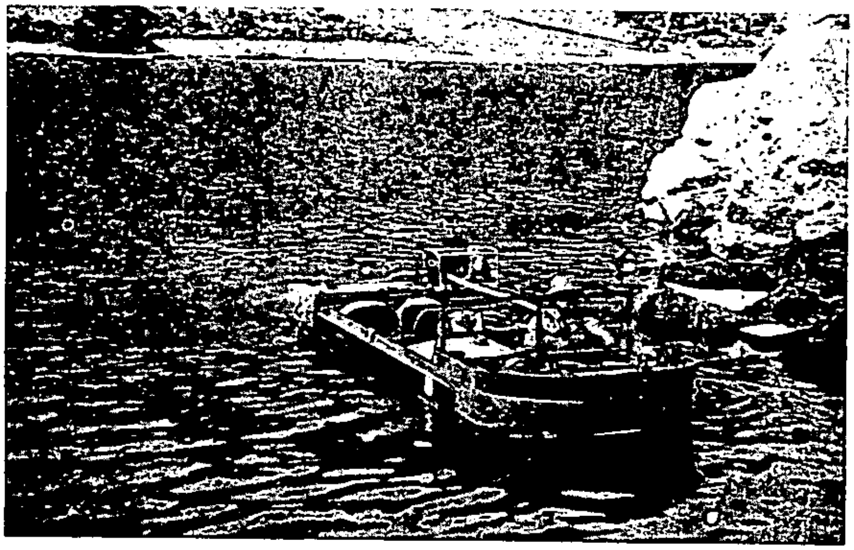
The portable pump was mounted on a special bracket over the rear end of the weasel proper and the rear float tank. The suction hose was looped and strapped to the top of the rear float tank in such manner that by unfastening one strap the strainer was dropped into the water between the two rudder controls. The pump exhaust, because of its water cooling system, was piped to the opposite side of the weasel where it was discharged overboard. This discharge outlet is behind the regular exhaust and muffler and is protected by the muffler's screen mesh wire protector.

During the actual tests in the water with all tools and equipment in place, the weasel rode level. It demonstrated its adaptability to water work, traveling at a speed of approximately 4 miles per hour.

It was also tested in wet sand wash where any other equipment would have bogged down completely and came through with flying colors. In dry sand it did not hesitate.

As for hill climbing, the weasel has been tested on grades up to 71 percent, where it was stalled, not for lack of power, but for lack of traction.

There are some danger points to be watched in the use of this type of equipment. The possibility of swamping while in water must always be considered. All personnel should be required to wear life jackets at all times when the unit is in water.



Loaded weasel being tested.

The braking system is not in proportion to the power of the motor in the unit. The unit will go up steeper slopes than the brakes will hold on when coming down. Auxiliary brakes are required, and these are being developed by the Equipment Development Center at Arcadia, Calif.

The weasel will go through heavy oak brush up to 10 feet high and with stems up to 1½ inches in diameter; larger stems have a tendency to foul the tracks.

In entering the water, the weasel must enter at right angles to the slope of the ground. If one side touches bottom first, the angle of repose may swamp the unit. Underwater obstructions must also be avoided to prevent rupture of the float tanks or the watertight bottom of the unit.

With float tanks removed the unit has been given a baptism of rescue work on the desert near Twenty-Nine Palms, Calif., bringing in nine Air Rescue Service personnel exhausted from hiking under the desert sun in midsummer for 3 days.

The demonstrations described above have shown that a fast crawler-type amphibious vehicle has its place in fire control work. It has possibilities beyond being a piece of suppression equipment such as described here. It can be made into a personnel carrier, which will take overhead or crews up fairly steep hillsides, and so reduce fatigue. By installing a pump and tank in the cargo compartment it will make a fast crawler tanker.

It is a machine of utility to the fire control work, traveling at 32 miles per hour on highways. Night use is also possible with the addition of the proper headlights and taillights. The value of such a vehicle in suppressing swamp fires should be obvious.

A Common Fire Control Fallacy.—Many learned theses have been written on forest fire control. Perhaps too much has been written and too little done. To dispel the idea that this is just another one I want to say right here and now that this is not learned and it is not a thesis. It's just a random thought that perhaps isn't even orthodox.

It's orthodox to consider forest fires as an evil (so far I concur). It is also customary to believe that we will always, or for a great many years to come, have forest fires with us in great numbers, and that we can expect no real decrease in number until most of the old timers who have been accustomed all their lives to burning the woods die off or become too feeble to run the ridges or set fire to a brush pile (and that's the bunk).

Most of the old timers that I knew when I was initiated into the fire game have died and gone to—well wherever these old woods burners go—many years ago. What were then the members of the coming generation from which so much was expected now are the old timers who are still burning the woods. We are now waiting for something to happen to them. Apparently we always have these "old timers" standing between us and our goal of adequate fire control. Why wait any longer? To anyone who says they can't be educated, I'll say that it can and has been done, in one way or another.

Of course it's easier to give a talk and show some pictures to 30 or 40 moppets than to walk up the hollow a few miles to find the old man of some of them, see what makes him tick, and diagnose his case. He's the guy that's doing the devilment and with whom we are currently concerned. Having shown our pictures and said our little speech we console ourselves with the thought that we are making it easier for the next generation of foresters, and then hurriedly muster a crew to stop the fire that got away from the old man while we were thus laboriously preparing for the future.

Work with the youngsters is highly important and far be it from me to minimize its value but it is not more important than working with the old timers whom we are too prone to consider a lost generation so far as fire control is concerned.

Nor should we overlook the fact that perhaps the old man has ways and means that we know not of, or if we do are not permitted to use, of influencing his progeny. I know that the current idea is to "reach the parents through the child" but this has been known to work in reverse and more effectively too than some child psychologists would have you believe.

When I hear that old and oft repeated story about waiting for the old generation of woods burners to die off, it leaves me pretty cold. It's the same old alibi that was used a generation ago. The new generation of foresters should have sufficient ingenuity to think up a better one than that.—S. H. MARSH, *Inspector, Region 7, U. S. Forest Service.*

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FOREST FIRE STATISTICS: THEIR PURPOSE AND USE

J. A. Mitchell

Fire Research, Lake States Forest Experiment Station[1]

Statistics may be defined as organized factual information, particularly information which can be stated numerically. Their purpose is to present related facts, so classified as to provide a basis for sound conclusions or inferences.

Reliable information is the foundation of effective effort—hence the need for adequate and dependable forest fire statistics. They are essential first of all to determine the need for fire control; second, as a basis for protection planning; and third, to properly gage the results of fire control effort. Incidentally, they provide a valuable historical record and data needed to solve many fire control problems.

While usually conceded to be desirable, the value and importance of good forest fire statistics is not generally appreciated. The significance of statistical information is often not apparent until it has been compiled and interpreted. This takes time and effort. As a result, if interest is lacking, compiling and interpreting are put off.

Another reason for our lack of good fire statistics is the fact that, until recently, there has been a deficiency of reliable base data. This has been, and in some cases still is, a serious handicap as anyone who has tried to compile such information well knows. This is no excuse, however, for not making the most of what we have; for even meager data, if properly analyzed, afford much valuable information. Until the need for better data is recognized also, our records will continue to be inadequate.

On the other hand, few realize how much factual information actually is available. The individual fire reports, both State and Federal, for example, contain a world of valuable data which for the most part has never been compiled or analyzed beyond the meager requirements of the Clarke-McNary and Federal annual fire reports. Once the required information has been extracted, these reports are too often relegated to the closed files and forgotten. What is more inexcusable, the reports are not always preserved, with the result that attempts to utilize them later are frustrated by gaps in the record.

Another source of vital information which has received even less attention is the daily fire-weather record. The Forest Service is equally remiss with the States in failing to compile and utilize the information these records contain. Yet what other sound basis have we for comparing the severity of fire seasons and determining the intensity or protection called for by protection units.

[1] Maintained at the University Farm, St. Paul 1, Minn., in cooperation with the University of Minnesota.

Without knowing the conditions prevailing, how can we hope to plan effectively or judge properly the results of protection effort? How does this season compare with last? We had more fires and area burned, therefore we say it was worse. But did we have more fire days or higher danger? If we did, the poorer record may be justified. If not, we have been slipping and there is some reason to believe that this is the case. Again, the record for the past 5 years on the whole has been excellent and we have been patting ourselves on the back and thinking that we have the fire problem licked. But have we? Isn't it possible that favorable conditions rather than more effective effort are responsible? What would have happened if conditions had been the same as in previous bad years? We may just be kidding ourselves and, when conditions are really bad again, will find that we are not as good as we thought we were. These are just a few examples of our lack of elementary information that adequate fire statistics would supply.

