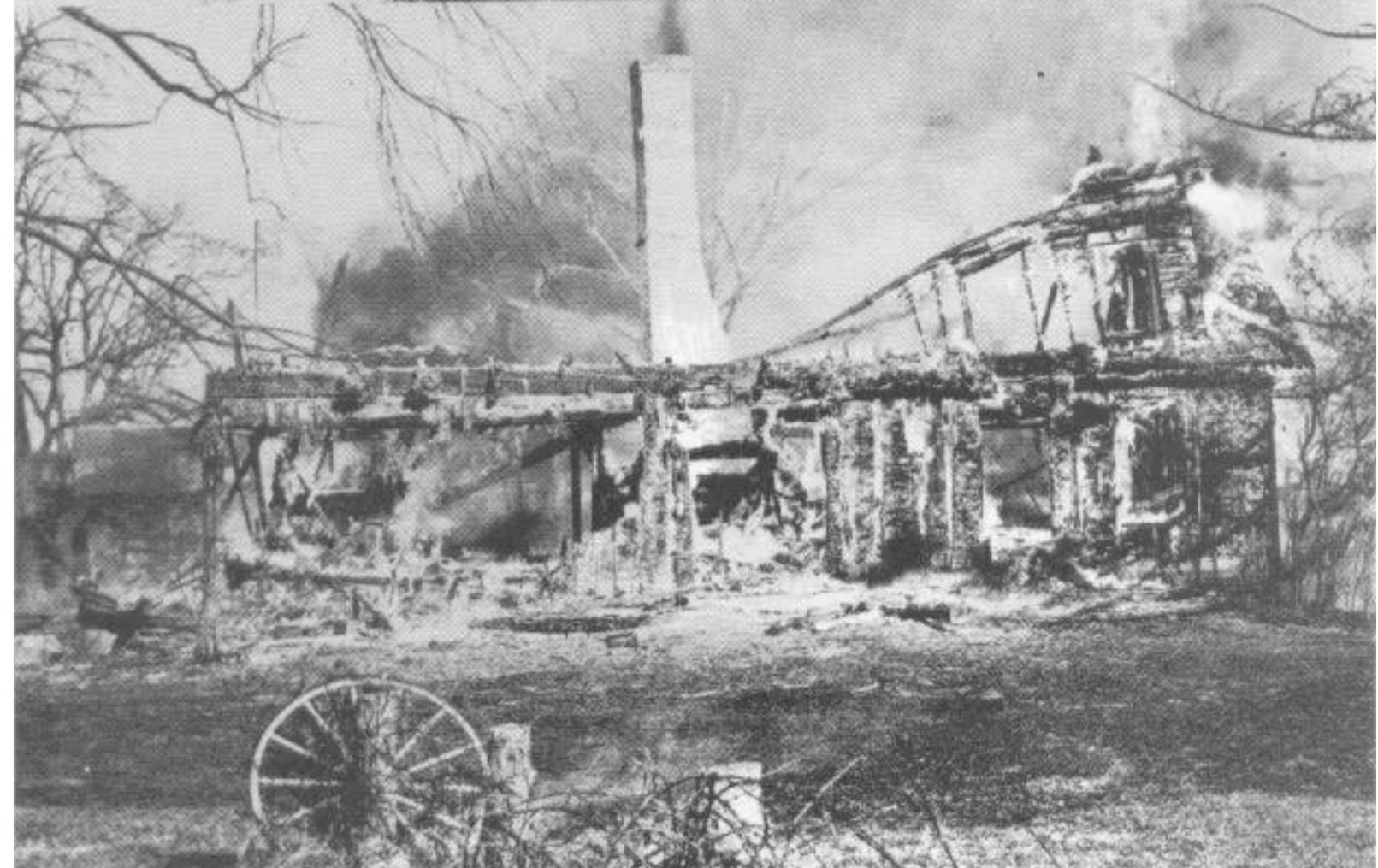


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13

RURAL FIRE PROTECTION

About a quarter of the American people, according to the 1970 census, live on the Nation's 420 million acres of rural land.¹ For many of these Americans, fire protection is woefully inadequate. The same is true of many suburban dwellers whose political institutions and community services have not kept pace with rapid population growth.

