

Controlled Burning on the Fort Apache Indian Reservation, Arizona

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THE Fort Apache Indian Reservation in east central Arizona has an area of approximately 1.7 million acres. Commercial timber covers 718,000 acres at elevations from 6,000 to 10,500 feet with a volume of 4.2 billion board feet. Ponderosa pine, the principal species, occurs in pure stands up to 8,500 feet on 632,000 acres of which approximately 300,000 acres is in residual stands. At higher elevations the pine occurs with Douglas and white firs. Spruce occurs in moist sites up to 11,000 feet.

Non-commercial timber consisting of juniper, ponderosa and pinon pine comprises an area of 353,000 acres and also includes numerous brush species. The invasion of juniper and various shrubs into the rangelands is a well known problem. The lower fringe of the commercial pine belt also has a serious invasion of juniper (Fig. 1).

Successful fire control for 4 or 5 decades on the Reservation and adjacent forests has allowed a heavy mass of surface fuel to accumulate in both virgin and residual stands. Dense seedling and sapling stands, some up to 30,000 stems per acre, are to be found across the entire 80 mile length of the pine belt on the Reservation.

The once substantial forest forage supply on the Reservation is now only in the old cowboys' memories. The intense root competi-

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FIG. 1. Fort Apache Indian Reservation. Salt Draw Rocky Mountain juniper invasion due to fire exclusion. Beneath this ponderosa pine were 96 junipers, 80 of which were killed by a fire in April, 1954. Fourteen juniper seedlings have since appeared. Photo June, 1969.

tion of this abnormal understory is making obvious, accelerated rate of mortality among the mature members of the stand.

During the decade of 1955–1964 the average number of fires controlled on the Reservation was 263 with 1,798 acres burned per season, and almost entirely in the ponderosa pine type.

Controlled burning on the Reservation was motivated by the destructive wildfires in the southwestern forest region beginning in the late 1940's both on and adjacent to the Reservation. In 1948 and 1950 the McNary No. 1 and Faught Ridge fires on the Reservation killed 4,000 acres of pine. Between 1948 and 1964 8,600 acres have been totally denuded. The southwestern forest region including Indian land during this period had about 115,000 acres of timber destroyed or heavily damaged. The Gila Black Range fire of 1951 covered

40,000 acres. Others ranged from 10,000 to 22,000 acres on the Lincoln, Apache and Sitgreaves National Forests.

On August 17, 1905, C. W. Crouse, Superintendent of the Fort Apache Agency in his annual report for the preceding fiscal year, mentioned the great drought of 1903 and 1904, "followed by floods the like of which was never known to anyone now living in this country." He states further, "at the beginning of the fiscal year this reservation had its greatest forest fires; during a period of six weeks the fires were beyond control. These fires were higher in the mountains and far from the agency or the Indian homes and in places almost inaccessible. There was not much damage to the large timber, but the younger growth was almost destroyed. The practicable and effective remedy is to employ six or eight Indians to ride the mountain ranges at appointed places and be on the lookout for fires."

The fires burned approximately 80,000 acres of which 20,000 acres of the spruce-fir type were killed on north and northeast facing slopes. Timber on the south and west slopes, mainly ponderosa pine but including white fir, Douglas-fir and limber pine survived. This was due to the intermittent natural fires of 5 to 10 year frequencies that kept surface fuels to a tolerable level in the pine type which stood the test of that summer of 1904 (Fig. 2).

The spruce-fir type, due to its more moist situation has no fuel reducing fire regimen, as enjoyed by the opposite pine exposures. At elevations of 9,500 to 11,000 feet, under more moist conditions, surface fuels disintegrate rapidly and summer rains appear soon after the snow melts. The 1904 fire failed to penetrate this higher portion of the forest.

In June 1951 the 19,000 acre Escudilla Mountain fire on the Apache National Forest burned at elevations from 7,600 to 10,000 feet both in the pine and spruce-fir types during this one of the severest fire seasons in recent history (Fig. 3). The fire behaved much as in the case of 1904 at higher elevations, but the pine stands with an abundance of surface fuel was almost entirely killed. At this time several other fires were burning, including one of 40,000 acres in the Black Range to the south.