It is true that statistics will put out no fires and that much time and effort can be wasted on their compilation. Without specific information, however, fire control is a matter of guesswork. To the extent, therefore, but only to the extent that they serve a useful purpose are fire statistics justified and their compilation and analysis warranted.

How far a protection organization should go in compiling and analyzing its fire data depends on conditions and the intensity of fire control in effect. The purpose of this paper is simply to point out the significance and use of statistical information in fire control.

In addition to furnishing a historical record, the purpose of fire statistics is to provide specific information as to where, when, and why fires occur and a basis for comparing seasons and protection units and judging the results of protection effort. The essential data are location of fire, date of occurrence, cause, conditions prevailing, action taken, area burned, damage, and cost. This information, in more or less detail, is given in most individual forest fire reports.

The basic statistics derived from these data are number of fires, area burned, loss, and cost.

All other fire statistics, with a few exceptions, are elaborations of this basic information. For example, some or all of these items may be broken down by political or administrative units, by land ownership, intensity of protection, season, cause, type of cover or conditions prevailing, and they may be presented graphically or as totals, averages, or percent.

At present the only forest fire statistics generally available are those compiled annually by the Forest Service, Division of State Cooperative Fire Control, or contained in State and Federal reports. Some States, it is true, break this information down by protection districts and months. Only a few, however, go into any greater detail.

As a matter of record and for general information, these statistics are fairly adequate. They also serve to show the relative over-all size and importance of the fire problem by States. Without further breakdown and elaboration, however, they fail to answer many important administrative and operational questions and do not provide an adequate basis for judging results. A minimum of fire data essential to serve these needs are shown in the check list that follows.

CHECK LIST OF ESSENTIAL FOREST FIRE STATISTICS

(By protection units and years)

Basic statistics:
- Area protected:
- Number of fires: Total and by
  - Cause (lightning, railroads, etc.):
  - Size class (A, B, C, etc.):
- Area burned: Forest, other, and total.
- Loss: Forest, other, and total.
- Cost: Presuppression, suppression, and total.

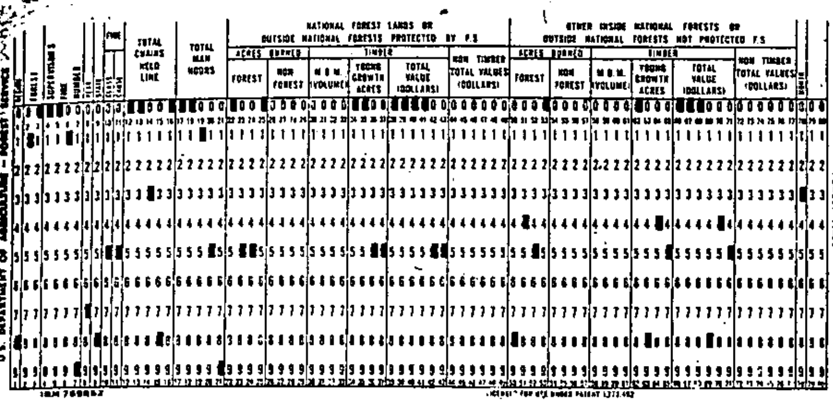
Calculated statistics:
- Danger prevailing (over-all seasonal rating):
- Risk of fires starting (number of fires per unit area):
- Risk of fires spreading (size of average fire):
- Risk of burning (percent of protected area burned over):
- Destructiveness (loss per acre burned):
- Risk of loss (loss per acre protected):
- Presuppression cost per acre protected:
- Suppression cost per fire:
- Effectiveness of suppression (percent of fires under 10 acres):
- Loss plus cost per acre protected (presuppression and suppression costs plus destructiveness):

At the regional level, in addition to the information now compiled, we should have by States and by years all the calculated statistics. At the State level the same information is needed by protection units.

In addition, for sound protection planning, we need to know by protection districts the distribution, concentration, and seasonal occurrence of fires; the normal number of days in each danger class; the normal duration and severity of the fire season; when, where, and how frequently abnormal conditions occur; the variation from normal to be expected; the distribution, concentration, and seasonal occurrence of fires by cause, size class, and fuel types; and many other facts that only a proper analysis of available fire data can supply.

To compile and organize this information by hand is a laborious and time-consuming undertaking and one that becomes more so as records accumulate and data increase in volume. The most practical answer is machine tabulation. While few States have sufficient use for tabulating equipment to justify its installation for this purpose alone, such equipment in some cases is available in other departments or commercially. Another possibility is for a group of States to cooperate in maintaining a tabulating center that would serve them all. The Washington Office of the Forest Service has handled national forest fire statistics in this way for several years and it has not only simplified getting the information desired, but has relieved the supervisors and regional offices of the burden of compiling and tabulating this material.

The machine method of tabulation has many advantages. It not only simplifies and expedites the compilation of required information, but special summaries and tabulations can readily be made at any time, thus aiding in the analysis of the fire problem. The method also has great flexibility and is adaptable to a wide variety of needs, since once the basic information has been entered on punch cards it can be classified and tabulated whenever and in whatever way is desired.

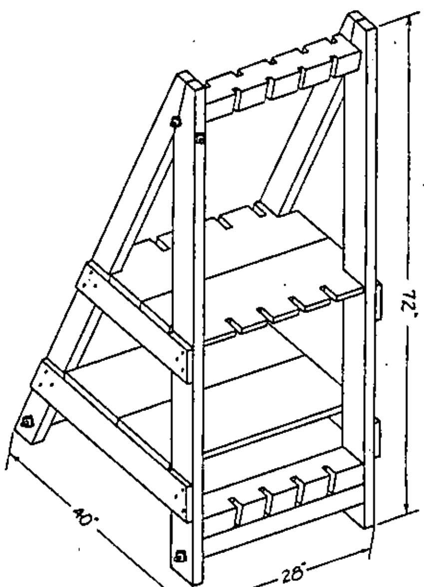


Punch card used by the U. S. Forest Service in tabulating forest fire data.

Since most people are allergic to figures, statistics often fail of their purpose. The remedy is to abstract the essential facts and to present them in more appealing form, either as a running story or by graphs and charts. Graphs and charts are especially useful in comparing conditions and results and in bringing out the significance of specific facts. A running account on the other hand is usually more suitable for presenting general information. Adequate statistics, however, are essential as source material in either case as well as for reference and analysis.

SAW AND ACCESSORY RACK FOR WAREHOUSE USE

A movable crosscut saw rack, as diagramed, is easily made of 2 by 4 and 1-inch lumber to accommodate any number of saws desired. Shelves built inside the frame strengthen it and also give storage space for wedges, handles, and saw guards. The notches which hold the saws are offset so the top ends of the saws clear each other. These notches are ¾ inch wide, 1 inch deep in the top 2 by 4, and 2 inches deep in the top shelf and bottom 2 by 4. A ¼-inch rod through the top and one through each side just under the piece that holds the lower ends of the saws makes the rack more rigid. Aside from the neat appearance the rack provides compact and complete storage for all crosscut saw equipment and can be located in odd corners of the warehouse.—ELVIN R. FELLOWS, *Fire Control Assistant, Stonyford District, Mendocino National Forest.*



TRAINING HIGH SCHOOL BOYS IN FIRE SUPPRESSION

JOHN D. WHITMORE

General District Assistant, Glenwood Ranger District, Jefferson National Forest

The manpower shortage brought about by the war is still familiar to everyone who was responsible for recruiting manpower during that period. The warden organization was practically depleted. Private industries which had agreed to furnish manpower for fire fighting were reluctant to close a plant and release their men.

We had a group in our high schools who came from the rural districts. These boys were husky fellows who could do a good job fighting fire if they were properly trained. There were still enough "old men" left in the warden crews to head up groups of 10 or 12 of these boys. So it was decided that the boys should be organized into crews of 10 or 12 with a group leader to work under the direction of a warden or other experienced fire fighter.

Our first attempt at organizing and training high school boys confronted us with several unforeseen problems. First, we found that many principals were unable to see the value of the program and were reluctant to have their school curriculum interrupted. Another problem was to coordinate the efforts of the United States Forest Service with those of the State so as to avoid duplication in the work and to avoid the confusion that was bound to result from having both agencies trying to work independently with each school. A third difficulty was to find a way to get the job of organizing and training done within a reasonable expenditure of time.

It was not easy to overcome the principals' resistance. It has finally been accomplished in most cases by repeated personal contacts, by using patience, and by becoming well enough acquainted with the principal so that we could talk as friend to friend rather than as an impersonal forest officer to a harassed schoolmaster. Contacts by the Forest Supervisor and the State forester to county and State officials of the board of education helped to start the program, but good personal relationships between the men on the ground was the secret of success.

Coordinating our efforts with those of the State was an easy problem to solve. The district ranger and the State district forester agreed that the United States Forest Service would be responsible for training at the 10 high schools nearest the National Forest, that the State would cooperate with us in this training, and that both agencies would be privileged to use the crews. We have found this to be a very satisfactory arrangement. In this way the schools are contacted by only one agency with the result that the interruption of the school program is kept to the minimum.

