

is attended by government and private industry representatives from throughout the western states and western Canada.

Civil Defense and Disaster Responsibilities

The Division has civil defense responsibilities for providing assistance to the Fire and Rescue, and Radiological Monitoring and reporting programs of the Civil Defense Organization. In addition, an agreement with the Department of Water Resources provides for flood-fighting assistance. During the month of May the Department of Water Resources alerted the Division to the potential need to assist them in the San Joaquin Delta area performing flood control work. Fortunately, flooding did not occur; however, the Division was ready to respond immediately into the area with personnel and conservation camp crews. During the latter part of November and early December, Orange County Flood Control District requested assistance in sandbagging operations in the Newport Beach area. High tides had caused a serious sand erosion problem. Sixteen conservation camp crews were used in this operation.

Liaison was maintained with State and local Disaster officials at various levels of the organization. Division of Forestry Rangers in 25 Ranger Units are Operational Area Mutual Aid Fire coordinators, while three Division of Forestry District Deputies are Regional Mutual Aid Fire Coordinators.

Water Project Fire Protection Planning

As part of its watershed fire protection planning efforts, the Division participated in two Type IV River Basin Studies*: The North Coast Study, and the Central Lahontan Study on the east side of the Central Sierras. These studies were made in cooperation with both federal and state agencies. Installation of land treatment measures is continuing on the Escondido Creek project in San Diego county under Public Law 566.

Fire protection services were continued under contract with the Bureau of Reclamation on the San Luis Reservoir project in the Madera Ranger Unit; and on a cooperative basis with the Yuba County Water Agency. Fire protection services on the Oroville Reservoir project are being supplied in cooperation with the State Department of Water Resources.

In addition the Division of Forestry studied fire protection needs and made plans to meet them on numerous reservoir projects in cooperation with state,

* Type IV river basin studies are comprehensive plans developed under Section 6 of Public Law 566, for the purposes of (1) flood prevention, or (2) the conservation development, utilization, and disposal of water, and thereby of protecting the nation's land and water resources. The federal government cooperates with states and their political sub-divisions, soil and water conservation districts, flood prevention and control districts, and other local public agencies in carrying out this program.

federal, and local agencies participating in water development. Included were the U. S. Army Corps of Engineers, Bureau of Reclamation, U. S. Department of Agriculture, State Department of Water Resources, Flood Control Districts, Irrigation Districts, Soil Conservation Districts, and Municipal Water Districts.

Communications

During 1967, the Division of Forestry's communications system was augmented by completion of certain segments of the State Microwave System as follows:

1. The Lassen Route of the State Microwave System was completed between Redding and Susanville. This segment provided means to extend the green phone system into the Susanville Ranger's Office and allowed completion of the Air Net Intercom System in the Sierra Cascade District.
2. The Air Net Intercom System in the North Coast District was completed. This vital communication system gives each ranger unit dispatch office control of a mountain top air net base station needed to control air tanker operations. It also establishes an intercom circuit between the five ranger units and the District Dispatch Center.
3. Green phone facilities were extended into the Mariposa, Tulare, San Luis Obispo, Amador, Tuolumne, El Dorado, and Nevada-Yuba Ranger Unit offices.

Due to the "freeze" on purchase of new radio and microwave equipment, no other additional or replacement equipment was added to our inventory. At this time the Division of Forestry has on inventory: 1429 mobile radios, 733 handie talkies, 149 control consoles, 405 base stations, 112 mobile relays, 88 monitor receivers, 60 microwave terminals, and 187 microwave multiplexes.

In anticipation of eventually providing each ranger unit with its own local net radio frequency, the radio frequencies available were redistributed among Forestry, Fish and Game, and Water Resources. The net result was that each Ranger Unit in the Southern California District now has its own local net frequency. The value of this change was readily apparent during the bad fire situation in that District in late October. Each Ranger Unit enjoyed the privacy of its own local radio net. Planning is continuing so local radio nets will be available for each Ranger Unit throughout the rest of the State within the next three to four years.

Equipment Maintenance and Development

The Division of Forestry operates a highly diversified fleet of automotive and heavy construction equipment. Maintaining and repairing this equipment is of

utmost importance to the efficiency of the Division's operations.

Maintenance and repair of equipment is performed at three basic levels. First, the Foreman-driver level at the field station, for minor maintenance; second, the Forestry Equipment Operator level, usually at a County Headquarters shop, and encompassing heavy maintenance and minor repairs; and third, the Equipment Maintenance Foreman level, either in a Forestry shop by an Equipment Maintenance Foreman himself, or in an outside vendor's shop under absolute direction of a Maintenance Foreman.

The Division continues to stress operation, maintenance, and repair, for the three groups as outlined. Foreman-driver groups now being trained in the new Fire Academy are given eight hours of classroom and four hours of field instruction on fundamentals of maintenance during the first two days of their five-week course. Foreman and drivers are then required to practice these maintenance fundamentals throughout their training course at the Fire Academy, returning to their units with full knowledge of proper methods of maintenance.

The Forestry Equipment Operators receive even more in-depth training during their course at the Fire Academy. Their training includes five days of instruction in maintenance and tuneup methods, taught primarily by instructors from the major manufacturers of vehicle components. Items such as primary and secondary electrical system repairs, carburetor adjustment and maintenance, tire construction, and fuels and lubricants are taught to equipment operators during their course. In addition to the emphasis on repair and maintenance methods, Forestry Equipment Operators are also given 10 days of instruction in operation of various types of heavy equipment, by instructors representing manufacturers of the equipment.

At the Equipment Maintenance Foreman level we continue the annual one week training session. Curtailment of funds in the spring of 1967 required cancellation of the training course for 1967; however, the course will be given again in February of 1968, since

it is a very important integral part of our overall training structure.

Equipment Maintenance Foremen, under guidance of Division Headquarters personnel, are currently preparing maintenance training guides for use in their day-to-day training of foremen and drivers at Fire Control stations. This training material includes slides, handouts, examinations, and visual aids; it will provide continuity of subject matter throughout the entire Forestry system.

Although one Equipment Maintenance Foreman position and four Heavy Equipment Mechanics positions were financed in the 1966-67 fiscal year budget, budgetary cutbacks dictated deletion of three of the positions prior to actually filling them. One Maintenance Foreman and one Heavy Equipment Mechanic were employed. Three Conservation Camp shops which require a Heavy Equipment Mechanic for actual operation have to date not been activated and are still utilized as a Class B facility rather than a Class A Shop.

The November fires in Southern California required movement of Forestry equipment from the farthest areas of the State. It is indicative of the level of maintenance within the Division of Forestry that buses, firetrucks, transports, and administrative vehicles responded to, operated on, and returned from the fires with an absolute minimum of down time or mechanical failures.

Forestry Equipment Engineers worked with nine counties in preparation of specifications for purchase of 12 new pumper trucks. Thus far, three of these units have been completed. Twenty-seven firetrucks were completed and delivered to the Division of Forestry in 1967.

The latest model firetruck delivered to the field in 1967 was the Model 8. This unit has a tilt cab, conventional drive, and carries 1200 gallons of water. It has a 500 gallon per minute (GPM) pump amidships and an 85 GPM auxiliary pump, and provides seating for 3 men with ample storage space for fire hose and tools.