Rural areas and rapidly developing suburbs can be plagued with many problems: insufficient water supplies, lack of adequate building codes or too few inspectors to enforce them, insufficient funds to pay firefighters or replace antiquated equipment. Even where a strong volunteer fire department exists, inadequate alarm facilities and great distances to fires often result in response times of 15 to 30 minutes or more.

Because many volunteer departments keep scanty records or no records at all, the seriousness of the fire problem outside of metropolitan areas is difficult to gauge. According to the Department of Health, Education, and Welfare, the fire fatality rate for white Americans in non-metro-

politan areas is half again as great as the rate for whites in metropolitan counties (4 per 100,000 versus 2.7 per 100,000). Among non-whites, the disparity is even greater: 15.3 per 100,000 in non-metropolitan counties, 8.1 per 100,000 in metropolitan counties. In New Hampshire, where 56 percent of the land is classified as urban, 29 out of the 32 deaths from fire in 1971 occurred in rural areas.

Fire officials in New Hampshire estimate that if all rural homes had early-warning detectors, rural fire deaths would decline by as much as 75 percent. In Chapter 11 we recommended that model building codes call for early-warning detectors and alarms in every dwelling unit; in Chapter 16, in addition to urging all Americans to install such devices, we recommend incentives to encourage their installation. Here it is appropriate to note the special plight of many of America's rural and suburban dwellers. As in urban areas, most rural fire deaths occur at night during sleeping hours. A few minutes' difference inawakening to a fire can be a matter of life or death. But what is especially critical for rural dwellers is that if they awake belatedly and are trapped, it may be many minutes before the fire department arrives to rescue them. In the event

¹ By including communities of up to 10,000, the congressional authors of the Rural Development Act of 1972 encompassed 37 percent of Americans within their definition of rural.

of a power or telephone failure, even notification of the fire department may come too late. With special urgency, **the Commission recommends that rural dwellers and others living at a distance from fire departments install early-warning detectors and alarms to protect sleeping areas.** Publishers of newspapers and magazines for farmers and country dwellers could perform a valuable public service by publicizing the importance of these devices.

The best fire equipment, properly located, cannot be effectively utilized without well-trained firefighters. While many rural volunteers receive

excellent training, there are many who do not. The risks to these men can be reduced and their effectiveness improved by proper training. The Commission received many pleas for improved training in our survey of the Nation's fire departments. Unlike those in urban areas, one rural fire department usually cannot afford to support a fire school. The consolidation of fire departments into county-wide or regional jurisdictions, as we urged in Chapter 3, would permit better training programs at less cost to the individual volunteers or their sponsoring departments. Strengthening of training programs would also come about



A couple surveying their destroyed home typify the plight of rural citizens with inadequate fire protection.

through the activities of the proposed National Fire Academy and under Title IV of the Rural Development Act.

The Rural Development Act

In its provisions for revitalizing the economy of rural America, the Rural Development Act of 1972 recognizes that fire protection in rural areas must grow apace. One section provides loans for water supply systems for industrialized areas being constructed in rural communities. Title IV of the law, called Rural Community Fire Protection, provides for assistance in organizing, training, and equipping local fire protection forces. The assistance is both technical and financial, with the Federal Government assuming up to 50 percent of the costs. Full and continuing funding of the fire protection provisions of the Rural Development Act is, in the Commission's judgment, essential.

The Rural Development Act also specifies that all applications for proposed water systems and other essential community fire protection facilities must be submitted to the agency that has been designated by the State as the appropriate clearinghouse. **The Commission recommends that U.S. Department of Agriculture assistance to such projects be contingent upon an approved master plan for fire protection for local fire jurisdictions.** (The master plan concept is discussed in detail in Chapter 4.) This recommendation is not meant to preclude Federal assistance, including financial assistance, to help local jurisdictions develop master plans for fire protection. Wherever possible, the master plan should be the product of county-wide or regional coordination.

There are several reasons why master plans for fire protection are vital for rural communities. The first shopping center or first factory in a rural

area can represent a huge jump in the demands that could be placed on the fire department's suppression capabilities. It is especially important to plan the location of future fire stations to minimize the distances fire engines must travel and to provide for built-in protection. Since funds, whether tax-based or volunteer, are generally scarce in rural areas, coordinated planning is needed to maximize the payoff in fire protection.