With the school principals working on our side, and with a definite working agreement with the State forest service, we can now carry on our school program in a manner that is almost routine. The third problem—that of finding time to do the job—has been largely solved by our having a definite schedule so designed that other district work can be done in conjunction with the high school training. The following schedule shows how we do the job on the Glenwood District.

SEPTEMBER 15–30

Truck is loaded with tools for making replacements in warden boxes; paint for boxes and signs; and material for checking and repairing wardens' telephones. The trip is made, taking the wardens as we come to them. A complete job is done at each warden location at this time. That is, tools are checked, poor tools replaced, sign and box repaired and painted when necessary, telephone checked for batteries, etc. A check up is made on the warden crew and its transportation, and revisions are made where necessary. Each high shcool to be organized is contacted and a date for training arranged. These dates are arranged so the training can progress from day to day. At the time this contact is made, parents' consent forms are left to be signed.

OCTOBER 15–30

Spend one day at each school on the following schedule:

9 a. m. Arrive at school. Assemble entire school if possible, girls as well as boys. Give short talk to group as to our purpose at school. Point out good work done by schools in prevention and suppression. Show motion picture to group. Picture should be general conservation film dealing with wildlife, soil, and timber products as well as fire control.

10 a. m. Assemble prospective crew members in classroom. Get principal's idea on desirable crew leaders. Discuss purpose of organized crews and work expected of them in prevention and suppression work. Explain connection between Federal and State fire control work and the difference in wage rates. The county warden should have comments.

Elect crew leader and assistant crew leaders for each 10 to 12 boys. Get names and addresses of all crew leaders. After the crews are organized, spend some time discussing ways of doing prevention work.

Turn job of poster and bookmark distribution over to the crews. Give specific instructions as to where posters will be put up.

11 a. m. Travel to training area in stake truck. Maintain the same order on truck as expected on trip to fire. Take principal or agriculture teacher if possible. Unload tools. Lay them out in same order as used on fire. Explain name of each tool, purpose of tool, proper and improper use, and safety hazards involved. This must be done through demonstration.

12 p. m. Lunch.

1 p. m. Explain organization of crews, line construction, and duties of each man. Ask and answer questions. Return tools to truck and pack in box.

2 p. m. Hold class in conservation work. Show why we prevent fires; the effect of fire on timber and soil; how fire affects the individual. Using an increment borer, Biltmore stick, tape, and Abney level, show how national forest timber is managed and sold. A good location for this discussion is adjacent to a burned area.

Return to school. Give each crew member some good literature or a bulletin to take home.

3 p. m. Have discussion with agriculture teacher and principal. Talk about his job as well as yours. Give him a picture of the job we are doing and how he can fit into it. Spend the necessary time with him to get acquainted.

Let him know you will be back in the spring.

4 p. m. Line up transportation for the crews. Replace No. 1 posters. Do general contact work.

FEBRUARY OR MARCH

Contact schools. Assemble crews in classroom. Take approximately 30 minutes to distribute posters, bookmarks, etc., and give boys pep talk. Check any change in crew and transportation. Contact county school superintendent on this trip.

We have found it to be workable and practical. Notice that much of the program is devoted to prevention work. We have the boys distribute all posters and prevention literature. It is felt that this part of the training pays off by creating interest and making fire-conscious citizens out of these boys who are going to be the leaders in our communities in the near future.

Accurate records have not been kept of the extent these high school boys have been used in fire suppression. But it can be safely said that they have helped us out in times when it seemed almost impossible to recruit even a small warden crew. The principal of one high school has kept a record of the fire fighting he and his boys have done. His record shows that the boys went to 94 fires and 16 false alarms; spent 4,787 manhours fighting fires; traveled 2,730 miles; and received $1,627 in wages. It is interesting to note that all but 19 percent of the time spent by the boys was outside of the regular school hours.

Air Operations Handbook: Cargo Dropping.—Cargo Dropping, a 58-page multilith pamphlet, has been prepared by the Division of Fire Control in Region 6 as one of the chapters of the Forest Service Air Operations Handbook. Factors governing the use of airplanes for dropping cargo in the fire-control system are given briefly. Included in the pamphlet are details of cargo-dropping equipment, how to package and load cargo, methods of transporting and discharging cargo, selection of the cargo-dropping area, and the organization necessary to do a given job. The pamphlet is not yet in final form but was printed in limited quantity to avoid further delay in meeting operating needs this season.—*Division of Fire Control, Washington Office, U. S. Forest Service.*

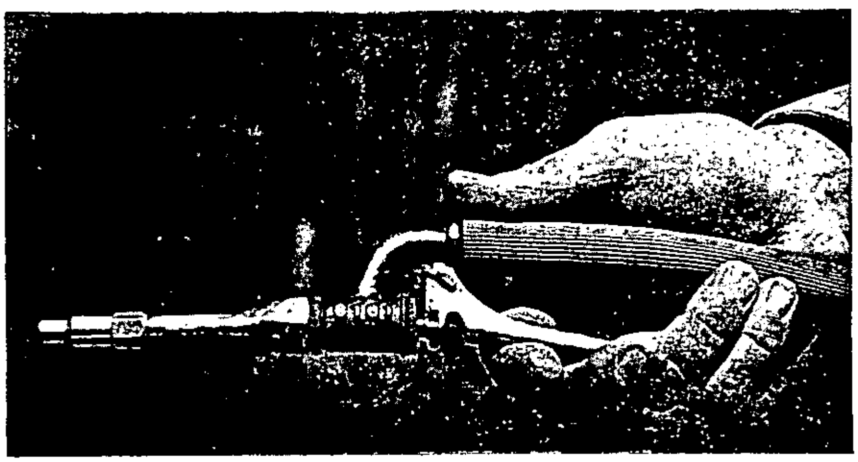
COMBINATION TREE MARKING GUN AND BACKFIRING TORCH

A. C. Wells

District Assistant, Francis Marion National Forest

This combination marking gun and backfiring torch was developed first as a paint marking gun. The conventional hand oil stream gun necessitated carrying extra paint in a container or returning to a central point for refilling. These operations were time consuming and it was felt that they could be reduced. In addition, the hand oil stream gun required a considerable pull on the trigger in order to make a mark on the tree. A complete stroke was necessary, thus, there was no control over the amount of paint used per mark. All of the above objections have been overcome in the development of the Wells' paint gun which is operated by air pressure. After the gun was completed, the backfiring attachment was developed in order to utilize the abilities of the gun.

The paint gun is made from a Montgomery Ward garden club sprayer with a capacity of 2 gallons and an empty weight of 7 pounds. This sprayer costs $6.39. It came equipped with a spray nozzle and control valve which proved unsatisfactory for our purposes. A Myers spray valve costing $1.35 was put in place of the original valve, and the nozzle from the hand oil stream gun was attached. Straps from a back-pack fire can were placed on the tank so that it can be carried on the back.



The nozzle and spray valve of the Wells' tree marking gun.

Operation of tree marking gun.—The air pump is extracted by turning and pulling up. Air-vent screw is loosened. Marking paint in any amount not to exceed 2 gallons is then placed in the can. Replace the pump. Replace air-vent screw and secure. All connections must be air tight. Then pump air into the gun with an up and down stroke of the pmp handle. Continue to pump until the strokes become difficult to complete. Sufficient air can be placed in the tank with from 60 to 80 strokes. Secure pump handle with clasp for this purpose. By manipulating the control lever tree marks can be made. Only 1 pumping of air is necessary to expend the entire 2 gallons of paint. Paint is completely utilized since the air pressure forces it out of the can. Even after all the paint has been expended, there is still pressure in the tank.

Advantages of the gun.—The can carries a full day's supply of paint (2 gallons). It is back mounted and easily carried. Air pressure operation reduces the work load on the trigger finger.

The gun conserves paint. The amount of paint can be controlled as it leaves the gun thus allowing the operator to use the minimum amount necessary to give a lasting mark. A test of the number of trees marked per gallon of paint revealed that in pulpwood areas the Wells' paint gun averaged 777 while the hand oil stream gun averaged 560. In saw-timber areas where a much heavier mark is necessary, especially when marking cypress and hardwoods, the Wells' paint gun averaged 650 trees marked per gallon as against 410 for the hand oil stream gun.

The marker can mark more trees per hour of marking. Less time is needed to mark each tree since air control gives a quicker mark than that of the manual trigger operation.