Controlled burning in ponderosa pine began on the Fort Apache Indian Reservation in 1948 following the successful work of Harold

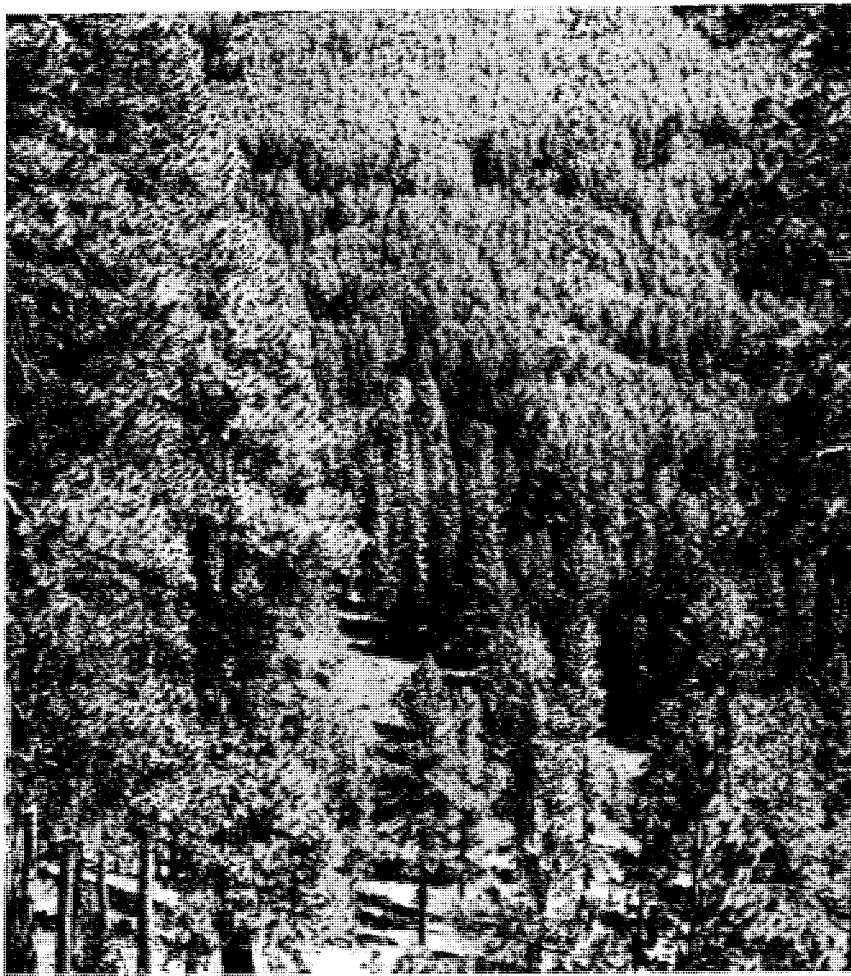


FIG. 2. Fort Apache Indian Reservation, North Fork, Diamond Creek showing north slope aspen stand resulting from destruction of spruce-fire of 1904. This fire burned south slope ponderosa pine in foreground which survived due to intermittent natural fire reduction of surface fuels. The spruce-fir slopes are normally too damp to carry fire except in extreme conditions as in 1904. This pine slope was logged in 1965. Elevation, 8,800 ft. Photo June, 1969.

Weaver on the Colville Reservation in central Washington several years earlier. The program at Fort Apache obtained in the consent of the Tribal council, several of whom were cattlemen who strongly favored the idea, but not particularly upon the Bureau's stated objective of reducing the flammability of the pine forest. Controlled burning plans are now required to have the approval of all Tribal and Bureau branches concerned with land, water and recreation.

Due to the dense understory, abundance of dead fuels and steep topography foresters were at the outset extremely apprehensive of their task to apply the fires. Initial treatments are begun only after November first, the onset of freezing nights and clear cool days.