RESEARCH AND DEVELOPMENT

Research and development play important parts in operations of the Division of Forestry. Research provides a foundation of factual knowledge that helps to understand the complex problems the Division faces in fire prevention, forest protection, and development and management of State Forests and other wildlands. Timely development of equipment and methods provides additional means for meeting management and protection responsibilities due to increased pressures and rapid changes in use of wildland resources.

To meet its research and development needs the Division relies heavily on cooperative agreements with agencies and institutions whose primary activity is scientific research. Research was continued in several different lines of activity during the past year.

Fire Research

The Division was involved in many fire research projects in cooperation with a number of other agen-

cies, both public and private. Funds were contracted to the U.S. Forest Service's Pacific Southwest Forest and Range Experiment Station for research in fire meteorology; in fire control systems and tactics; and in establishment and maintenance of fuelbreak systems. Money was also contracted to the University of California, School of Forestry, at Berkeley for a continuing study of the economics of fire protection. This latter project has recently concentrated on establishing mathematical models of air tanker systems with special emphasis on the probability of success of using different air tanker types in a variety of fire conditions, including the distribution of fire occurrence and size, topography, fuel, and fire load index. One special study suggested a day-to-day optimum air tanker distribution pattern using both the initially assigned air tanker locations and alternate locations related to the expected fire load index.

Two principal problems still face fire control agencies in permanent establishment of fuelbreaks: controlling brush regrowth and reinvasion; and establishing low-volume, low-stature plants in the cleared breaks. Several public and private agencies are working cooperatively in these programs. One interagency seminar produced a mutually accepted sampling design for testing herbicides under a wide variety of climatic and vegetative conditions. Another seminar resulted in assigning over-all direction of ecological studies of plants which show promise for planting on fuelbreaks and around residences. The seminar also resulted in interagency agreement on a new pamphlet published by the University of California Agricultural Extension Service recommending to homeowners what to plant and how to maintain the plants around homes to



Field test of a new nozzle made from polycarbonate (Lexan). Nozzles of this material are harder than brass and one-third its cost, yet they weigh only a few pounds.

minimize damage from wildfires spreading into residential areas.

The Experiment Station, with the help of some Division personnel and people from other agencies, continued to study characteristics of marine air inva-



Performance tests of several makes of large and medium bulldozers were conducted during the summer. Tests included line building capability in different kinds of vegetation and topography, winching ability, and cross-country performance.

sion of coastal and inland California, as well as structure of destructive Santa Ana winds.

Much attention is being given to quantitative techniques of analyzing fire control systems. Such techniques can lead to more effective decisions concerning short-range planning and implementing of specific day-to-day tasks, and long-range planning to meet broad objectives and goals. The Experiment Station and the Division completed a two year study of rates of hand-line construction using Conservation Camp inmate crews. Considering the variables included in the study, results will be given in terms of probability of achieving a desirable goal of line construction in different fuel types with different crew sizes within specified time limits.

In past years, people guiding bulldozer operators at night in fireline construction have carried flashlights and have been difficult to see. This year a few of the guides wore brightly flashing electroluminescent Sam Browne-type belts. Initial evaluation reports showed excellent results. The belts will be tested through the 1968 fire season before conclusions are reached regarding more widespread use in the Division. Other tools being tested in the field include new 1½-inch nozzles made from Lexan (polycarbonate), a fraction of the weight and cost of traditional brass nozzles; a system of oblique aerial colored slides of an entire ranger unit to aid the dispatcher in making decisions about man-

power and equipment needs; several new types of synthetic hose for use on firetrucks and at air tanker bases; a much faster and simpler mixing system for Phos-Chek fire retardant. The prototype remote telemetering fire weather station purchased in 1966 was placed in operation at Howard Forest in mid-1967. The station is designed to observe all elements needed for fire danger rating and to transmit this information via the Department of Water Resources' North Coast Telemetering System and the State's microwave radio network to automatic read-out and memory equipment located in the Resources Building in Sacramento, both on schedule and on demand. Knowledge gained from testing this one station will assist in designing a total automatic fire weather sampling system and fire danger rating computing system.

In June and July, the Division conducted extensive and intensive performance tests of several makes of large and medium bulldozers on the Hunter-Liggett Military Reservation in Monterey County. Such tests are made every five or six years to assist the State in selecting and purchasing those makes and models of bulldozers which will best meet the particular needs of the Division's fire control job. Tests include line building capability in different vegetation types and topography, gradeability, winching ability, and cross-country performance.

Fire Prevention

Fire Prevention Research is continuing in the Butte Ranger Unit in cooperation with the United States Forest Service, Pacific Southwest Forest and Range Experiment Station, and the Division of Forestry. This project is a field laboratory for fire prevention research. A new Research Note on this study, by the Pacific Southwest Forest and Range Experiment Station, is titled *Evaluation of Fire Hazard Inspection Procedures in Butte County, California*. This report assessed the effectiveness of fire hazard inspection procedures in securing compliance with fire safety requirements. Effects of different types of procedures, and the combination of contacts and timing were determined; and the production capacity of the inspector measured. It was demonstrated that fire law inspections consist of fire prevention education and engineering as well as law enforcement. The public was found to be uninformed about fire laws but very receptive to an inspection program.

A "children-and-matches" sociological study was initiated with George Washington University. Results are not yet available.

An attitude survey of Division employees and their feeling toward fire prevention and other Division activities was completed. Results should be forthcoming very soon from the contractor, University of California Survey Research Center.

Inventory of Wildland Soil and Vegetation

This inventory is being carried out cooperatively with the Pacific Southwest Forest and Range Experiment Station and the University of California. During



During 1967 the soil-vegetation survey was completed on 251,000 acres of wild lands. Fifty-eight soil profiles were described, and sampled for laboratory analysis.

1967, a total of 251,000 acres in Butte, Plumas, and Calaveras Counties was completed; fifty-eight soil profiles were described and sampled for laboratory analysis; coding and card-punching of soil-vegetation data for automatic data processing were completed; inventory data were prepared for use in special studies. During 1968, we will continue field mapping in Butte, Plumas, and Calaveras Counties; continue publishing maps of the Shasta County Survey; and begin publishing maps and reports of the Sonoma County Survey. Since this survey began in 1947, the soils and vegetation of over eight and one-half million acres of privately owned wildlands have been mapped within the area of Division of Forestry fire protection responsibility in Northern California.

Forest and Watershed Research

To reduce budgeted expenditures in the 1967-68 fiscal year, research efforts in forest and watershed management were cut back. Effective July 1, 1966, studies on seed tree effectiveness, forest growth prediction, gall rust, and California hardwoods, under contract to the University of California, were discontinued. Financial support for watershed research at the San Dimas Experimental Forest of the U. S. Forest Service also was terminated, but assistance in the form of Conservation Camp labor will continue.

Research projects remaining after this adjustment of the program consist of studies in planting stock physiology, bark beetles, dwarfmistletoe, and forest rodents. All of these are being conducted by contract with the University of California.

FOREST, RANGE, AND WATERSHED MANAGEMENT

The objective of this program is to aid and encourage development and utilization of California's vast forest, range, and watershed lands for the greatest public benefit. Encouragement and assistance to landowners, regulation of use, and demonstration of good wildland management practices are means of attaining this objective. Knowledge needed to achieve best development and utilization of these resources is sought through research and practical field studies.