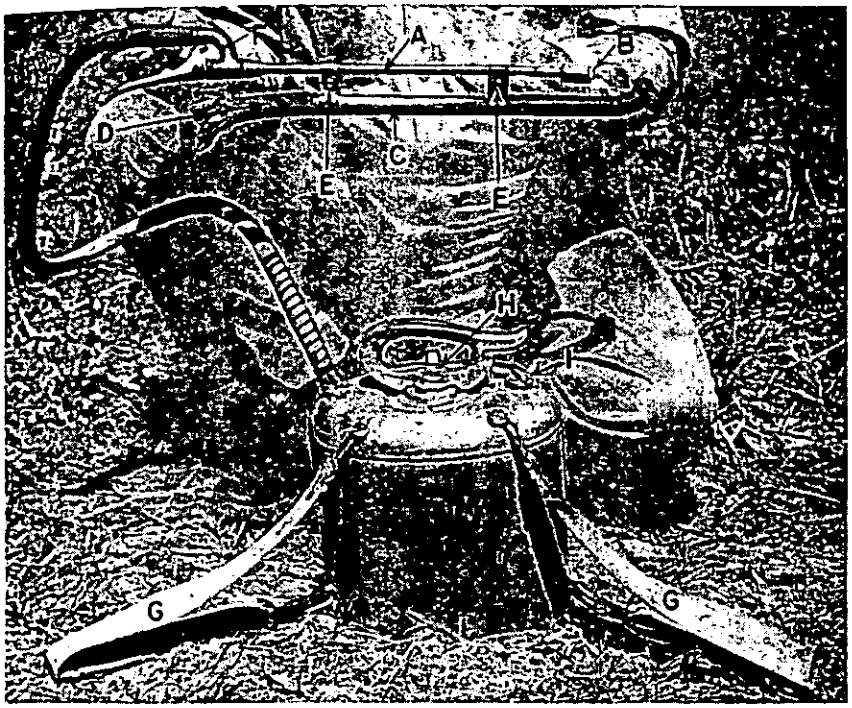
Within a matter of minutes this gun can be changed to a backfiring torch. In the Coastal Plain country, the timber marker has to be prepared at any time to leave his marking to control a fire.

Cleaning the gun.—Remove pump and wash pump and tank with kerosene. Clean nozzle by removing and washing parts thoroughly. Do not attempt to disassemble the pump. The single action of the pump prevents any paint from getting into it, so it is only necessary to clean the exterior. Average cleaning time is 20 minutes. Of course in an emergency when changing to the torch, this operation can be done satisfactorily in a few minutes.

Use as a backfiring torch.—In a matter of about 5 minutes the paint can be removed from the can; paint nozzle removed; can filled with 2 gallons of a backfiring mixture one-half gasoline and one-half kerosene; and the backfiring attachment screwed on.

The backfiring attachment consists of a small pipe, a grease fitting for the nozzle, an inner brass tube of Indian fire can trombone type pump, ordinary wicking, and two clamps.

Operation of backfiring torch.—Operation is the same as for the paint gun except for the use of a fuel mixed half and half, gasoline and kerosene. First moisten wicking with fuel. After initial wetting, the wick will stay wet with fuel thus providing a constant pilot light. Two gallons of fuel, conservatively used will backfire 2 miles of line. This torch gives a maximum of burning fuel to the area to be burned, and with the air-forced stream of live fuel, it is possible to set areas up to 15 feet from the operator. The torch will not be manufactured and used until its safety is assured by a competent testing authority.



Wells' combination with backfiring torch attachment: *A*, Small pipe; *B*, grease fitting for nozzle; *C*, inner brass tube of Indian fire can trombone type pump; *D*, ordinary wicking; *E*, clamps; *F*, spray valve; *G*, back-pack can straps; *H*, air pump; *I*, air-vent screw.

Backfiring torch in operation.

FOG MOP-UP NOZZLES

A. B. Everts

Forester, Snoqualmie National Forest, U. S. Forest Service

Many different types of fog nozzles varying from high to low pressure and from 5 to 54 gallons per minute water consumption are finding favor with forest fire fighting services throughout the country. The Navy all-purpose fog nozzle pictured herein is of the low-pressure type operating at 100 pounds' pressure and using 54 gallons of water per minute. The nozzle is composed of two parts:

(*a*) A bronze nozzle with a handle that can be moved to a shut-off, open, or fog position. When in the open position a straight stream is secured. When in the fog position with the fog disk inserted (shown hanging from chain) a high-velocity homogeneous fog with a projection range of 25 feet is produced.

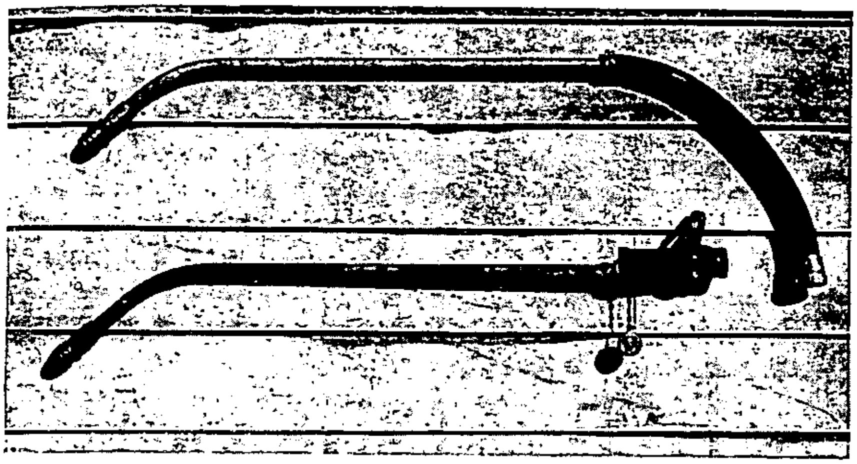
(*b*) A pipe applicator which can be inserted into the bronze nozzle as pictured. The fog tip on the applicator is of the low-velocity type which produces a ball-shaped fog design approximately 16 feet in diameter. It has considerable less projection range than that produced by the high-velocity tip.

Since both of these tips use 54 gallons per minute they are limited for use with low-capacity tank trucks where water conservation is an item to be considered. It has been pretty well established that the efficiency of a fog nozzle is in direct relationship to the amount of water being fogged. Large gallon per minute delivery fog nozzles are, therefore, most useful on pump shows and gravity lines.

This Forest is satisfied that the pipe applicator is about the most efficient mop-up nozzle ever employed. The fog is produced by external impingement, that is, the fog tip is so designed that there are a number of small streams under equal pressure striking each other at right angles. The impact of the streams breaks the water up into fog. There are no moving parts in either of the fog tips, as is the case with the high-pressure fog nozzles. Thus the applicator can be rammed into the deep duff and fuels common to the Pacific Northwest without danger of plugging the tip. Deep-seated burning material around stumps and under logs can be extinguished quickly and efficiently.

Using the applicator with the bronze shut-off nozzle, however, has two drawbacks. The first is that the combination is heavy and tiresome to use for long periods, and the second is there is a tendency for the hose to kink at the nozzle, especially when linen hose is used.

As the result of experience on the East Creek fire, Ross Files of this Forest suggested the improvement shown in the upper nozzle. An 18-inch length of hard rubber hose was clamped to the applicator. At the other end a 1½-inch female coupling is provided for attaching direct to the hose line. This arrangement prevents kinking and reduces the weight from 13 pounds (lower nozzle) to 6 pounds (upper nozzle).



Lower, Navy all-purpose fog nozzle with pipe applicator attached. Upper, an 18-inch section of hard rubber hose replaces the bronze nozzle, to decrease weight 7 pounds and to overcome the troublesome hose-kinking tendency.

TWO-WHEEL MESS TRAILER

John W. Cooper

Division of Fire Control, R–8, U. S. Forest Service

Many plans and styles of camping trailer and mess truck outfits have been designed throughout the country and all with certain advantages for particular conditions. The Francis Marion two-wheel mess trailer, designed by Improvement Foreman R. N. Strickland on the Francis Marion National Forest, is offered herein as being highly adaptable for immediate dispatch of sufficient food for 100 men for 1 meal or for 40 men for 1 day.