Areas to be treated are defined by roads, streams, washes or types

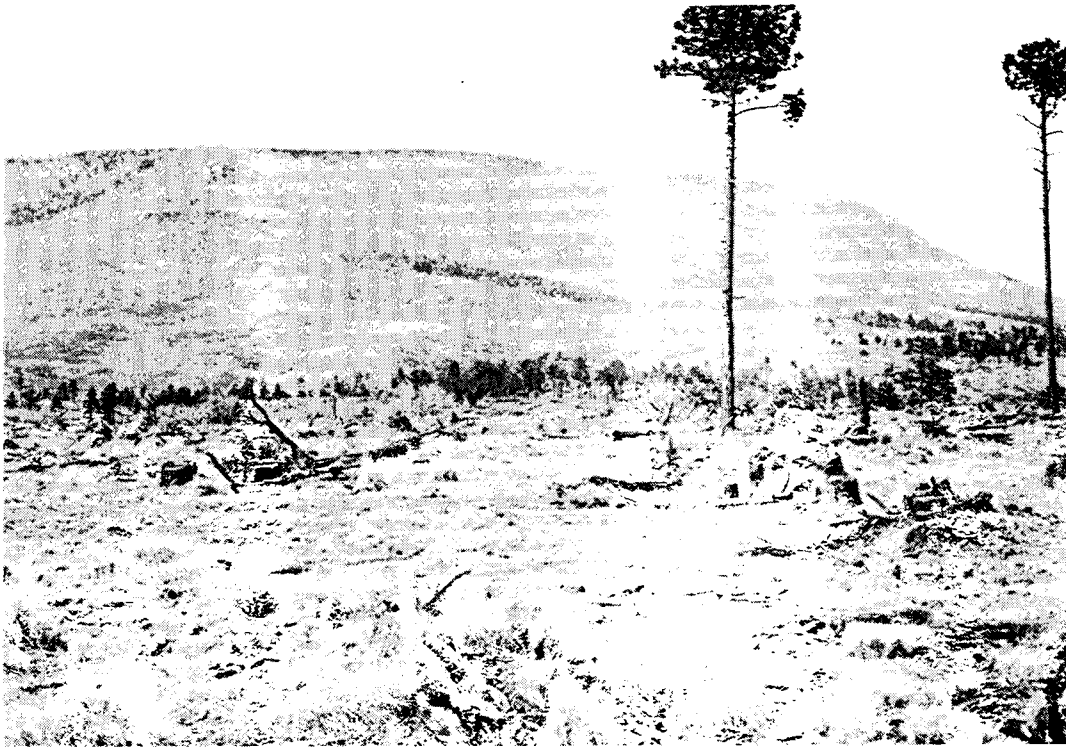


FIG. 3. Apache National Forest, Escudilla Mt., Summit Elevation 10,800 ft. viewed from east. Burned by wildfire of 1951. Spruce-fir is from mid-slope and higher. Foreground and to mid-slope was mature ponderosa pine under fire protection for several decades. Nurse crop of aspen can be seen on slopes. Photo June, 1969.

through which fire will not pass such as aspen and spruce. The plan-
ning takes into account the following:

1. Areas of high fire occurrence
2. Timber values, and hazards
3. Protection of homesite sub-divisions
4. Desires of Indian stockmen and others
5. Topography and accessibility
6. Risks in areas and routes of intense human activity

Execution of the plan after approval is as follows:

1. Earliest burning date: After November 1 on initial burns, frosty nights and clear days. On previously treated areas, after October 1. No burning is done in spring.
2. Dry fuel: For optimum burning conditions, duff and litter

should be dry clear to mineral soil. However, fire will spread when surface is dry and lower portions damp, consuming only the upper needle layers. Optimum hazard stick fuel moisture 7 to 10 percent.

3. Burning plan must specify backstops of roads, streams, meadows or aspen against which burning will commence for each specific project area.
4. High points, such as butes and ridges, will be ignited first so that there will be no uphill runs. If an uphill run does develop men are to ignite short strips of 50 to 100 feet intervals above the head of the run to the ridge top. This checks the intensity of the run very considerably.
5. General progress of burning shall be from northeast to southwest.
6. Fences and improvements will be protected by hand lines, plowed lines, or tank truck in advance or as needed, and the Bureau will be responsible for damage to fences and improvements incurred as a result of burning.
7. Strips parallel and at right angles to the prevailing wind may be set from the backstop 100 yards to $\frac{1}{8}$ mile apart. There will be no strip firing on slopes.
8. Starting lines must be patrolled until they are completely burned out. One man must be in each general area while the fires are burning.
9. A tank truck and fire tools will be located in each area being treated.
10. A hygromograph and hazard stick station will be maintained at the McNary Forestry Station.
11. Personnel will be briefed at the beginning of treatment at each project area.
12. Notices will be posted warning that burning is to be done only by qualified Forestry personnel.
13. Burning will be accomplished in one enumerated area at a time except when adequate personnel is available to supervise and to insure proper treatment and control of two or more areas simultaneously, and sufficient heavy equipment and tankers are stationed in each area under treatment.

BURNING ON FORT APACHE RESERVATION

CONTROLLED BURNING RECORD

Year	First Burn Acres	2nd Burn Acres	3rd & More Burn Acres
1948	180		
1949	2,800		
1950	65,000		
1951	600		
1952	1,200		
1953	5,800		
1954	42,500	12,500	
1955	—	—	
1956	28,500	3,600	
1957	—	—	
1958	4,400		
1959	140	70	50
1960	2,720	1,780	480
1961	—	80	—
1962	10,260	3,760	
1963	4,560	9,120	5,200
1964	6,210	5,060	1,840
1965	6,280	18,320	1,280
1966	48,640	—	—
TOTAL	<u>229,790</u>	<u>54,290</u>	<u>8,850</u>