State Forests

The Division manages eight State Forests with 70,238 acres of forest land representative of California's varied timber types. These demonstration forests are managed for timber, Christmas trees, recreation and other uses, but one of their major functions is to provide a laboratory for demonstration and experimentation of forest management. A staff of professional foresters is assigned to the four largest forests to direct the experimental and management work on 69,000 acres.

In a continuing program of harvesting mature timber and maintaining production and growth, 1967 operations produced 34,667,580 board feet of timber and 8,705 Christmas trees and miscellaneous products, with a combined value of \$573,175.00. Since 1946 receipts from the State Forests totaling \$8,888,816 have been transferred into the State's General Fund. Counties having State Forests received \$43,978 in lieu of property taxes for 1966-67; and a total of \$566,807 since the forests were acquired. Taxes have increased at a startling rate in some cases; the taxes on Boggs Mountain State Forest were \$254.83 for 1952-53 and \$3,699.14 for 1967-68.

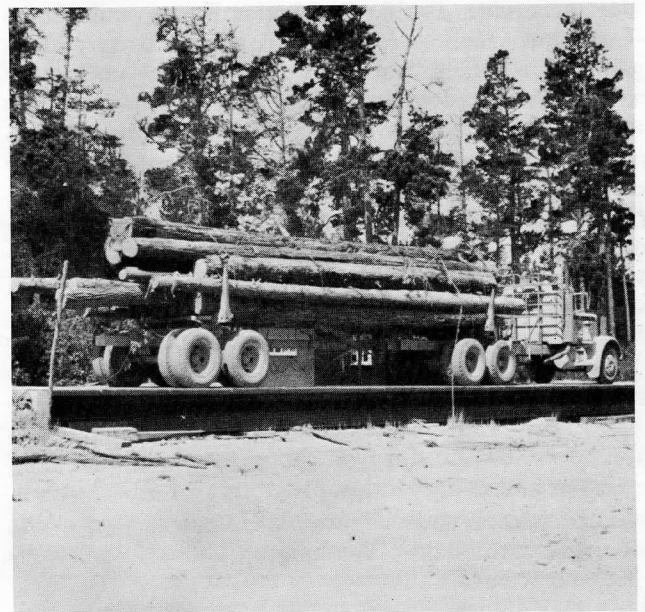
The State Forests had a 9.3% increase in the volume of timber harvested in 1967 over 1966. The allowable cut on the forests has been increased, on the basis of a recent inventory and accelerated growth. Also, during 1967 commercial cutting was accomplished on Boggs Mountain State Forest for the first time since the State acquired the property. Some three million board feet of overmature, decadent timber was removed in two sales to improve growth and health of the stand on that forest. Data from the first remeasurement of the Jackson State Forest continuous forest inventory indicates that additional increases in allowable cut are desirable. In accordance with a 1967 contract with the University of California, data from the timber inventory of Latour State Forest are scheduled for processing during 1968.

The State Forests experienced continued increases in recreational use. Some of this increase is undoubtedly in response to improvements such as the new loop horse trail near Hobergs, and completion of Mountain Home State Forest demonstration camp-

ground at Frasier Mill. The National Speleological Society held their statewide meeting in one of the Mountain Home State Forest's group campgrounds so they could explore Haughton's Cave. Camping on Jackson State Forest along Highway 20 continued at a high level and camper use at Latour State Forest increased, especially during deer season.

Work continued on the Caspar Creek Watershed Study with 1,600 yards of silt and debris being removed from the pond behind the North Fork Weir. This was completed by mid-August 1967, and the instruments were immediately put back in operation. The logging access road was constructed into the South Fork of Caspar Creek as part of an adjoining timber sale. It was necessary to install four bridges and two large culverts in the main drainage to complete this road. Besides shaping and rocking the road, exposed fill slopes were fertilized and seeded to annual rye grass to reduce erosion. The effects of road construction in a watershed will now be evaluated for a few years before the watershed is logged.

The weight-scaling study was continued on Jackson State Forest to evaluate a technique for more efficient use of manpower in handling large numbers of small logs that result from the young-growth sales. A 70-foot-long, 100,000 lb. capacity truck scale was installed and all of the logs from one timber sale were weighed and scaled. From this test we are satisfied that an accurate ratio can be determined from young growth



The weight scaling study was continued at Jackson State Forest. A typical load of young-growth logs being weighed to determine an accurate board foot-weight ratio. The scale is 70 feet long, with a capacity of one hundred thousand pounds.

timber sales. Two 1968 timber sales will be offered where the weighing technique will be combined with random sample scaling to convert timber weight to its equivalent in board feet.

Several other experiments were continued in 1967. Continuing cooperative study with the University of California on *Fomes annosus* root rot indicates that Boggs Mountain State Forest Douglas-fir are susceptible to inoculation. Cultural trials were continued on Latour State Forest to determine better techniques for pruning, thinning, and shaping white and red fir Christmas trees. In several reproduction studies on Mountain Home State Forest herbicides were used in site preparation, and fertilizers were used to test effect on seedling establishment and growth.

Plans indicate that the State Forests will sell approximately 7 million board feet more of timber in 1968 than in 1967. Better inventory information and subsequent change in allowable cut on Jackson State Forest accounts for this increase. While the total sale volume is increasing the value per thousand board feet is decreasing because a larger part of the cut consists of lower quality young-growth timber which is less valuable than old-growth.

Conservation Camp Crews provided much of the labor for fire road and truck trail maintenance, hazard reduction, and experimental work that was accomplished on all forests.

Forest Practice Act

More attention has been directed toward state regulation of forest practices on private land in California in recent years than at any time since the enactment of the Forest Practice Act in 1945. Increasing concern is being shown by the general public over the impact of logging on parks and recreation, watershed and stream protection, fisheries and conservation, and fire hazards near urban communities. Eleven bills were introduced in the 1967 session of the State Legislature to amend the Forest Practice Act. Five of them passed the Assembly but were not approved by the Senate. The Senate adopted a resolution requesting a review of the capability of existing regulatory and advisory programs of state government to ensure that the privately held timberlands of California continue their optimum contribution to the economic growth of the State. The Senate Natural Resources Committee made a field tour of logging operations in Humboldt, Trinity, and Shasta Counties in October to see conditions for themselves.

All Forest Practice Committees conducted hearings in 1967 to determine adequacy of their district rules. Amended forest practice rules for the Redwood Forest District became effective July 7; amended rules for the North Sierra Pine Forest District became effective September 22. Early in 1968 it is expected that the South Sierra Forest Practice Committee and the Coast



The Senate Natural Resources Committee on a field tour to observe logging conditions in the Redwood Forest District.

Range Pine and Fir Forest Practice Committee will conclude hearings and present recommendations for amendment of their district rules to the State Board of Forestry. Amended rules become law 30 days after filing with the Secretary of State.

In 1967 several changes were made in district forest practice committees. Sidney D. Haynes, farm timber owner in Burney, replaced William L. Gray of Bieber on the North Sierra Committee. William H. Kuphaldt of Martell replaced Seth Beach, and Byron W. Bacchi replaced Gordon K. Van Vleck, on the South Sierra Committee. David M. Williams of Redding replaced Harold R. Crane, Jr., on the Coast Range Committee.

District forest practice rules are developed to conserve and maintain productivity of private timberlands for the economic welfare of the state and continuance of the forest industry. The State Forester administers the Forest Practice Act under policies adopted by the Board of Forestry. Division personnel inspect timber operations to determine and require compliance with the rules and the Act.

