

Planned

Range Improvement

programs are beneficial

Range improvement programs are changing adaptable California brushlands into grasslands and thereby increasing feed supplies for livestock, improving watersheds, and reducing the hazard of wildfires.

California converts about 100,000 acres a year from agricultural production to residential and industrial uses. Increasing recreational use of public lands—about 55 million visitor-days annually—and private lands—15–20 million visitor-days a year—reduces further these land resources for livestock use. Consequently, rangelands—including grass revegetated brushlands—are of increasing importance as a natural resource.

An extensive series of adaptation tests of range forage plants—native and introduced species—has been carried on throughout California since 1938.

Range improvement involves removal and subsequent control of the brush, re-seeding with desirable forage plants, and proper management of the grazing. The operator of a range improvement program employs technological advances as skillfully as does the farmer in the valley areas who grades the land, irrigates, plants improved varieties, cultivates, and controls harmful pests.

The most widely used tool for range improvement in California is controlled fire. The number of acres burned under permit has increased from 50,424, in 1945, to 150,564, in 1958. Controlled fire is the most economical method to remove undesirable brush from carefully selected, potentially good rangelands.

Authorized by State Laws

Enabling legislation authorizes the California Division of Forestry to issue permits for controlled burning of brush-covered land in areas where fire protection is the Division of Forestry's responsibility. In a separate statute, the Legislature directs the Division to engage in a program of experimental land clear-

ance and revegetation of areas believed useful for forage production.

Controlled burning projects are carried out by the permit-holder on land under his legal control. Frequently the burns are cooperative, and two or more permit-holders work together in planning, preparing and conducting control-burns.



Organized effort to conduct brush range improvement programs includes fire control equipment in pickups—often also used in wildfire control—diagram of fire lines and ignition techniques on blackboard, and task assignments to participating cattlemen by the fire boss.

Preburn preparation, used by an increasing number of cattlemen, includes crushing the brush by bulldozing, rolling, or chaining. Careful preburn preparation increases the effectiveness and safety of the control burn and produces a better seedbed for later seeding. Most of the brush crushing treatments are applied from four months to a year, or longer, prior to the date of the actual burn. Where the brush is crushed, the burning can be done under the safer conditions which exist during the winter months or during the evening.

After initial brush removal by fire, chemical treatment often effectively controls rapidly regenerating sprouts and seedlings. Chemical brush control on

these same areas would be virtually impossible without prior burning.

In Madera County, when chamise brush was crushed and left for two years before burning, resprouting after the burn was practically eliminated.

Studies indicate feed production from reclaimed brushland is 4–5 times greater than before the brush was removed. An acre of brush so dense no animal could get through it may produce 20 pounds or more of beef the season following burning and seeding.

A planned management program is essential to prevent control-burned or wildfire rangelands from reverting to dense brush stands.

Soil and Water Conserved

Whenever vegetative cover is removed from land by fire—either controlled burning or wildfire—there is danger of soil erosion but, if useful crops are to be produced, land preparation becomes a necessary risk. However, very little soil erosion has resulted from controlled burns. Native or seeded grasses and other herbs quickly provide good ground-cover that protects the soil from erosion as well as or better than some types of brush protect the soil. Exposed soils of

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burned brushlands are subject to high erosion hazards during the comparatively slow process of natural revegetation, but grasslands recover rapidly from the effects of a fire. Seeding adapted species into the ash seedbed greatly reduces the risk of erosion.

Conversion of brushland to properly managed grassland aids in water conservation. The roots of grass are shallow. When the upper soil moisture is used up, perennial grasses usually go dormant and annual grasses die. Brush roots go deeper into the soil and remove moisture that otherwise could supply springs and streams during the summer.

Wildfire Control

The brush that covers much of California's hills encourages the spread of wildfires, hampers economic fire control, and endangers vast areas of valuable forest land. Brush areas are a constant threat to adjacent property. In seven years of a nine-year period—1949–1957 inclusive—total annual acreage burned by wildfires exceeded that of controlled burns.

Cost per acre of control burning is less than cost per acre for wildfire protection. For example, in 1957, the statewide average cost of control burns was \$3.00 per acre. The average cost for wildfire suppression was \$97.00 per acre.

Range improvement reduces fire hazards and provides many additional benefits. Stopping wildfires in grassland is easier and cheaper than in brushland. Seeding with adapted forage species and subsequent control of brush following a wildfire enhance the state's fire prevention efforts and avoid the production of brush fuel for the next wildfire.

California cattlemen invested approximately one-half million dollars to improve the 146,212 acres control-burned in 1955. The following year showed a gross value of product of over \$700,000 which, with the proper follow-up treatment, is continuing production.

Early studies show that costs of control burns in 1947 and 1948 ranged from a low of \$0.45 per acre to a high of \$2.95 per acre. This was early in the program when no preburn preparation, except for fire-control lines, was made.

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A planned range improvement program includes a clean control burn of carefully selected and prepared sites—top; seeding of the burned area to provide more feed of better quality than the site offered before—center; and chemical sprays that are often used as a follow-up to insure complete conversion—bottom.



RANGE

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Cost analyses of 36 burns involving 38,410 acres in Shasta County show somewhat lower costs, averaging \$0.38 per acre in 1952 and \$0.54 per acre in 1953. In one instance a cost of \$5.00 per acre was indicated for crushing brush.