There are special problems to which master plans for fire protection in rural areas should be addressed. One is transportation fires, as discussed in Chapter 12. Provisions should be made in the plan for training and for equipment adequate to handle these fires. The second special concern should be buildings that have outlived their usefulness. Rural areas abound with them: schools not needed because of consolidation, village stores closed by nearby shopping centers, and farm buildings now unused because a number of small farms have combined into a large one. These structures are enticing to mischievous arsonists and to property owners for whom burning down a building is convenient disposal or even a source of profit. The master plan for fire protection should specify the limits of fire department responsibility when such fires occur.

Only through planning for fire protection will the impact of new structures on insurance and fire service costs be controlled. Only in this way will the responsibility of the public and that of the private sector (for example, company-supported fire brigades in industrial plants, automatic extinguishing systems in larger buildings) be specified. Only in this way will a fire in a shopping center or other large complex no longer be the first time anyone realizes the water mains are too small and the fire companies too few to stop a controllable fire from becoming a major disaster.



14

FOREST AND GRASSLAND FIRE PROTECTION

Despite the urbanization of the United States, vast areas of the country still resemble the primeval wilderness. Of the two billion-plus acres that make up the Nation, more than half consist of forests and grasslands. (Cities, highways, and waterways constitute only 500 million acres, farmlands and small wooded lots roughly the same amount.)

In recent years, forest and grass fires, ignited at the rate of about 300 a day, have been destroying an average of 4.7 million acres annually. In national forests alone, resources lost by fire amounted to more than \$700 million in 1970. Fire destroys the prized hardwoods of the north-tem forests, the pines that supply pulp mills in the South, the western species that go into plywood and other lumber supplies. The losses, already considerable, will grow critical as the Nation's consumption of industrial wood products rises. Presently that consumption amounts to 10.7 billion cubic feet of timber annually. By the year 2000, that consumption will nearly double to 20.8 billion cubic feet.

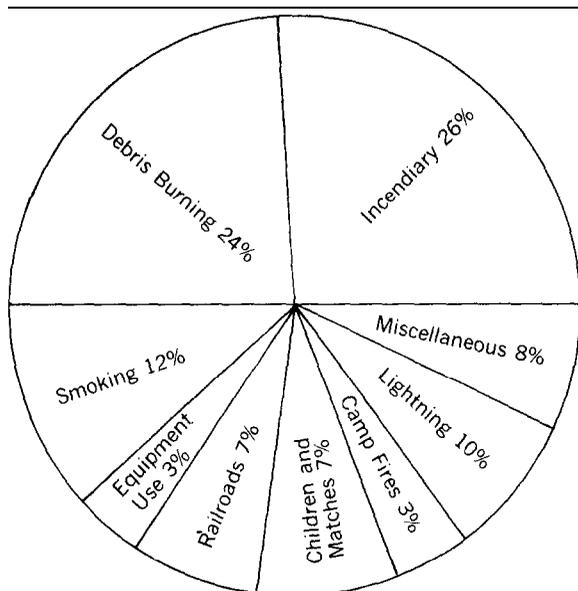
Grassland fires destroy valuable range land, robbing domestic animals and wildlife of their food supply. Not only is vegetation removed, but heat from range fires often dries out root systems and lays the soil bare. In turn the barren soil,

eroded by wind and water, pollutes the air and streams, Erosion delays natural regeneration, sometimes stopping it altogether, leaving the soil sterile.

As urban sprawl encroaches on wildland areas, forest and grassland fires can pose a direct threat to man. In southern California during a 1-month period of critical fire weather in 1970, 1,260 fires burned more than 600,000 acres, killed 14 people, destroyed more than 900 houses and other structures, and generated the potential for an aftermath of erosion, floods, and mudslides. That same year, the Laguna Hills fire in San Diego County burned 225,000 acres and caused an estimated \$100 million damage to dwellings, other buildings, field crops, utilities, bridges, and other facilities.

As with other kinds of fires, man is the chief culprit. Nine out of ten forest and grassland fires are caused by human action (Figure 14-1). About a fourth of these man-caused fires are set by arsonists; a slightly smaller fraction results from people burning debris. Those fires not caused by man are usually caused by lightning-10,000 such fires a year, resulting in about \$100 million losses annually. In the West, in fact, lightning is the leading cause of forest fires.

Figure 14-1. Percent of Fire Starts by Cause in 1971*



*Source: Forest Service, USDA.