In 1967, the State Forester issued 268 original timber operator permits and renewed 947 permits, collecting \$13,685 in license fees. There were 58 fewer active timber operators in 1967 than in 1966. Some 1,860 timber operator's notices were filed in 1967. Operators reported cutting 5.01 billion board feet of timber in 1966—about 263 million board feet less than in 1965.

The Division, in 1967 made 1,850 forest practice inspections. Statewide, 93 percent of all rules inspected for were found to be in compliance, compared with 94 percent in 1966. Over-all compliance with the rules in the Redwood Forest District and Coast Range Pine and Fir Forest District was 92 percent. There was 93 percent compliance in the South Sierra Pine Forest District and 94 percent compliance in the North Sierra Pine Forest District. Inspectors observed 968 infrac-

tions of the rules in 1967, compared with 780 in 1966. Forest practice rules most often found to be in non-compliance were snag disposal, fire plan filing, erosion control, and slash disposal requirements.

In 1967 the State Forester started the first action under Sections 4615-4618 of the Public Resources Code, to correct Forest Practice violations, in two cases. The provision of the Forest Practice Act authorizes the State Forester to serve "Notice to Correct Violations." If not corrected, the State Forester can make the correction, or contract for correction, and charge the operator or timber owners for the cost, up to a maximum of \$40 per acre. This action was necessary because some operators stopped timber operations and contracted the logging to others, or simply went out of business leaving uncorrected violations. There has been increasing public support for more positive enforcement of the Forest Practice Act and Rules.

Most law enforcement by the Division was carried out administratively. The Division of Forestry sent 638 notices of violation for infraction of the forest practice rules in 1967. Division personnel sent many other letters, and held follow-up meetings with operators to improve compliance with the Rules. Ultimately, over half the areas where infractions were observed were in compliance when repeat inspections were made.

In four cases complaints were filed with county district attorneys against persons who were operating without a valid timber operator's permit. One case was dismissed and pursued by other enforcement action. Another operator obtained a permit at the request of the District Attorney. One operator was fined, and put on probation to comply with forest practice rules. One case is still pending.

Early in 1967 it was recommended to the State Forester that renewal of timber operator's permits be denied in thirteen cases; seven were continued from the previous year. In two of the 13 cases, all violations were corrected. Eleven did not apply for 1967 permits; they either did not operate, went out of business, or contracted timber operations to others and were no longer timber operators under the law.

Intensified field and administrative effort during the logging season was applied to six more cases in 1967, trying to obtain compliance. Two of these completely corrected violations; the other four stipulated correction or partially corrected violations.

Five litigation cases were formally on file with the State Forester in 1967. One of these was dropped on advice of legal counsel; and four are being continued into 1968 for corrective action, including the two cases on which the first such action started in 1967.

Action to deny or revoke permits or pursue corrective action by the Division of Forestry is pending on 20 cases for 1968, including 11 new cases. These cases are in various stages of development.

In 1968 the Division plans to make greater effort to proceed with corrective action for rule violations when appropriate and when other methods fail to gain compliance.

Affidavits were filed in 1967 by 38 owners to devote 6,243 acres of timberland to purposes other than growing timber. This is less than half the acreage filed for conversion in 1966, and the least acreage filed for in any one year. About 56 percent of this acreage was declared by owners to be for the purpose of improving grazing; 33 percent for urban development projects; and the balance for other agricultural pursuits, or for construction purposes.

The Board of Forestry approved 14 alternate plans in 1967. Ten of these plans were in the Redwood and Coast Range Forest districts to log and remove merchantable timber and promptly restock the cutover area by seeding or planting trees. One plan in each of the same forest districts provided for increased fire protection deferring the treatment of slash concentrations until salvage operations are completed. One plan in the North Sierra District allows intensive Christmas tree management and another plan provides for silvicultural thinning of small trees to improve forest growth.

Forest Practice Committee hearings will be continued in 1968 to make desirable amendments to the South Sierra and Coast Range District rules. New enforcement features of the Act, such as correction of rule violations by the Division, and charging the timber operator or owner for the corrective work, will be tested in 1968. The Division will intensify inspection and enforcement against timber operators who fail in a reasonable time to correct rule violations.

Service Forestry

Service Forestry is a nationwide cooperative forest management program of professional forestry assistance to owners of small tracts of forest land and forest products producers. The federal government cooperates with the state, contributing funds which provide services of professional personnel to work with forest land owners on their management problems.

Ten foresters are employed to assist land owners in solving problems of forest reproduction, timber stand improvement, protection from forest insects and diseases, and many other aspects of forest and land management. These service foresters are located in Fortuna, Willits, Santa Rosa, Redding, Oroville, Camino, Sacramento, Fresno, Monterey, and Riverside.

The 30,000 owners of forest land tracts of less than 5,000 acres hold about 3.5 million acres of commercial forest that are vital to the State's economy, and especially to the economy of the forested counties. Many additional owners are assisted with management problems on several million acres of noncommercial



A service forester and a Christmas tree grower examine an immature Christmas tree that will become the fourth crop to be removed from this stump. Several "choose and cut" Christmas tree farms in Santa Cruz County gross approximately \$30,000 per year, as this product assumes greater importance in many areas of California.

forest land where recreation, special forest products, water, and wildlife are produced.

During 1967, California's Service Foresters assisted 212 owners per man as compared to an average of 137 nationwide. Under Cooperative Forest Management 2,124 woodland owners were assisted on more than 230,000 acres of timberland. About 6,800 acres were planted or seeded, and 2,800 acres of timber stand improvement was accomplished with forester assistance. In meeting the diversified needs help was provided to 125 forest land owners for recreation, water, and wildlife management. More than 140 owners were referred to consulting or industrial foresters because of the size, nature, or complexity of the owner's problem. An effective job of demonstrating benefits of intensive forestry generates work for forest consultants.

An analysis of the service forestry program was begun in 1967; when this survey is completed in 1968 we will have better knowledge of the total job to be accomplished, the work load and its distribution, and a review of performance standards.

Service Forestry is coordinated with other public and private programs. The industry-sponsored tree farm system is recognized for its role in improving forest management and landowners are often assisted by service foresters to become tree farmers.

Service Foresters cooperate closely with federal and state soil conservation agencies and local soil conservation districts, and provide technical assistance to the Federal Agricultural Conservation Program for cost-sharing on forestry practices.

Under the Cooperative Forest Management Act of 1950, the U.S. Forest Service shares some of the cost of the service forestry program. Additional reimbursements are contributed by the Agricultural Stabilization and Conservation Service for providing technical assistance to the Agricultural Conservation Program.

Nursery and Reforestation

The spring of 1967 marked the 45th year of continuous tree production from the Davis Headquarters Nursery in Yolo County. Trees grown in the early days were primarily for planting along county roads and state highways; production amounted to from 50,000 to 60,000 trees annually. Since 1950 the nursery has been producing trees primarily for forest products, watershed protection, and farm windbreaks; present production is 150,000 container-grown trees. Between 1952 and 1954 three additional nurseries began to produce bare root seedlings. Now the total production distributed each year to California landowners is between three and four million seedlings.

