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start may prove feasible. The main shortcomings of grass as a fuel are easy ignition and rapid fire spread after the plants have matured. But, some of the perennial grasses show promise of adding sufficient green material to slow the spread of fire during a long period of the year.

Species Previously Recommended

Testing of grasses on cleared brushland areas is not new in southern California or elsewhere in the State. The work of many years had shown that certain species are adapted to many sites. This information has encouraged us to sow grasses on fuel-breaks, and it has indicated which species to recommend or to test further. The general recommendations for grasses to sow within the brushland zone were based on work of the Agronomy Department and Agricultural Extension Service of the University of California, on studies by the Forest Service, Agricultural Research Service, and Soil Conservation Service of the U. S. Department of Agriculture, and on the experience of many private landowners.

Two longlived grasses--Hardinggrass and smilo--were recommended as the base species in a perennial grass mixture. Veldtgrass was recommended for light-textured soils in southern and coastal California. Several other perennials were suggested to replace part of the Hardinggrass or smilo on different sites in northern and central California, but were questionable for the southern part of the State.

The biggest gap in knowledge of adapted species in southern California was for the mountains too high in elevation for good growth of Hardinggrass, above approximately 4,000 feet. For this area, where few tests had been made, four wheatgrasses were suggested for trial sowing.

Changes in Species Recommendations

The new species now recommended for southern California are the four wheatgrasses: pubescent, tall, intermediate, and crested. During a favorable season and two dry seasons, the wheatgrasses have been outstanding at upper elevations. And during the past two seasons, in tests at lower elevations, both pubescent wheatgrass and tall wheatgrass have grown well under extremely unfavorable weather conditions.

Hardinggrass remains as a preferred species in the lower zones, but is not recommended for sowing above 3,500 feet.

Smilo has not established well in any of the tests during the two years, but on the basis of past performance it is included in the mixtures below 3,500 feet. However, supplies are probably too short for use except on a trial basis.

Veldtgrass is still recommended for sandy soils at low elevations.

Nodding stipa has been the outstanding perennial grass for sowing on poor sites at lower elevations. But, this native perennial bunchgrass is not in commercial seed production.

Blue wildrye, another native perennial, has given good to fair establishment in the lower zones. It also is not commercially available.

Big bluegrass, a native commercially available at a moderate price, has not grown well under the dry conditions during the last two years. However, it is still being tested extensively to determine the range of conditions under which it may be adapted.

Tall fescue and orchardgrass have not produced vigorous stands during the dry years. They probably will be short-lived where they do grow well, and are not being recommended for fuel-breaks and other permanent conversion areas. Because seed is abundant, these two species are being tested for use as temporary watershed cover after fires.

Of the annual grasses, domestic ryegrass, wimmera ryegrass, and Blando brome have grown best. The latter two appear better than domestic ryegrass for seed production on south exposures in dry years. Blando brome is the only one recommended for general sowing with perennial grasses on fuel-breaks. The ryegrasses may have a place, in small amounts, for broadcast sowing with perennial grasses on extensive watershed areas where maximum soil protection is needed for the first 2 or 3 years.

Recommended Species by Climatic Zones

Species for permanent plant cover have been recommended from the tests to date for each climatic zone in which tests have been made. The recommended sowing rates are for drilling, which is the positive method for obtaining satisfactory stands. If broadcast sowing is necessary, double the rate of sowing. The recommendations are:

<u>Climatic Zones</u>	<u>Species</u>	<u>Pounds/acre</u>
<u>Zones 2 & 4</u>		
Coastal and inland 15-25 in. precip. Below 3,500 ft.	Hardinggrass	2
	Tall wheatgrass	2
	Pubescent wheatgrass	1
	Blando brome	1/4
<u>Zone 5</u>		
Inland 15-25 in. precip. Above 3,500 ft.	Tall wheatgrass	2
	Crested wheatgrass	2
	Intermediate wheatgrass	1
	Blando brome	1/4
<u>Zone 6</u>		
Inland 25-35 in. precip. 2,000-3,500 ft.	Hardinggrass	2
	Tall wheatgrass	2
	Intermediate wheatgrass	1
	Pubescent wheatgrass	1
	Smilo	1
	Blando brome	1/4

<u>Climatic Zones</u>	<u>Species</u>	<u>Pounds/acre</u>
<u>Zone 7</u>		
Inland	Tall wheatgrass	2
25-35 in. precip.	Intermediate wheatgrass	2
3,500-5,000 ft.	Pubescent wheatgrass	1
	Blando brome	1/2
<u>Zone 8</u>		
Inland	Intermediate wheatgrass	2
25-35 in. precip.	Tall wheatgrass	2
5,000-8,000 ft.	Pubescent wheatgrass	1
	Crested wheatgrass	1
<u>Zone 9</u>		
Desert side	Tall wheatgrass	2
15-25 in. precip.	Intermediate wheatgrass	2
3,000-9,000 ft.	Pubescent wheatgrass	1
	Crested wheatgrass	1

George Edmunson of the FUEL-BREAK Staff and Dr. D. R. Cornelius of the Agricultural Research Service have prepared a report giving in more detail the results and conclusions from the species trials, for publication as a technical paper. Edmunson also is preparing a report describing the climatic zones within which the tests are being made.