Lightning-caused forest fires were a natural and frequent occurrence in North America over the millenia prior to the arrival of the first ocean-crossing settlers. But European civilization brought with it a propensity for making this natural phenomenon a problem: Over the years, debris from logging and land-clearing-treetops, limbs, and chips-multiplied the accumulation of "dead fuel" waiting to be ignited and to rage with great intensity. The encroachment of home-sites on wildlands and the use of forests for recreation have continued, and they have magnified the threat of devastating fires.

Ironically, our Nation's efforts in the twentieth century to save our forests has contributed to the problem also. For the longer a forest remains protected from fire, the more dead fuel accumulates on the forest floor, thereby increasing the hazard of a major blaze. The chaparral forests of southern California, for example, deposit as much as 1.3 tons of litter per acre every year. Other species in the Sierra Nevada deposit twice that amount of litter. In recent years, the practice of "prescribed burning"-to make forests more productive as well as to dispose of dead fuel-has won more and more adherents.

With forestlands in such abundance, the prevailing view in nineteenth century America was that forests could be harvested without replacing trees and that forest fires posed no serious

problem. That view now threatens to be replaced by an equally erroneous notion: the romantic idea that the best management of nature is no management at all.

In a year's time, an acre of forest can convert solar energy into vegetable matter equivalent to as much as 300 gallons of gasoline in potential energy. Like a helium balloon being inflated, a forest accumulates an ever-greater fuel load with each passing year. To leave forest preservation to the whims of nature, or to depend solely on campers being careful in forests, simply courts disaster. Man must intervene directly with forest and grassland environments to preserve these important resources.

Accumulated residue, as we have mentioned, can be burned off-through prescribed burning or piling-and-burning. Both require skilled operators, careful control, and favorable environmental conditions. Another approach is to replace vegetation that is highly flammable with low-lying plants of low flammability. In addition to reducing fire hazards, such conversion projects can improve soil stability, increase water yield, improve the habitat for wildlife, and increase the production of forage.

Still another method of intervention is to clear strips of forestland of all vegetation to create firebreaks. A modification of this is the fuel break : strips of land in which only plants of low flammability are allowed to thrive.

A very different approach to discourage forest and grassland fires lies in weather modification-specifically, in inducing rain to counter the hazards of a dry season or in suppressing lightning. But the approach is controversial: first, because effects are unpredictable; second, because efforts that have good effects in one place may have bad effects elsewhere. In Colorado, for example, potato growers have taken barley growers to court, claiming that the latter's efforts to suppress hail storms reduced precipitation so drastically that potato crops were ruined.

The Bureau of Land Management, an arm of the Department of Interior, has launched an effort to abate lightning and to increase precipitation in Alaska. (Tests in the mid- 1960's showed that seeding clouds with silver iodide nuclei could reduce cloud-to-ground lightning strikes by as much as 60 percent.) These efforts will have to

be carefully monitored to determine whether they have any undesirable effects.

The Agencies that Protect Wildlands

Responsibility for fire protection on Federal land lies, primarily, within the Departments of Agriculture and Interior. Other agencies, such as the Department of Defense and the Tennessee Valley Authority, are involved to a lesser extent. Each of the 50 States also has an agency responsible for fire protection of wildlands.

The Forest Service, a division of the U.S. Department of Agriculture, protects 203 million acres in 154 national forests and 3.8 million acres in 19 national grasslands. The Forest Service has a Congressional mandate to seek a balance among competing needs, such as timber, watershed management, protection of wildlife, and recreation. To provide fire protection, the Forest Service does not hesitate to alter the natural environment. For example, in fiscal year 1970, it converted 34,941 acres of highly flammable brush to perennial grasses. At the end of that year, the Forest Service reported that the national forests contained 3,882 miles of fuel and firebreaks. Government experts, however, estimate that an additional 22,000 miles of fuel breaks are needed to prevent decimation of our forests.

The Forest Service also has cooperative agreements with each of the 50 States to provide fire protection for lands in all major watersheds-575 million acres, all told. Federal support to the States takes the form of financial assistance (on a cost-sharing basis), training, inspection, implementation of research results, and the development and procurement of fire equipment.