Since all trees are raised from seed, seed production is a major phase of operations. In 1922 small quantities of seed were collected locally by nursery crews for the exotic species used along roadsides. Today, Con-



Seeds being removed from sun-dried white fir cones by Conservation Camp inmates at Davis Headquarters Nursery. Cones have shattered and are being fed into a tumbler to remove seeds.

ervation Camp inmate crews throughout the state collect more than 13,000 bushels (about 180 tons) of cones for 10,500 pounds of clean seed. Seeds are removed from cones in a new extraction plant at the Davis Headquarters Nursery which began operating at full capacity in 1967. The plant has a capacity of 500 bushels every two to four days. To supplement the plant operation, cones are also opened in the sun and seeds removed in portable equipment.

There was a slight reduction in reforestation efforts on private land, some 70 acres less than the preceding year. This was due primarily to a reduction in direct seeding following clear-cut logging. This kind of logging followed by seeding, rather than leaving seed trees, is permitted under the Forest Practice regulations. There were 7,790 acres seeded, a reduction of 340 acres. Planting seedlings, on the other hand, increased by some 250 acres, for a total of 5,380 acres. California's place in the nation in reforestation again improved. Although we remained fourth in seeding, an improvement was made from 19th to 18th in combined seeding and planting.

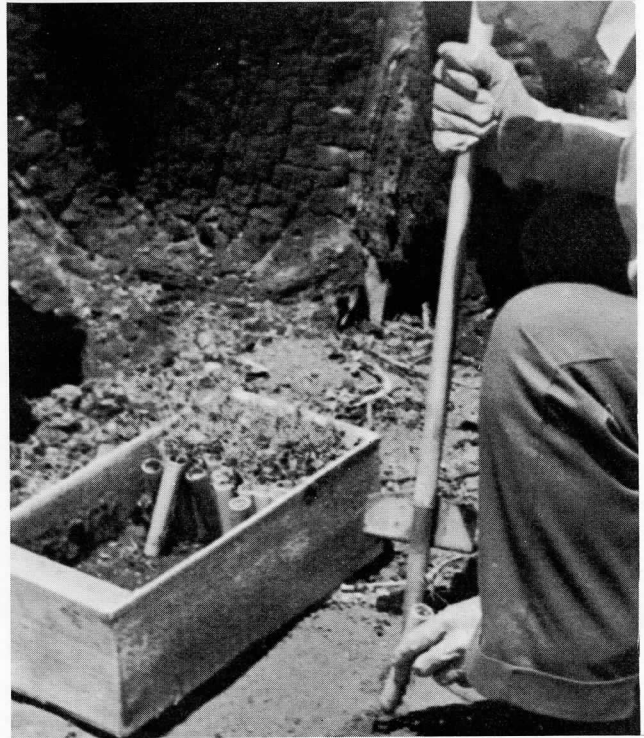
The State Forester's Reforestation Advisory Committee met twice during the year. In June members toured reforestation projects in Amador and Calaveras counties. The tour stressed methods used to control "mountain misery." Mountain misery (*Chamaebatia foliolosa*) is a plant forming a dense ground cover in sparsely timbered middle elevations of the Sierra Nevada. The cover prevents successful natural and artificial reforestation. The Committee found that the pest can be controlled by burning then spraying succeeding sprouts with herbicides.

In early November the Committee compared results of different regeneration methods within a 1960 burn on private and Forest Service land in Placer County. Methods ranged from a minimum of only controlling rodents to protect natural seed fall from trees around the burn to the ultimate of mechanical site preparation, planting seedlings, and spraying competing brush. On this particular burn all methods provided an adequate number of young trees. Committee members also visited two of the Division's reforestation studies, one of seeding and one testing recently developed hybrids.

Reforestation studies were conducted in the laboratory and field. New root growth as a measure of seedlings' physiological condition was used to determine best storage treatments of white fir seedlings. Seedlings were grown in a controlled temperature water bath for thirty days after receiving the storage treatments. Two weeks cold storage appeared to be better than no storage since more new roots were produced from that treatment.

Two field tests in the central Sierra Nevada compared broadcast and machine seeding of white fir, Douglas-fir, and ponderosa pine. Where competing grasses invaded part of the 1966 seeding there were

few seedlings remaining at the end of the 1967 growing season from either the broadcast or machine application. However, where there was no grass competition plots were well stocked with seedlings from broadcast seeding. Machine seeding results were poor. Seeding tests done in the fall of 1967 will be evaluated in 1968.



Planting 3-month-old fir seedlings grown in plastic "bullets," Forest Creek Burn, Calaveras County. These plastic containers were tested to determine if they improved seedling survival.

Propagation of seedlings in plastic bullet-like containers of different depths was tried in the spring. In the central Sierra Nevada survival was generally very poor, but near the coast the deeper "bullets" provided good survival.

The effects of burning and different herbicide spray treatments in mountain misery plots were evaluated. Growth of pine and fir seedlings after three years was excellent where densities of mountain misery were controlled by treatments.

Tree improvement studies were continued. The first seedlings from hand pollination using Monterey pine pollen on knobcone pine mother trees will be available for sale to the public in early 1968. This Monterey \times knobcone hybrid has possibilities for rapid growth in low elevation droughty sites. Work on the Jeffrey \times Jeffrey \times Coulter pine hybrids promises to produce a hybrid that will survive well and grow rapidly in middle elevations of the Sierra Nevada. Well-formed, rapid growing ponderosa pine parent trees were selected for hand pollination to pro-

duce offspring superior to that from natural pollination.

Forest Pest Control

The objective of forest pest control activities conducted by the California Division of Forestry is to detect, appraise, and control damage to forest trees from insects, disease, and animals. Action to control insect epidemics and disease infection centers on state and private lands is taken within "zones of infestation" established by the State Board of Forestry. The activities are usually undertaken by the Division in cooperation with landowners and the U.S. Forest Service.

Bark beetle activity in 1967 increased in several areas of the north end of the State. The Douglas-fir beetle activity in the north coastal Douglas-fir forests decreased considerably.

Forest disease conditions changed slightly in 1967. Several new infection centers of root diseases were found. Discovery of new outbreaks of white pine blister rust in Tuolumne County extended the southern limit of this disease about ten miles.

Deer depredation continues as the State's primary animal damage problem. Mountain beaver caused considerable damage in Humboldt and Del Norte Counties.

Detection of forest pest damage is obtained through individual reports and a cooperative aerial survey with the U.S. Forest Service. The Division surveys over five million acres of timberland.

Three large cooperative appraisals were participated in by the Division: (1) an appraisal of conditions affecting forest trees in the Tahoe Basin, with the California and Intermountain regions of the U.S. Forest Service, and the Nevada Division of Forestry; (2) the Douglas-fir bark beetle epidemic covering 1.6 million acres in the north coastal Douglas-fir forest, with the U.S. Forest Service; (3) the Trinity Lakes western pine beetle infestation, involving 133,000 acres, with the U.S. Forest Service.



Infested trees were cut and burned in an insect control project by the Division of Forestry at Mountain Meadow Reservoir, Lassen County.

In bark beetle control projects 5,245 trees were treated on private land and in four State Parks. Control work on white pine blister rust, in cooperation with private owners and the U.S. Forest Service, was extended to 4,494 acres of private land.