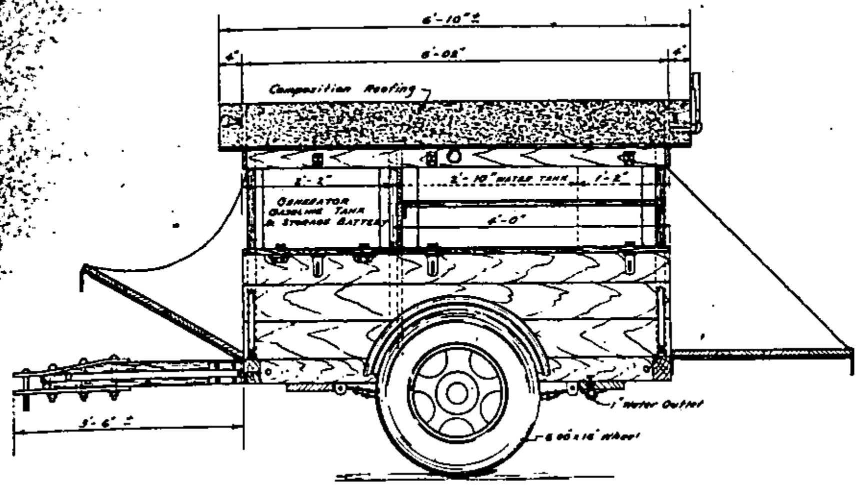
The trailer is light enough to be towed by a one-half-ton pick-up or passenger car, and can be equipped with a standard trailer hitch so that any truck on the district can hook to it and take off immediately for the fire. Two cast iron grills are carried to serve as a stove, and the trailer is always kept loaded with canned and staple food items, cooking utensils, plates, cups, etc., so that it is literally a camp on wheels. Its 40-gallon drinking water tank is a handy convenience.

The trailer carries a 1½-kilowatt gasoline light plant and 100 feet or more of extension cord to be used for lighting the camp area. Sockets are available on all four sides of the trailer to make light for the cook. The use of yellow bulbs repels insects.

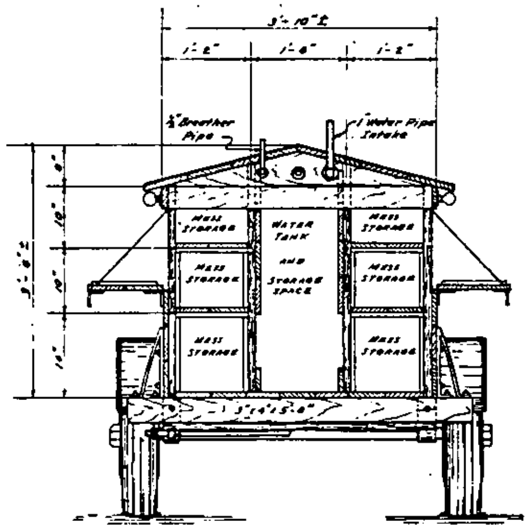
Mess trailer showing: Left end and side gates from rear and Ranger Koen drawing a cup of water; right, front gate, trailer hitch, and light plant.

Among the advantages of this trailer are: The accessible storage of food; the convenient front and rear drop gates that serve as work tables for the cook, and the side drop gates that serve as shelves; simple economic local construction; and the availability of mess gear without tying up a truck.

Construction details are shown in the drawing, which is available by requisition from Region 8 (drawing M–4301).



SIDE VIEW



REAR VIEW

The Francis Marion mess trailer.

Commercial Tackers Facilitate Fire Sign Posting.—Ranger E. A. Hanson of the Toiyabe Forest, tired and a little disgusted with bruised fingers and the job of removing Indian fakir beds of nails and carpet tacks every year from sign backs, looked around for something better than the conventional hammer and carpet tacks. He found it in an automatic tacker using quarter-inch staples. One such outfit costs about $5. Hanson estimates a timesaving of approximately 50 percent per sign and states he is getting a much neater job of sign posting. These tackers are in wide use by business firms, express companies, theaters, and others and can be readily obtained. Rangers having a heavy annual sign posting program may well welcome something like this.—E. A. Hanson, *District Ranger, Toiyabe National Forest.*

FOREST FIRE FIGHTERS SERVICE IN INDIANA

JOSEPH S. DEYOUNG

Division of Forestry, Department of Conservation, Indiana

At the beginning of World War II, the fire control problem in Indiana was serious. Many key men, the real "smoke eaters," had joined the armed forces. What manpower would be available to combat forest fires?

In 1942 the Forest Fire Fighters Service (FFFS) was organized in Indiana as a wartime agency. The National Coordinator appointed a State coordinator and an assistant. These were responsible for the organization, publicity, and training work in the State.

At first among the adult groups the progress was very slow. Later the idea of enrolling volunteer members from the Indiana high schools was presented. This proved to be the right move in the development of the Forest Fire Fighters Service.

During the war, the high school students patriotically volunteered their services to help out in the war effort. But how could this work be carried on when the war period ended?

This was made possible by the carefully planned ground work in 1942 when the program started. The school officials, especially in southern Indiana, saw the possibilities of a good conservation training program in the schools. County superintendents, high school principals, civic organizations, conservation club officers, county agricultural agents, and leaders of rural youth groups helped put the program over in their communities. Publicity by newspaper editors and radio broadcasts also helped to get the work before the public.

Just before the expiration of Civilian Defense, July 1, 1945, Gov. Ralph F. Gates wrote a letter to the State forester, a part of which reads as follows: "It has come to my attention that you have done creditable work along the line of training volunteer fire fighters. I would certainly appreciate your going ahead with whatever work you feel essential along this line."

To July 1, 1945, training had been given to boys at 200 high schools in 35 counties, as well as to 1,000 Boy Scouts, 700 adults and 350 high school girls. This made a total of 12,000 volunteers trained. Also 8,000 man-hours were spent combating 238 fires which burned 19,000 acres.

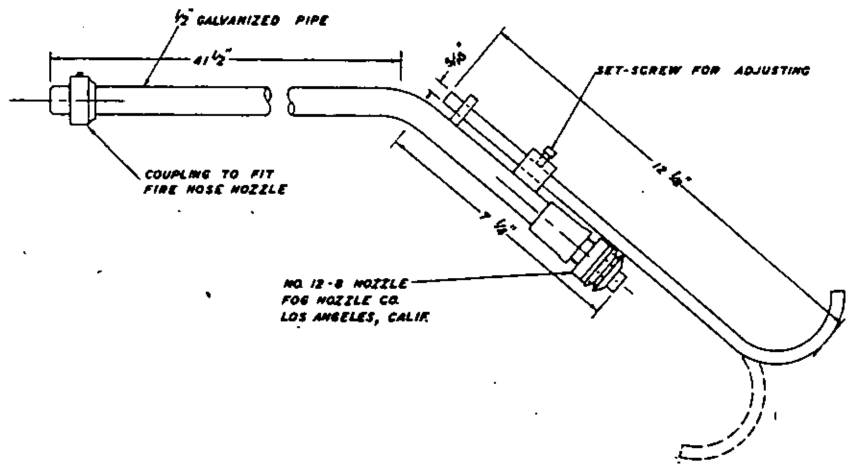
Considerable progress has been made by the Forest Fire Fighters Service. During the period July 1, 1945, to January 1, 1947, training has been given in 100 high schools located in 26 different counties. Five thousand volunteers have been trained, including 3,000 high school boys and girls, 1,400 Boy Scouts, and 500 adults. This makes a total of 17,000 volunteer fire fighters trained to the first of the year. Also 2,000 man-hours were spent combating 100 fires which burned 6,000 acres.

A certificate of merit is awarded to each high school or adult group for their services in suppressing forest fires. There have been 71 awards presented to high schools, and 3 to adult groups since 1942.

Plans have been made to continue and develop the Forest Fire Fighters Service in Indiana by extending the fire training into other counties, appointing additional local coordinators, making new training charts and a fire fighting film, and continuing the contact and follow-up work being done by the fire control personnel of the Division of Forestry, Department of Conservation.

Cooperation by Hoosier conservationists, a thorough and interesting training course given by our training officers, friendly relations with all school officials, and the increased interest in conservation over the whole State of Indiana have all played a part in fostering the continued enthusiasm being shown by students and adults in the FFFS program.

Fog Nozzle Hook.—Fog nozzles have been used effectively in suppressing grass fires and checking spread of certain types of forest fires. In using fog nozzles for forest fire mop-up, however, the effectiveness of this type of nozzle is limited. Most of the cooling action is on the surface and ordinarily it is impossible to reach deep burning fires with a minimum amount of water. The fog nozzle hook was devised to overcome this limitation.



The hook attached to the fog applicator enables the nozzleman to turn over sticks and small logs and to stir up duff so that all burning material can be treated efficiently in one operation. The hook attachment has been used on fires in Glacier National Park and has proved valuable in mop-up work.

The attachment is simple in design, as illustrated by the drawing. The hook is attached to the end of the fog nozzle applicator and is adjustable so that it can be extended or retracted or turned up or down. The five-sixteenth-inch metal rod is heavy enough to withstand fairly rough usage and as much lifting and straining as the applicator itself will stand. The hook also serves as a guard for the nozzle tip.—M. E. SULLIVAN, *Foreman, Glacier National Park.*

THE GILA SMOKE JUMPERS

DON BECK

Southwestern Region, U. S. Forest Service

As an experiment in fire control technique a squad of eight parachute jumpers and one pilot and plane were secured from Regions 1 and 6 for the period May 27 to June 27 for smoke jumping in the Gila Wilderness Area in southern New Mexico. This was the first time smoke jumpers were ever used on fire control in the Southwest.