Also in cooperation with the States, the Forest Service conducts the Smokey Bear educational

program, which has been credited with saving \$17 billion in fire losses,

Further, the Forest Service has a Fire and Atmospheric Sciences Research and Development Program. It supports basic and applied research on a broad range of subjects, from fire prevention to forest surveillance, and from hazard reduction to suppression methods. In addition to research in its three major laboratories, the program supports work by university scholars, industrial research groups, and fire control agencies.

A total of 545 million acres comes under the jurisdiction of the Department of the Interior. Its Bureau of Land Management provides fire protection for 455 million acres, and its Bureau of Indian Affairs protects 48 million acres. Through contracts, these two Bureaus protect an additional 110 million acres of State and private lands. Finally, the National Park Service and the Bureau of Sport Fisheries and Wildlife provide protection to 14 million and 30 million acres respectively.

As Table 14-1 indicates, the protection record of the 50 State fire agencies and the two major Federal agencies-the Forest Service and the Bureau of Land Management-has been improving significantly.

The improvements over the past two decades would be even more impressive were it not for a number of very large fires in 1968 and 1969. Indeed, it is the occasional fire that "gets away" which presents the greatest problem in wildland management. An accumulation of highly flammable vegetation or a long dry season are open invitations to such fires. While large fires-over 300 acres-account for less than 1 percent of total fires, they account for 60 percent of the acres burned and a high percentage of the total loss of

Table 14-1 Effect of Fire Protection in Forests and Wildlands

Period	Average number of man-caused fires per million acres protected	Average number of acres burned per year-all causes		
		National forest	State and private	Bureau of Land Management
1950-59	139	261,264	8,074,797	1,235,996
1960-69	99	196,000	3,704,871	874,342

Source: Forest Service, U.S.D.A.

life and resources. Firefighters also have their hands full when there are multiple ignitions-as, for example, when lightning strikes in several places or when sparks from damaged train wheels set fires along a railroad right of way.

Nearly every wildland fire is a candidate for status as a major fire if the conditions are right. Against that possibility measures must be taken. First in order of priority is *fire prevention*-reducing the number of starts. Second is *preparedness*; this includes intervening in the environment so that, if a fire starts, it will not rage out of control ; it also includes early detection and response. Third in order of priority is *initial* attack-that is, stopping fires while they are small with adequately trained and equipped forces. The fourth measure is *suppression* of major fires.

Fire Prevention

Smokey Bear is a great success story in the field of wildland fire protection. Yet the average of 300 forest and grassland fires a day shows that the message is not getting through to everyone. While much information has been gathered concerning the effectiveness of Smokey Bear, the au-

dience reached is not precisely known. This audience must be identified and a program devised to extend the coverage to other groups who cause forest and grassland fires. In support of such an effort, the Forest Service has conducted studies concerning the personalities and background of those persons known to have caused wildland fires. The results of these efforts must find a way into all school courses that deal with the ecology, and into other appropriate educational media. Hence, **the Commission recommends that the proposed United States Fire Administration join with the Forest Service, U.S.D.A., in exploring means to make fire safety education for forest and grassland protection more effective.**

The effectiveness of fire prevention on non-Federal wildlands, in fact, depends heavily on the adequacy and enforcement of State fire laws. At present, several States-California, Florida, Georgia, and Oregon among them-have excellent fire laws. Other States lag far behind. **The Commission recommends that the Council of State Governments undertake to develop model state laws relating to fire protection in forests and grasslands.**



Prescribed burning is one way of reducing the accumulation of needles, branches, and other dead fuel from forests.



Air tankers, dropping water or chemical retardants, have proved especially valuable in limiting the spread of fire.

These laws should require, as a minimum: permits for debris burning, the use of fire safety devices for mechanical equipment operating in wildlands, strict zoning and building regulations, the construction and maintenance of firebreaks, and the establishment of access and escape routes. Provision should be made for such emergency measures as shutting down logging operations or rescheduling the hunting season during times of severe fire danger.

Once these laws are enacted, they will only be as effective as the enforcement. Several have testified to this Commission that, in many high-hazard areas, enforcement and court cooperation are inadequate.' **The Commission urges interested citizens and conservation groups to examine fire laws and their enforcement in their respective States and to press for strict compliance.**

If fire prevention efforts are to be effective, they must be aimed at the real, rather than imagined, causes of fire. This, in turn, means that accurate and detailed reports of forest and grassland fires must be gathered and analyzed. The national data collection system, recommended in Chapter 1, applies to wildland fires no less than to other kinds of fires.