Studies in San Benito County indicate that the area receiving the most intensive—and expensive—treatment showed a profit about 50% greater than did the area given the least expensive treatment. Even more important, however, is the fact that the former is now practically cleared of brush, and its forage production is increasing, while the latter is reverting to brush, with a decline in forage quality.

Current research is directed toward assisting cattlemen to attain complete, permanent removal of brush and replacement with good forage species of high nutritive value.

Chemical Control

Chemicals are widely used for control of undesirable woody species on lands which offer good potential for range feed production. The principal chemicals used are 2,4-D, 2,4,5-T, when used in accordance with label instructions, and the combination of the two, commonly referred to as brush-killer. Coyote brush, coast sagebrush, purple sage, white sage and mixed coastal brush are effectively controlled and suppressed by these materials, as are sprouting chamise and chamise seedlings. Old chamise and the chaparral, including the various manzanitas and ceanothus species, are not controlled by the now known chemicals until after burning. Sprouts and seedlings are then controllable by foliage application of 2,4-D, 2,4,5-T, or mixtures of the two.

More effective chemicals may be developed, which can be adapted to a wider range of species. Economic data on use of chemicals are somewhat meager, mainly because chemicals have not been

used so extensively as fire. Information available on injection of 2,4-D in species of oak indicates costs of about 3¢ to 5¢ for a 10' tree.

Costs per acre of chemical brush control range from less than \$5.00 to as high as \$50.00. Generally the cost of the chemical will range from \$2.00 to \$5.00 per acre per application, to which must be added the cost of applying the material, which will vary from \$1.00 to \$5.00 per acre if done by aircraft. Sagebrush—desert—was controlled for \$3.50 to \$5.00 per acre, materials and application. Excellent control has been obtained on several hundred acres in Sierra Valley from one aerial application.

Comparative Costs Per Acre of Various Methods of Brush Removal

CONTROLLED FIRE			
Northern California 1947-48, \$0.45 to \$2.95			
Shasta County:			
	Ave.	Low	High
1952	\$0.38	\$0.15	\$3.33
1953	\$0.54	\$0.14	\$5.52
San Benito County:			
Low			\$ 7.26
High			\$43.24
AVERAGE STATEWIDE, 1959:			
No preburn preparation, \$3.00 to \$4.00			
With preburn preparation, \$5.00 to \$12.00			
CHEMICALS			
Ranges from \$3.50 to \$50.00			
General:			
Material, \$2.00 to \$3.50			
Application, \$4.00 to \$5.00			
Desert sagebrush:			
\$3.50 to \$5.00			
MECHANICAL			
San Mateo and Santa Clara Counties:			
Low			\$8.00
High			\$50.00

Without proper application, two and sometimes three treatments may be necessary. Hand applications with the knapsack sprayer, on follow-up chemical treatment, seem invariably to result in a more satisfactory job. This is simply a matter of thoroughness in wetting. With hand applications, labor costs usually exceed the cost of the chemical.

Mechanical Control

Mechanical control of brush has shown some increase during the past few years. This practice has always been most widely accepted in southern California,

where climatic conditions make burning less acceptable and where some of the brush problem occurs on areas which lend themselves readily to disking.

Costs of mechanical clearing vary from \$8.00 to \$50.00 per acre, for tractor and labor, and average approximately \$25.00 per acre in most instances.

Many operators prefer to leave the knocked-down material in place for two or three years and complete the clean-up job with a broadcast control fire during late summer or fall. This method helps later forage plant stand establishment because of the general distribution of ash. Other operators either windrow or stack the brush in isolated piles and leave it for from one to several years. The piled material is cleaned up by winter burning when fire restrictions are not in operation.

Excessive soil disturbance during tractor clearing operations often restricts establishment of seeded grasses and legumes. Mechanically cleared brushlands may present a serious erosion hazard.

The controlled burning of brush, followed where needed by chemical treatment of regrowth and seeding of improved forage plants, is converting brush areas to grass. Controlled burning, properly planned and managed, brings many benefits to everyone.

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HEATING AND COOLING

of dwellings under study

Investigations at Davis seek basic answers to the problems of making houses as efficient and economical as possible for heating and cooling. Among the chief objectives of the study are to assess the effects of solar radiation in occupied dwellings; to find the most desirable amounts of heat from the sun within houses in the various climatic environments of California; and to evaluate methods of control for shading openings to modify the effects of heat from the sun.

Tests are being conducted in actual tract houses and experimental structures including a trailer, cubicles, and panels.

—Richard D. Cramer, Dept. of Home Economics, Davis.

Cost Summary—Spring Dell Study Area, San Benito County, 1950-58*

Treatment	Cost /acre	Lbs. beef/A	Value @ 21¢/lb.	Net profit/A
A Burn plus reburn	\$ 7.26	187.0	\$ 39.27	\$32.01
B Burn, seeded, reburn, seeded	15.37	218.4	45.86	30.49
C Burn, seeded, reburn, seeded	20.43	302.3	63.48	43.05
D Mashed, burned, seeded, chemicals 3x	43.24	476.4	100.04	56.80

* Spring Dell Study area is one of the range improvement field studies conducted by the California Division of Forestry in cooperation with University of California.