The wilderness area has rough terrain with altitudes which vary from 5,000 to well over 10,000 feet. An emergency landing strip was constructed near Mogollon at an altitude of 8,500 feet. The higher altitudes and strong air currents created by desert heat were given consideration in planning the action part of the project.

The jumpers were based at Deming, N. Mex., at a former Army air base through the cooperation of the local city officials who had acquired the facilities. Hangar, shop, barracks, and baths were made available. Deming is located within 50 minutes' flight time of the heart of the 800,000-acre wilderness area.

The men and plane arrived on schedule May 27. Between that date and June 27 the jumpers went out on eight fires. At least three of these fires, in all probability, would have reached large acreage and would have been very expensive to control. There is no doubt in the minds of Region 3 personnel that the project proved its value.

During the period of operation all regular ground forces were on duty. On six of the eight fires the jumpers arrived prior to the ground forces and were primarily responsible for control of the fires. Competition was consistently keen between ground and aerial personnel.

At the conclusion of the project results were analyzed and Region 3 believes they can justify an even larger parachute force next season for a longer period. The Region is sure a 12-man group of jumpers based at Deming and used over a 150-mile radius for a period of 2 months will more than pay its way in reduced damage and other fire costs.

One of the interesting portions of the project was the narrative report made by the jumpers on their return to base. The following report covering a single jump and fire was made by Emil M. Reidys, a boy who likes to jump and who comes from Flagstaff, Ariz. It may be of interest to readers of Fire Control Notes.

"Rocky Canyon fire—June 15, 1947.

"Preparations were made for a routine patrol; take-off time was about 9:40. After flying along uneventfully for a short while, a wisp of smoke was spotted—the aircraft circled the area. After our pilot had determined exact location by wireless and oriented the area, the decision was made to jump. In order to determine wind-drift, a drift-chute was dropped—as is invariably the case in all these operations. I left the ship at 10:40—exit and opening shock, normal. Rate of descent increased as I neared the ground—violent oscillation set in and a sudden down-draft had me in its grasp. The ominous crunching of wood and breath catching sound of rending nylon blended into one as my 'chute caught and held in the top of the tree. The canopy collapsed, the tree broke, and I obeyed the law of gravity—fell 20 feet and landed on point of left heel. The fire packs were dropped just above me on the ridge—my partner joined me and retrieved the tools—the wind favored us. After working 3 hours on the fire my foot gave out on me. The first smokechaser arrived on the scene about 2:40 and assisted on the fire. Baurer, my partner, set up the wireless and contacted Mimbres Ranger Station. Thereafter contact was maintained every hour on the hour till 6 p. m. The fire was under control at 3 p. m. The packer arrived around 5 p. m. Preparations were made to evacuate. We left the scene of the fire at 6:45 p. m. Two men were left to mop up. We arrived at the Mimbres Ranger Station about 6:30 a. m., Monday morning.

"Aside from inconvenience to other members of the group, due to my slight injury, everything went smoothly. After checking with the doctor at Silver City, we checked in to Deming Air Base at approximately 4:40 p. m., Monday, June 16."

(Signed) EMIL M. REIDYS,
June 24, 1947.

Comment.—"Outstanding above all else is the time element involved in all airborne operations. The sequence of events that follow after a jumper leaves the aircraft is, with a few exceptions, standard operating procedure. From a personal viewpoint of all men involved, it is a job one has to like in order to execute the assignment."

THE USE OF A WETTING AGENT ON A FOREST FIRE

EDWARD RITTER

Region 7, U. S. Forest Service

Comprehensive tests of wetting agents are planned. In the meantime experience of field men in trials like this are valuable and can speed up the full utilization of advantages that detergents may contribute.

Through the cooperation of State Forester Jacobson and Ranger Edson of the Rhode Island Forest Service, some interesting information was gathered on the use of a wetting agent in the control and mop-up of a spring fire.

On April 11, 1947, an accidental fire started at 12:20 p. m. on Division Street in the town of West Greenwich, central Rhode Island. It was picked up by the Pine Tower at 12:28 p. m. and a crew immediately dispatched, the first men and equipment arriving at 12:50 p. m. The wind was very strong at the scene of fire although the nearest fire weather station some 15 miles away indicated only a class 3 day. A strong southwest wind was recorded by the United States Weather Bureau station at the Hillsgrove Airport about 10 miles south of fire. Velocities at 10 a. m., 12 noon, 2 p. m., and 4 p. m. were recorded as 26, 27, 31, and 25 miles per hour respectively, with gusts recorded as 35, 37, 42, and 32 miles per hour.

The fire originated in a grassy field and blew across a 24-foot black top road into a slash area which had been cut over during the winter of 1945-46, the remaining stand consisting mainly of small scrub oak, pitch and white pine with a heavy accumulation of brush on the ground. The fire crowned heavily in the remaining trees but dropped to the ground and burned into stumps, duff, and brush piles.

The head of fire was controlled with backfire while the west flank was knocked down with water along the edge of a county road. In order to save time, additional cost, and burned area, it was decided to flank the east side without aid of a fire line, rather than to drop back to an old woods road and burn out, which would have increased the burned area by a third.

Twelve hundred feet of fire edge was completely extinguished by approximately 400 of the 600 gallons of water with a 1 percent solution of wetting agent carried in a fire truck with booster pump. The fire was burning in medium to heavy pine slash, some windrowed and some in piles. Many stumps were on fire. No brushing out was done.

Two hundred gallons of "wet water" from the aforementioned fire truck was used in 20 back-pack pumps in extinguishing the 50 or more spot fires which occurred. A second fire truck with a load of 450 gallons of "wet water" was used in mopping up for a width of 250 feet along the entire 1,200 feet of fire edge plus an additional stretch of 1,500 feet at the head and other sectors needing attention.

The ranger was not convinced that the fire was safe or out after the corral and mop-up had been completed 6 hours later so he left a patrolman for an additional 4 hours. No evidence of a holdover fire was noted later where the wetting agent had been used.

There is little point in attempting to show a saving in cost of suppression because of the many variables involved although it is believed a considerable saving in mop-up time might be apparent if figures were analyzed. It does suggest certain possibilities in control without the use of a raked, dug, or plowed fire line. Where the local practice by State or town warden crews does not emphasize line-building in control or mop-up, the use of a wetting agent should be most helpful in keeping burned area to a minimum. Incidentally, the fire described reached a size of 35 acres. Three wardens and thirty-two crewmen were used on the fire in addition to the two fire trucks. Total cost of fire was $137.30. Damage was estimated at $10 per acre or a total of $350.

On April 30, 1947, the effect of a wetting agent in the conservation of water on short lengths of unlined linen hose was demonstrated. By attempting to pump untreated water through 200 feet of dry hose at approximately 100 pounds pressure per square inch, it was found that the loss was so great due to leakage that the 40 gallons used failed to reach the nozzle, while the same quantity of water with a 1 percent solution of a wetting agent reached the nozzle end and 15 gallons came through with considerable force. No predictions will be wagered as to results with use of more water and longer lines of hose, greater pressures, etc. It is interesting to note, however, that there was no apparent difference in loss of liquids in a similar test with the use of mildew-treated forestry linen hose.

Modifying the Trapper Nelson Pack Board.—The following suggestion for modifying the Trapper Nelson pack board may be of some value to those who find frequent occasion to use it. Although I find it more comfortable for heavy loads than any other I have tried, including the Army frame pack, it has one serious drawback. It is poorly suited to use off trails, or on narrow, poorly cleared trails through heavy brush or undergrowth. The upper and lower ends of the frame supports catch constantly in the brush, throwing the wearer off balance, causing an excessive waste of energy, and materially slowing down progress.

By sawing off the upper and lower ends of the supports flush with the pack bag and by shortening the metal pack pins correspondingly, the above inconveniences should practically be eliminated. The loss of the extra lengths on which to hang rope or other odd items will, I believe, be more than offset by the advantages wherever any considerable amount of back-packing has to be done through heavy brush. BERNARD FRANK, *Washington Office, U. S. Forest Service.*

PLYWOOD WATER TANK

H. C. Buckingham

State Forester, Maryland

During the War when many kinds of metal were difficult to obtain because of the needs of the armed forces, forestry services were hard pressed for suitable water tanks to be used on forest fire patrol trucks. Many fire control agencies use ½- or ¾-ton pick-up trucks as the first striking units in forest-fire fighting. One such truck used by the State of Maryland is equipped with a fan-belt rotary-type pump, a 75-gallon water tank, 300 feet of ¾-inch rubber garden hose, a supply of hand tools for 6 to 10 men, and two-way FM radio.