Preparedness

The rate at which natural fuels build up depends, in part, on the type of vegetation, its growth rate, and its rate of decay. It also depends on climate. Rainfall and temperatures obviously influence growth rates. What is not so obvious is the fact that decay is faster in warm-moist than in warm-dry or cold-moist weather. Were it possible, on the basis of a few indicators, to predict far in advance which wildlands are building up fuel to hazardous levels, then it could be determined which wildlands should get first priority for modification—whether prescribed burning, fuel breaks, or other appropriate means. Educated guesswork for such predictions already exists; what is needed is firmer grounding in science. **The Commission recommends that the Forest Service, U.S.D.A., develop the methodology to make possible nationwide forecasting of fuel buildup as a guide to priorities in wildland management.**

One element important to the success of such forecasting is long-range weather prediction. That elusive goal is the subject of numerous Federal research projects. In the meantime, the National Oceanic and Atmospheric Administration is devising a National Fire Weather Service to

aid fire control agencies. The forecast and advisory field services portion of the program is lagging and another portion that should be pushed is a research and development program to apply improvements in weather technology to fire weather forecasting. **The Commission supports the development of a National Fire Weather Service in NOAA and urges its acceleration.**

Preparedness also depends upon adequate surveillance of fire-prone lands. Increasingly, lookout

towers are being supplemented by aircraft surveillance, including planes equipped with infrared sensors. The feasibility of using satellites for infrared detection of fires merits exploration.

Over the years, the Forest Service has given increased emphasis to preparedness. In general, larger investments in pre-suppression efforts should be matched with a downward trend in the cost of emergency suppression of large-scale fires. Evidence of the value of preparedness comes from a long-term look at the record of the Forest Serv-



A forest fire out of control, like this one near Los Angeles, can become a direct threat to whole communities.

ice (Table 14-2). If 1971 fires had burned at the 1951 average acreage per fire rate, 172,000 acres would have been lost, instead of the 36,266 acres actually burned over. At the 1956 average acreage per fire rate, 102,000 acres would have been lost.

Initial Attack and Suppression

Under conditions of drought or high winds, forest and grassland fires can move with unbelievable speed. Winds have been known to carry fire along treetops more than a mile from where the fire is burning at ground level. Fires have leapt 300 yards across freeways. A vital ingredient in effective suppression, therefore, is early detection, followed by swift initial attack with sufficient fire-fighting forces.

In addition to well-trained firefighters, effective initial attack depends on access by road or trail, plus the equipment that can be deployed—tractors, plows, and aircraft, for example. Air tankers and helicopters, dropping water or chemical retardants, have proved especially valuable in limiting the spread of fire. The efficiency and effectiveness of amphibious air tankers have been increased in many areas through the use of water-scooping capabilities. Helicopters have also proved valuable for rescue operations and transport of firefighters.

Recognizing the important role of these aircraft, the Forest Service and cooperating agencies have begun a program to upgrade aircraft, provide more landing strips, and improve the effectiveness of retardants. In addition, some Air Force planes are being equipped with modular tank equipment to supplement strike forces for severe emergencies.

The Ecology-Minded Public

More than for most kinds of fires, there are grounds for optimism about the efforts against

forest and grassland fires. The capabilities of Federal, State, and local control agencies are excellent. More heartening still, Americans have taken a new interest in the preservation of the Nation's unspoiled wildlands.

They are visiting State and national parks as never before, thus straining the parks' capacities and leaving them a little worse for wear. As the Nation's population grows, pressures will grow to give over wildlands to human settlement. Yet it is clear that future generations will need more unspoiled recreation lands, not less.

Americans know their obligations to others. They know that litter left behind today will be an annoyance to park visitors tomorrow. They know that a carelessly tossed cigarette or a campfire not adequately doused can turn a rich natural environment into a black wasteland. Care with fire is more than a moral imperative. It is a sound principle of ecological management.



A carelessly tossed cigarette or a campfire not adequately doused can turn a rich natural environment into a black wasteland.

Table 14-2. National Forest Fire Record

	January 1-July 31		
	1951	1956	1971
Number of fires.....	1,263	1,765	2,319
Acres burned.....	94,011	77,679	36,266
Average acreage per fire..	74	44	16