The California Forest Pest Control Action Council was concerned with the need for more funds for research about forest pests. Funds should be made available to keep abreast with forest pest problems. The forest insect research center at Hat Creek, Shasta County, should be retained to continue forest insect research efforts in the northern part of the state. The Council asked the Legislature to support implementation of the Fish and Game Commission deer management policy and revise the big game depredation laws to authorize issuance of permits sufficiently in advance of actual damage so practical programs of hunting could be conducted. The wildlife biologist position with the U.S. Bureau of Sport Fisheries in Sacramento has had considerable turnover. The Council asked that this position be upgraded to provide more stability and tenure. The root rot (*Fomes annosus*) was prevalent in the State. The Council recommended that where landowners wish to prevent this disease, freshly cut stumps should be treated with borax. The Council also opposed changing the status of the squirrel from a game animal to a fully protected animal; the proposed change would prevent any control action against squirrels which do considerable damage in the forest.

Plans for 1968 include continuing the direct control for bark beetles, cooperative appraisals with the U.S. Forest Service and landowners in Northern California, and reviewing the white pine blister rust program.

Timber Taxation

Article 12 $\frac{3}{4}$ of the State Constitution exempts timber from taxes following cutting, under certain conditions. A Timber Maturity Board must declare exempt timber "mature," 40 years or more after cutting, before it is returned to tax rolls. The Maturity Board consists of a representative from the State Board of Forestry, one from the Board of Equalization, and the Assessor of the county where the timber is located.

Because the Board of Forestry is represented on the Maturity Board the Division of Forestry has certain responsibilities for administration of Article 12 $\frac{3}{4}$, including record keeping, participation in field examinations, and assisting the Board of Forestry representative. An experienced forester from the State Forester's staff is assigned to this work.

The Legislature amended Chapter 1847 of the Revenue and Taxation Code in 1965. The change required timber owners to file affidavits for exemption of cut-over timber under Article 12 $\frac{3}{4}$ of the Constitution, and for Maturity Boards to consider timber stands for return to tax rolls as soon as they pass 40 years after cutting. Formerly the Assessor called for Maturity

Board action only when he thought exempt stands mature, usually evidenced by commercial operations in comparable stands in the county.

The amended law immediately created a backlog for Maturity Boards to consider all exempt stands more than 40 years old including those previously exempt that had not been examined.

Maturity Boards considered most of these parcels in 1966 and declared a number of them mature. During 1967 Maturity Boards overcame the remaining backlog in most of the timber counties.

Maturity Boards were formed and acted for the first time in four counties: Butte, El Dorado, Plumas, and Tehama; they continued action begun in 1966 in Humboldt, Lassen, and Siskiyou. These Boards declared 86,611 acres on 60 properties mature, compared with 70,380 acres on 143 properties in six counties in 1966 (see table). The Division of Forestry assisted the the Board of Forestry representative throughout field examinations and hearings. By the end of 1967 a cumulative total of 462,773 acres of timber on 938 properties had been declared mature for assessment purposes.

In 1967 the export log market caused significant increased cutting in young growth and older cutover stands within an economic radius of deep water ports (Humboldt Bay, Sacramento, and Stockton).

If such operations continue to increase as is now indicated, more frequent reexaminations and maturity declarations would be required in the future for stands previously found immature.

Timber Maturity Declarations in 1967
Maturity Board Examinations

County	No. of Properties	Examined	Number of Acres Declared Mature
Humboldt	46	33,977	21,154
El Dorado	1	10,382	10,179
Butte	2	41,900	15,286
Plumas	4	43,950	14,777
Tehama	1	16,066	12,287
Siskiyou	4	24,815	11,467
Lassen	2	5,341	1,461
Totals	60	176,431	86,611

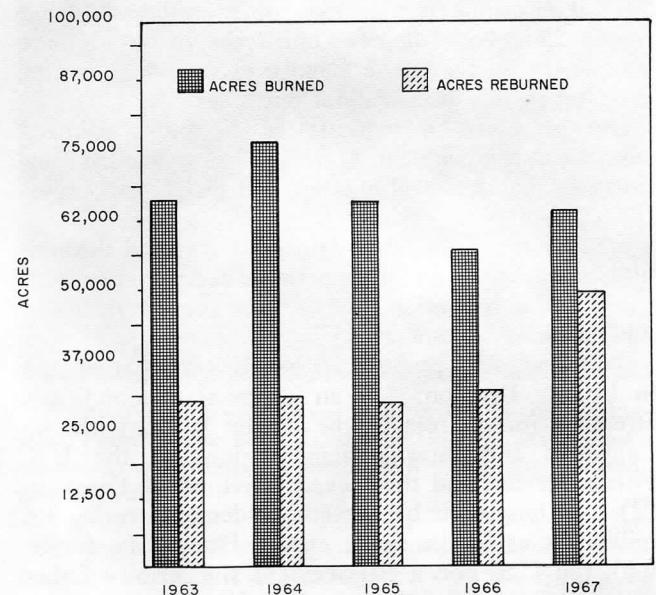
Brush Range Improvement

The Range Improvement Program entails administration of range improvement burning, advisory services, and standby fire protection in cooperation with private landowners desiring to use fire as a means of converting brush-covered lands into forage lands. Prime objectives of the program are to increase forage production on low quality brush-covered land, to stimulate fire prevention and protection measures, and to promote watershed protection and conservation practices. The program provides for advisory services to applicants for controlled burning permits as to pre-

cautions to be taken to prevent damage to adjacent property owners due to such burning, and to provide standby fire protection to the extent personnel, fire crews, and fire fighting equipment are available.

Ranchers and sportsmen used fire in clearing 64,633 acres of brush range land in California during 1967. Formal applications were received from 202 landowners proposing to burn 108,408 acres of brush-covered land for livestock range and wildlife habitat improvement; 180 permits were issued for burning. These permittees conducted 137 controlled burns; 16 were cooperative burning projects including participation of two or more adjacent landowners. Regular fire control forces were available for standby during burning of 38,383 acres, on 45 separate burning projects this past season.

Activity in the brush range improvement program has continued at about the same level over the past



Activity in brush range improvement changed little in the last five years. The total acreage burned under permit in 1967 was about the same as the five-year average. Reburning reached a peak—some 57 per cent more than the preceding year.

five years. The number of burns was slightly down from 1966 but total acreage burned under permit was comparable to the current five year average. Since inception of the State's permit program in 1945 about 2.4 million acres of California brush lands have been burned; this acreage includes 0.6 million acres reburned to maintain a range forage cover. Reburning reached a peak during 1967 with 49,315 acres—76 per cent of the total acreage burned under permits—being treated.

Although most burning is conducted for improvement of livestock range, 17 of the 180 permits were issued for game management only, covering approxi-



Preparation is a most important part of a safe and effective controlled burning project. Firing crew burning in lines on the Mosley Burn in Santa Barbara County.

mately 1,800 acres. In addition, 16 controlled burns were conducted as dual-purpose burns for both domestic livestock grazing and wildlife habitat improvement during 1967.

Mechanical and chemical pre-treatment practices are being applied more and more as an important step in brush range land conversion. An estimated 8,160 acres were treated mechanically and 750 acres of standing brush were chemically sprayed prior to burning. Ranchers report that results have been excellent in all instances when burning followed this pre-treatment spraying of the standing brush.