Since corrosion-resistant metal was not obtainable, Maryland experimented with 50-gallon steel drums, cut-down fuel oil drums, and so forth. Finally at the suggestion of Senior Forest Supervisor Paul H. Seward, a waterproof plywood tank was constructed. This pilot model met the needs—rust free, watertight, shakeproof, easily installed, easy to construct, and economical.

The standard tank adopted is 47 inches long (the width of the pick-up body), 26 inches high (the distance from the floor to the bottom of the rear glass), and 19 inches wide. The reason for the narrow width is to permit the installation of a tool box behind the tank long enough to accommodate a standard fire rake. The ends, top, and bottom of the tank are of 1-inch waterproof plywood and the sides of ¾-inch waterproof plywood. One baffle was installed to prevent bulging and to reduce shifting of the load. The plywood was fastened to a 1½-inch frame of white oak with marine glue and galvanized screws set about 2 inches apart. In assembling the tank the top was put on last. This was to permit wiping excess glue, which would clog the pump, from all inside joints.

A 2-inch flange was used as an inlet in the center of the top of the tank. A 1-inch flange was placed on one end and a hole drilled through the pick-up body to permit a 1-inch pipe connection to a three-way cock installed on the side from which hose lines were taken to the pump.

The materials costs between $20 and $22. Two men can build a tank a day. Regular forest guards are assigned this work on wet days. An 18-gage stainless-steel tank of the same outside dimensions holds approximately 100 gallons or about a third more. It costs, however, about $92, or more than four times the cost of a plywood tank, disregarding contributed time of guards.

So far no tank has been discarded because of structural failures—none has warped, twisted, or opened at the seams. Once on the way to a fire, a truck upset and the tank, half full of water, was tossed several feet. After the truck was righted, the tank was replaced and used on the fire. No leakage resulted.

The only drawbacks to this tank are the volume of space used by the plywood and frame, and the fact that eventually the tanks become waterlogged and gain considerable weight. Experiments with thinner plywood to reduce weight and increase capacity are now being made.

SLASH DISPOSAL IN SELECTIVE CUT PONDEROSA PINE STANDS

Merle S. Lowden

Forest Supervisor, Fremont National Forest, U. S. Forest Service

Slash disposal is big business. As millions of acres of timberland are cut over in this country each year foresters, loggers, lumbermen, land owners and others are concerned that the hazard created in logging receives proper attention. An important requirement in changing virgin stands to managed forests is to keep protection costs in the cut-overs at a low figure. Costs of protection should be as low as is reasonably possible if forestry is to be profitable. The amount and type of hazard reduction done after cutting has a vital effect on these protection costs. There will likely always be two schools of thought as to the amount of effort that should be put into hazard reduction and that which should be devoted to extra protection. The ramifications of that argument are many. Regardless of the good points put forward by the "extra-protectionists" there still seems to be a place in protection for disposal of some slash. The insurance against large fires which prepared fire-breaks give cannot be completely depreciated.

Much of the cutting in ponderosa pine stands is now by tree selection with 30 to 70 percent of the stand volume removed. Adequate treatment of the slash hazard in this cutting presents many problems in both technology and economics. Study and experimentation in new and different methods may bring dividends far above their cost.

In carrying out a $60,000 annual business in hazard reduction on the Fremont National Forest during recent years our men have tried to devise new methods, practice economies, improve practices and in every way get the most in future protection from every dollar spent. Many of our ideas are not new. We've copied or adapted devices of others that looked good to us. Many foresters on other Federal, State, or private protection units likely have developed methods in advance of ours or at least ones they strongly advocate. Because we have had a large job of a particular type it seemed that our methods might be of interest to others.

Our aim in slash piling has been to establish prepared firebreaks along roads or otherwise at not too widely spaced intervals from which to backfire. In doing this we pile about 10 percent of the total cutover area. We don't expect to prevent fires by piling and burning slash but we do hope to reduce the burned acreage.

Planning the Job

We consider careful planning to be most important in all hazard reduction work. Planning means a visualization of the desired product and then setting up step by step procedures to get this product. Planning starts with a good base map of the forest area to be cut.

Our maps for "rushed" wartime cutting were not as good as we wanted. Logging plans are easier to make with a good map. A good base becomes the foundation for road plans, cutting progress maps, hazard plans, and future detailed fire control maps.

From the logging plan on a good base map an appraisal of the hazard reduction job can be made. This is necessary in most of our national forest timber sales where an advance cooperative deposit is taken to cover slash disposal. Such deposits have varied from 25 to 40 cents per 1,000 board feet of timber cut. The exact amount is based on an appraisal of the work needed.

Our hazard reduction plans are of two types: the over-all plan for a unit and the detailed plan for an individual project. An over-all plan may be for a unit as large as one or several townships. Project plans are usually for the work one crew will do in a season or a contractor will do in a reasonable time of possibly 1 to 3 months. The over-all plan consists of a map showing all roads and firebreaks on which slash is to be piled with such explanatory material as necessary to make the map clear. The plan outlines whether contractors or hired crews are to do the work, whether machine or hand methods are to be used and when the work is to be done.

Project plans consist of a plan map, narrative instructions covering specifications of the job, who is to do the work, when it is to be done, and a financial plan or budget. A short statement covers the extra protection planned for the area until the hazard is appreciably reduced.

Early in planning it is necessary to determine who will do the slash job, the operator or the Forest Service. Several years ago this work was usually assigned to the operator by the terms of his contract. We have gradually quit this practice. Now practically all our slash is covered by cooperative deposits and the work is done by our crews or is contracted. Where the operator did the work it was necessary to write careful specifications for the job. The work required close supervision and there was likelihood of misunderstanding. There are many advantages to the cooperative deposit method such as flexibility of funds, assurance of getting the exact type of work desired, having available labor to do other project work which is not of sufficient amount to support a crew, and the value of supplying off-season work for protection personnel.

Road construction slash is a particularly perplexing problem. Our former practice was to have the operator care for such slash. This did not always prove satisfactory. There is a likelihood of misunderstanding when the logging operator handles the construction slash and the Forest Service handles the logging slash. If road clearing is done well in advance of grading as should be done, the operator can pile the road debris without interfering with later work on logging slash. There are strong arguments for requiring logging operators to do this and if it is their responsibility unnecessary "pushover" tree messes are not likely to occur.

Snag Felling

An important part of the hazard reduction job is felling snags along roads, in other critical locations, and on firebreak strips. Snags not only are bad to scatter fire and hasten its spread but if not felled are there to come down later and block roads. Location of the snags to be felled is an important part of the hazard plan. Our practice has been to fell all snags that would reach or that are within 100 feet of roads or bulldozed firelines to be piled. In addition, critical snags along ridge tops, around recreation or other public-used areas are felled. Practice has varied on different cutting areas as to whether we or the operator did the felling. Through the period of employment shortages in the war years the usual practice has been operator felling. They had trained fallers on the job and could get the required work done. Performance bonds assured that the required snags would be felled.

Many methods of snag felling have been used with varied success. As in felling green timber there doesn't appear to be a great saving in costs of machine felling over the hand method but it does take less men. Burning down is quite successful for many snags, particularly those referred to as "buckskins" and any with large cracks or pitch bleeding. Machine pushing works well in light soils, particularly those of the pumice type in the north end of our forest. Our largest operator there has pushed over snags along hundreds of miles of road during the last few years. There is need for more study on comparative costs for the various methods of snag felling. Present figures point to pushing on light soils, burning those that burn easily on heavy soils, and machine felling the balance. Burning with "goop" offers good possibilities and so far is working out well. It is being given a thorough trial to determine the best methods of use.

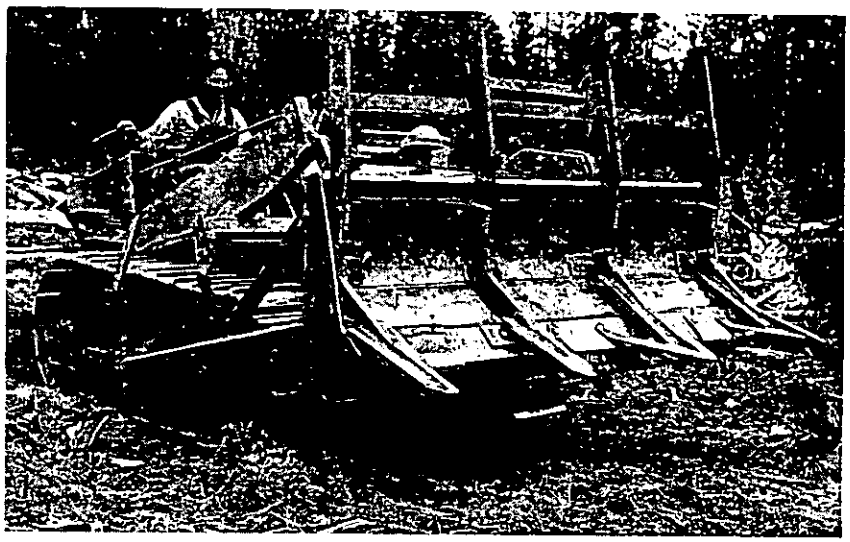
Managing the Slash Job

Each of our district rangers is directly in charge of the disposal job on his district. He prepares the work plans and financial budgets. These are approved by the forest supervisor and then placed in execution by the ranger. If it is a contract job, he has charge of preparing bid maps, staking the area in the field, and inspecting the contractor's work. On one district where the job is particularly large a project foreman supervises slash disposal work under the general supervision of the ranger. Timber sales personnel may assist in some details but we have found it best not to interrupt their primary timber work. Financial control is maintained through a project budget prepared by the ranger and approved by the supervisor. This sets up an allowance of man-days, mileage, supplies, and other predetermined expenses. Record of the progress of work is maintained by the foreman on his plan map and by the ranger for all projects on a district map. For a large unit on which several contractors are working, a map is prepared showing each contract in a different color. Progress is kept by putting a wavy line over the planned work line.