RESULTS

The objective of controlled burning is to reduce the flammability of the forest. All fire control men observe ignition of the canopy of small trees from the burning of surface fuels. The chain of ignition is then from these smaller crowns into those of larger trees and is known as the "dependent crown fire." It advances by showering burning material onto adjacent surface fuels causing continuous flare-ups of a fraction of an acre to several acres at a time. The "independent crown fire," once in motion, does not require surface fuel heat to continue after its origin in the same manner from burning surface fuels. Controlled burning deals with the fuel problem in two ways:

1. Reduction of surface fuel volume.
2. Raising of the green foliage level of sapling by scorch.

Measurements on the Blue Mountain Plots showed that surface fuels of all classes were reduced by 57 percent. These were burns made on September 30 and October 10, 1950, much earlier than is

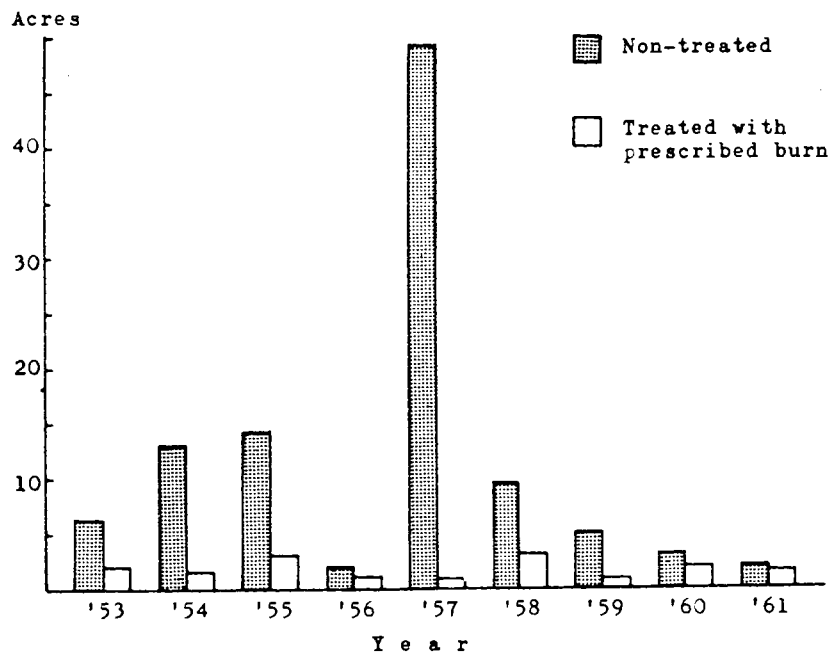


FIG. 4. The average size of wildfire on all non-treated area is compared with the average size of wildfire on area that has been treated with a prescribed burn (over parts of the area re-treated with prescribed burns). Note that for each year the average size of wildfire is larger on the non-treated area.

now recommended. Generally, less than 50 percent of surface fuels are consumed.

In the seriously overstocked seedling and sapling stands thinning by controlled fire has not reduced this population as much as desired. In some areas a good job has been done but the acreage is small. Concentrations of heavy down fuel have caused flareups killing areas of $\frac{1}{10}$ to 10 acres. Of 229,790 acres of initial treatment, an estimated 300 acres of trees of all sizes have been killed by such flareups.

The rate of advance of controlled fires has been measured over periods of several days. The rates have been between $\frac{1}{4}$ and $\frac{1}{3}$ miles per 24 hours.

The principal result of controlled fire is the reduction of rates of spread by wildfires. While records show that the incidence of wildfires after treatment is reduced, especially the first 3 or 4 years after treatment, this result diminishes with the new accumulation of litter. The scorching of low foliage of sapling stands has a longer lasting effect in reducing crown ignition in the event of future fires.

BURNING ON FORT APACHE RESERVATION

A study by Professor Philip N. Knorr of the Department of Watershed Management, University of Arizona was made from the individual fire reports for the years 1953 through 1961, on 1,852 fires in the untreated area and 439 fires in the controlled burn area. The results in his report are shown graphically in Figure 4.

The effect of controlled burns in suppressing wildfires is readily noticed by fire control men in many hundreds of fires in the treated areas since 1948. Only minor losses have been recorded in these cases. While no calculation was made percentage-wise for this 9 year period it is estimated that the reduction in the average size of fire in the treated area is easily over 60 percent.

New improved methods and equipment have entered the fire control picture. They are expensive and all other costs may be expected to rise for an indefinite period. Fuel reduction by controlled fire is yet the most decisive action forest land managers can take. By using their pre-suppression personnel, costs on the Fort Apache Reservation have been less than 20 cents per acre.

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