Range improvement specialists provided assistance to landowners through individual contacts, group demonstrations, and distribution of printed material. These specialists answered over 400 requests, giving advice and assistance to landowners about brush range and hazard reduction practices—chemical sprout control, mechanical preparation, and seeding—used in combination with burning. They also accepted many requests to meet with local range improvement associations, to conduct or participate in range tours, and to speak on brush range improvement topics to ranchers and civic groups. In addition, these specialists conducted a program of brush hazard reduction on Division of Forestry fuelbreaks through the use of herbicides.

The cooperative range improvement field study program is conducted for the purpose of testing methods and demonstrating practices. Long term projects are undertaken in cooperation with landowners and agricultural specialists of other agencies. Findings from these studies are published from time to time in a series of Division publications entitled *Range Improvement Studies*, available for public distribution. The Division currently has four active projects. In addition, a number of smaller trial plots including seeding,

fertilization, and use of chemicals are being established by the range specialists for testing purposes each year. Information gained from these test trials is passed on to local land owners and others. The search for new methods and techniques in brush range improvement will continue through this field study program.

Emergency Revegetation

The Cooperative Emergency Revegetation Program is authorized and conducted under Sections 4675-4677 of the Public Resources Code. The Program provides for the seeding of critically burned watershed lands to establish a temporary vegetative cover on areas that would not be restored by natural means in time to effectively prevent excessive runoff causing severe soil erosion, flooding, and sedimentation of downstream facilities detrimental to public health and welfare.

Emergency seeding activity during 1967 exceeded all previous years since the state's program started in 1956. Eleven major fires burned more than 141,400 acres of watershed land in southern California, most of which qualified for emergency treatment. Field examination determined that 111,557 acres required seeding under the cooperative emergency revegetation program. A total of 92,386 acres of private land and 565 acres of state-owned land received those emergency measures (table). An additional 18,606 acres of intermingled public lands received similar emergency treatment.

Emergency Revegetation Activity in 1967

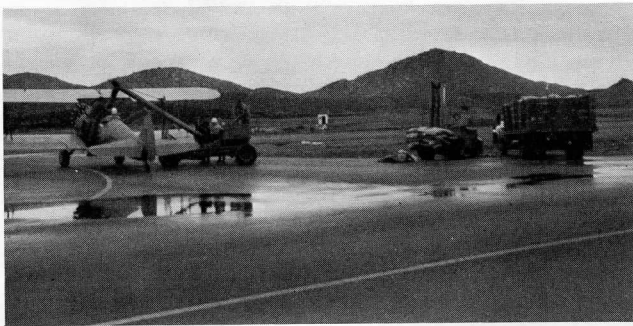
Fire	Date	Area burned (acres)			Private lands seeded (acres)
		Public lands	Private lands	Total	
Kohler	Jun 9	280	6,964	7,244	6,733
Reche Canyon	Sept 20	—	2,686	2,686	2,500
Palmer	Oct 15	—	5,205	5,205	1,050
Turnbull II	Oct 15	—	1,720	1,720	1,720
Timber	Oct 16	1,950	9,500	11,450	9,500
Bailiff	Oct 29	8,848	14,981	23,829	11,207
Junction	Oct 29	—	640	640	640
Latigo	Oct 30	—	2,870	2,870	2,870
Paseo Grande	Oct 30	5,986	42,613	48,599	39,400
Pine Hill & Pole	Oct 30	2,218	4,947	7,165	2,740
Woodson	Oct 30	*1,575	28,425	30,000	*14,591
		20,857	120,551	141,408	92,951

* Includes 565 acres of State-owned lands.

The Division of Forestry directed seeding of 91,327 acres of burned watershed included in five major fires in Riverside, Orange, and San Diego counties. Aerial seeding was accomplished by sowing either annual ryegrass (*Lolium multiflorum*) or wimmera ryegrass (*Lolium subulatum*) at the rate of eight pounds per

acre; the cost averaged approximately \$1.50 per acre. In addition, the U. S. Forest Service directed seeding of two major burns, including 13,950 acres of public and private lands, in Ventura and Riverside counties; Los Angeles County Fire Department contracted seeding of 6,280 acres in four major burns on private land in Los Angeles County.

The Division dispatched the range specialist from each of the northern districts to southern California to assist in evaluation of burned areas. This intensified effort proved successful; all burned lands were examined; areas meeting criteria for seeding were identified and delineated on maps within a week's time. With this assistance, personnel of the Southern California District were able to proceed rapidly and seed 97,607 acres by December 11, 1967. The remaining 13,950 acres were seeded by January 8, 1968.



Aerial seeding for emergency revegetation of the Woodson Burn, San Diego County. Operations being resumed at Ramona Air Attack Base after a light shower. Approximately 125,000 pounds of wimmera ryegrass were sown on 15,600 acres of private and public land, in a project directed by the Division of Forestry.



High intensity rains of the first major storm caused severe soil erosion along Highland Valley Road on the Woodson Burn, San Diego County. Two to three inches of rain fell within 48 hours. Emergency revegetation is intended to prevent this kind of damage, but in some years storms occur before the seeded grass has time to germinate and produce a protective plant cover.

Since this cooperative, cost-sharing emergency revegetation program began in 1956, 83 projects have been completed; some 310,125 acres of private lands have been seeded to provide a temporary protective grass cover. The average cost of the program to date has been approximately \$1.42 per acre, of which the state has paid about \$.71. The Emergency Revegetation Program is a costsharing program with the state paying up to 50 percent of the cost on private land, and other local or federal agencies, or private landowners paying the balance.

FIRE PREVENTION EDUCATION

The objective of the Fire Prevention Education program is to coordinate fire prevention education and information activities of the Division of Forestry with those of other cooperating governmental agencies, industrial organizations, and citizens groups. Law enforcement activities, involving both civil and criminal cases, also are included in this program.

Fire Prevention Activities

In 1967 four Fire Prevention Officers V were appointed at the Sacramento Headquarters, to head up the principle activities of the Fire Prevention Program. Due to an economy move in state government, the Fire Prevention Officer V position for Research was not established. Program development and administration of the entire Fire Prevention Program improved in 1967 despite the standstill in appointment of personnel to fill critically needed positions.

Fire starts in 1967 were about the same as the current five-year average notwithstanding the continued increase in California's population. Fires continue to occur in the areas protected by the California Division of Forestry at a rate of about 17 per 100,000 population, and are increasing at a rate of 138 fires per year. The ultimate goal is to reduce man-caused fires to six per 100,000 population.

Fire Prevention Handbooks, being prepared for use by field personnel, are designed to give detailed instructions on all phases of the fire prevention program. Portions of the handbook should be ready for distribution to the field by mid-year.

An attractive, modern display was prepared for the meeting of the National Association of State Foresters, held in Sacramento in October. This display caught the attention of the visiting State Foresters, producing a great deal of comment.

The Fire Prevention Program continued to emphasize cooperation with other agencies to secure the best possible results. Two of the organizations with which the Division worked in a constant effort to promote forest fire prevention are the Redwood Region Conservation Council and the Keep California Green, Inc., Committee.

The Redwood Region Conservation Council (RRCC) is a non-profit organization dedicated to Conservation Education and Fire Prevention in the North Coast area from Santa Rosa to Crescent City. Its elected officials are outstanding conservationists representing industries and businesses. These industries, and private citizens financially support the RRCC Programs and a small staff—headed by an Executive vice-president—with offices in Santa Rosa.