Slash Piling Methods

Methods of slash piling have changed greatly on this forest in recent years. The work was formerly done entirely by hand with hired crews. As wartime employment problems increased and the quality of available help decreased, contracting by the acre was encouraged. The bulk of our work is now done in this manner. Detailed specifications for piling are included in the bid requirements.

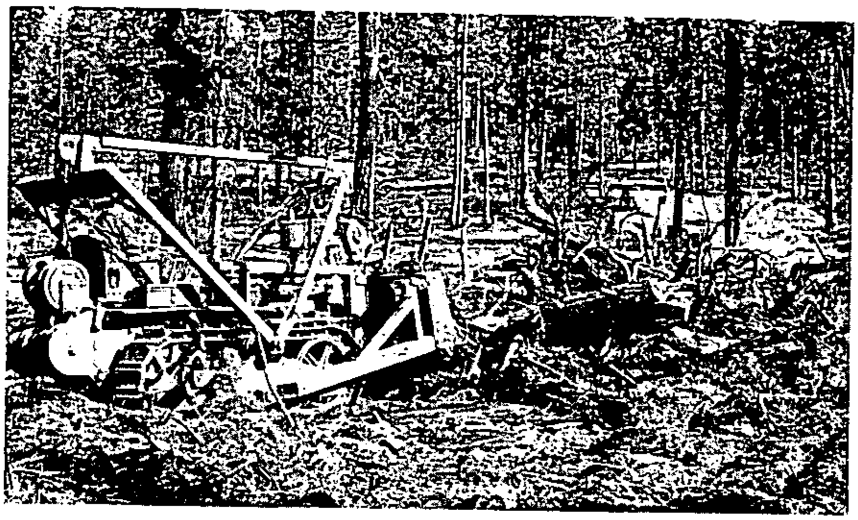
Hand piling has followed conventional methods except we have tried to take advantage of existing logs, uprooted snags and slash concentrations and to pile on them. Supervision of employed crews and close inspection of contractors is important. The real test of whether piling is good or bad comes when the piles are burned. Loose piles wet through quickly and after heavy rains or snowfall are hard to burn. Roughly a pile that can be seen through is too loose. We have tried to get the piling and burning done by the same persons but that has proven difficult. Contract pilers are often itinerants or at least want their money soon. They can't wait for it until the burning season. Sometimes we have been able to hire them later for burning work and usually it means better future piling. After a man has tried to burn wet loose slash he makes better piles. Hired crews have been mainly students and they are gone when the burning season arrives. The period when successful swamper burning can be done is short.



D–4 tractor equipped with slash-piling teeth on bulldozer blade. Note heavy shoe under blade which prevents teeth from digging in ground. Designed by private contractor working on Forest Service contracts.

In 1944 considerable experimenting was done with machine piling and this work readily sold itself. Different tractors were fitted with a variety of special teeth on the dozer blade until what seemed to be the correct set-up was worked out. Employment of operators at Government pay for this job proved difficult so other means were tried out. A local tractor owner was persuaded to equip his D–4 Caterpillar with the special teeth and try a contract. He did one contract and was anxious for more. This procedure is now well established and we have been very gratified with results.

Machine piling in general does many things in a better way than hand piling. It gets all the heavy fuels such as logs, large limbs, and uprooted stumps into the piles to be burned. Piles are larger and can be put in openings. There should be less damage in burning. With a little care on the part of an experienced operator there need be but little damage to reproduction or valuable browse plants. Our machine-made piles have burned well. At the same time it has proven to be a cheaper method per acre. For 1945 and 1946 machine piling has cost us from $9.50 to $10.50 per acre with an average of $10.20. Hand piling in the same period has varied from $8 to $14 per acre with an average of $11.11. These are contract figures. Machine piling with our own operators has run a little less and hand piling with crews a little more than by contracting. Contracting takes less overhead and is a means of accomplishing a job when hired help cannot be obtained. We hope to get more private owners to equip their bulldozers for piling slash and thus get more competition and more available equipment. Machine piling has the added advantage of providing a very good suppression tool where it is likely to be needed during the fire season. After watching the work of various sizes of bulldozers from a small Clarkair to a large D–8 we favor a medium size.



D–4 tractor equipped with slash-piling teeth on bulldozer. Note heavy material being placed in pile.

In our piling along roads or skid trails we usually work 100 feet on each side after the snags have been felled. A set distance aids inspection of contract work and requires less supervision. With our own crews we often vary the strip width to meet hazard and need conditions. Our chief problems beside loose piles are those that are too small or those piled too close to live trees.

The Burning Job

Our burning methods have varied as widely as have our piling procedures. We have tried many types of torches or burning machines, impregnated sawdust and planer shavings, goop, flame throwers and old fashioned methods of kindling. Dryness of slash and weather conditions determine the best device for a particular job. It is difficult to get ideal conditions between the time fire will not spread from burned piles until the piles are too wet or the snow too deep. This time is usually short. When the slash is fairly dry we have found a good hand flame torch utilizing air pressure or the drip torch to be the best. Several types are suitable. Sawdust or planer shavings soaked with a mixture of one-half gasoline and one-half Diesel oil is good on tight piles even though wet by rain or covered with up to 4 inches of snow. We mix the materials in open barrels, pack in buckets and distribute with scoops made from tin cans. This method is better than hand torches on fairly wet material but slower than the torches on drier slash. Goop seems to work best on very wet material or heavy chunk and logs. It is slower than the other two but has a real place when used liberally on large piles, logs, whole trees or any wet material. We've tried several "machine" burners but haven't yet found a fully successful one. With improvements or perhaps other types we have not used they undoubtedly have a real place in slash burning.

Immobility, initial cost, fuel cost, and mechanical faults have been the chief drawbacks to those we have used. With further development they will likely gain in favor. There is a large field for experimentation with a cheap, easily used chemical burner on the order of a fusee but more powerful and longer burning.

We have a burning plan for each district and try to hit the job hard when conditions are right. Fortune smiled on us in 1946 and we got nearly 100 percent of our piling burned. On one district the crews burned 87 miles piled on both sides of roads or plowed lanes in 1945 and 59 miles in 1946.

Other Measures

Following logging we try to get all roads signed as soon as possible. Many of our large areas are a maze of roads which would baffle a taxicab driver. We name main roads and sign them with termini and distances. On other roads we use a numbering system from 1 to 100 or more. Units distinctively separated have a different series of numbers starting at one. Every road junction or takeoff is signed. Road numbers are shown on the detailed fire maps. These maps cover all cut-overs and when completed will cover the entire forest. We have a key map for the forest showing the units covered or to be covered with detailed maps. Besides showing all roads with their name or number the maps show physical features of value as fire control information and the location of prepared firebreaks. Lookouts, firemen, or other personnel working in or near a unit have the map for it.

In planning protection of cut-overs there are of course many other aids that must be considered such as water developments, personnel, equipment, detection, closures, patrols, prevention efforts, roads, and cooperation. But those are other stories.

INFORMATION FOR CONTRIBUTORS

It is requested that all contributions be submitted in duplicate, typed 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 unit.

Any introductory or explanatory information should not be included in the body of the article, but should be stated in the letter of transmittal.

Illustrations, whether drawings or photographs, should have clear detail and tell a story. Only glossy prints are acceptable. Legends for illustrations should be typed on a strip of paper attached to illustrations with rubber cement. 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 legend to aid in later identification of the illustration. 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. Do not submit copyrighted pictures or photographs from commercial photographers on which a credit line is required.

India ink line drawings will reproduce properly, but no prints (black-line prints or blueprints) will give clear reproduction. Please therefore submit well-drawn tracings instead of prints.

The approximate position that illustrations bear to the printed text should be indicated in the manuscript. This position is usually following the first reference to the illustration.