Keep California Green, Inc. (KCG) is primarily concerned with forest fire prevention via mass media outlets. Supported also by industry and private citizen pledges, KCG covers most of the State except the North Coast. With headquarters in Sacramento, KCG has elected officials and a permanent Secretary-Manager.

Both organizations work to prevent forest fires and cooperate very closely with the California Division of Forestry at Sacramento headquarters, district, and Ranger Unit Levels.

Other organizations, such as the California Women's Club, Junior Division, joined in the Fire Prevention effort by publishing a Conservation Handbook and setting a week in May aside as Forest Fire Prevention Week in California. The Southern California Edison and Pacific Telephone companies hosted the 1967 California Fire Prevention Committee meetings. Sniff 'N Snuff, two new Fire Prevention characters, were introduced to California citizens, in a new approach to Forest Fire Prevention.

Information and Education

Meetings of the California Fire Prevention Committee were held in April. The Southern Section meeting was held in Los Angeles and the Northern Section in San Francisco. Topic of the meeting was discussion of new and better methods of disseminating fire prevention materials by business and industry. This organization of more than 400 members distributed large amounts of Fire Prevention material in 1967. Together, the Committee and Division personnel distributed eight million pieces of Fire Prevention literature during 1967. KRON-TV, Channel 4, was the Northern California plaque winner for outstanding Fire Prevention contribution as a member of the California Fire Prevention Committee. George Fox, President of Public Service Films, Inc., was the Southern California winner.

Sniff 'N Snuff, the Super Fire Safe Snoopers, two animated cartoon characters, were created and put to work in 1967 to help prevent forest fires. Sniff 'N Snuff, jointly created by the Division and Public Service Films, Inc., with help from the Hanna-Barbera Company, were designed to reach children, but have appeal with adults. These two characters were seen on TV and movie theatres throughout California urging that: children should not play with matches; the recreationist must be careful with fire; man can be the most dangerous animal in the forest; arsonists should be reported to the nearest fire agency. Additional Sniff 'N Snuff TV spots and theatre trailers were produced last year for use during the four most hazardous months in 1968. A 10-minute feature Sniff 'N Snuff film is being made; copies will be purchased for the film library. Sniff 'N Snuff were seen on 4' x 8' roadside signs during 1967.

The Division worked closely with the California Federation of Women's Clubs, Junior Membership, helping to prepare a section on Forest Fire Prevention in their Conservation Handbook. This section of the handbook stressed areas where Junior Women's Club Conservation Committees could work effectively to promote forest fire prevention. The Division will present an award to the Women's Club with the most achievements in a Forest Fire Prevention Program for children from kindergarten through sixth grade. This award will be presented at their State Convention.

A program of wildfire filming was begun in 1967, the objective being to obtain fire scenes which are shocking, and show human suffering and loss of property. The film will be edited and produced as one-minute TV spots, including sound commentary. One thousand feet of film was obtained last year; the program will be continued during 1968.

A committee of Division personnel, who normally handle public information activities, completed in rough draft detailed instructions for public and fire information duties. This portion of the Fire Prevention Handbook should be made available to Division personnel in 1968. Detailed instructions are also being written in other areas of the Information and Education Program.

Format and styling of the Division of Forestry *Newsletter* were changed, and will continue to be modified to disseminate information internally. An attempt was made to issue the *Newsletter* on a bi-monthly basis. Workload problems in 1967 prevented a bi-monthly issue; however, it is hoped that 1968 will solve some of the problems encountered in 1967.

"Cooperation" was the key word in our effort to work with associations and clubs in Conservation Education. A report was prepared and sent to the Citizens Conservation Education Committee together with

fire prevention materials and books. This Committee was appointed by the Governor in 1967 to study Conservation Education problems in California schools.

The Division cooperated with the Head Start Program of the Office of Economic Opportunity by teaching fire prevention to preschool, economically deprived children. This pilot project was established in the Riverside Ranger Unit where more than 1,000 Head Start children are receiving fire prevention instructions. A monthly fire prevention packet is sent to Head Start teachers, along with fire prevention films, to help teach fire prevention. Some results have been obtained but much more needs to be known about this age group. Fire prevention materials presently being used by the Division were found to be too advanced for pre-school children. New materials were developed; results of their use are not known at this time.

Fire Prevention Engineering

Through encouragement and advice of Division of Forestry personnel the Western Pacific Railroad Company instituted a complete Fire Prevention Engineering Program to reduce fire occurrence along their rights-of-way.

Action by the company included four steps. Chemicals were used for clearing the right-of-way; in most areas the entire width of right-of-way was included, dead brush being removed by mechanical means and hand labor. Spark arresters were installed on *all* engines, including those for switchyard use. An engine maintenance program was established in which engine spark arresters were serviced and exhaust stacks scoured at least once each thirty days; scouring exhaust stacks was to prevent build-up of large carbon deposits which, when they do break loose, ignite fires in light fuels. Engineers were trained, from a fire prevention standpoint, on proper use of more electrodynamic braking to reduce use of the train's air brakes. The program was far-reaching; because of costs and for technical reasons it could not be completed in one year.

Through the over-all program, reduction of fires in the Sierra Cascade District can be appreciated by comparing total railroad fires for recent years.

<i>Year</i>	<i>Number of fires</i>
1964	More than 100
1965	Less than 65
1966	42
1967	6

Working with Southern Pacific Railroad Company and Fibreboard Corporation, California's largest user of wood chips, an agreement was reached to use nets to cover all freight cars carrying wood chips within the state. This will greatly reduce accumulation of

wood chips along rights-of-way which has led to easy ignition of wildfires. The expense of nets and fasteners is being shared by the two companies.

A new Roadside Hazard Reduction Guide was completed, in cooperation with the United States Forest Service, Region 5. The California Division of Highways reviewed the guide while it was being written, making several suggestions for improvement and offering some of their official correspondence for inclusion.

Electrical utility companies continue to make good progress on right-of-way maintenance. Continuing at their present pace, by the 1969 fire season they should reduce fires caused by powerlines coming into contact with trees or limbs.

Law Enforcement

Significant progress in coordinated investigations with cooperating and contracting agencies were attained this past year. A high number of investigations were conducted by the Division at the request of cities and adjacent fire and law enforcement agencies. Requests included industrial and commercial fires which caused major loss, along with watershed fires. It became apparent that a significant number of persons responsible for city and urban fires were also responsible for fires in the Division's responsibility area.

Division investigation teams were requested by Ventura County during the rash of major fires which occurred the last part of October. Each of the four teams consisted of two Division investigators and one Ventura County Fire Inspector. These teams conducted 42 separate investigations in a little over a week's time, establishing the causes on all but two of the fires. Of these fires, five were major watershed fires burning over 70,000 acres, resulting in the loss of hundreds of thousands of dollars in homes and improvements. Fire investigators found themselves deeply involved with suspects who were also involved in narcotics, burglary, and grand theft; and a number of homosexuals. This information was turned over to local law enforcement agencies; it helped expedite apprehension of these people not only for fire violations but for other crimes as well.

Additional use was made of investigation teams in southern California in early November during the siege of watershed fires. The cause, and parties responsible were determined in all but one of the major fires. There were 225 fires during this period, with six major fires burning over 112,000 acres and causing about six million dollars' worth of damage. Fires investigated by these teams burned some 113 structures, resulted in flood damage to 200 others, and utilized over 4,200 men from all agencies.