

reforestation remains the greatest weapon in the hands of the Forest Service. The catchment areas have been re-clothed extensively by planting and seeding, both with broad leaves and conifers. It has been found that except in the few situations where conditions are very favorable for forest growth, planting is much more satisfactory and even more economical when results are considered. Nurseries have been started near all the large projects, and coniferous species are used for an overwhelming proportion of the work, the most common of which are the pines, *P. sylvestris*, *P. cembra*, and *P. uncinata*. Other conifers planted extensively are larch (*Larix europaea*) in the Alps and Pyrenees and fir (*Abies pectinata*) in the Cevennes and Pyrenees. Broad leaf trees, chiefly various species of alder and willow, are planted in the beds of streams and on steep banks where it is important that a soil cover be rapidly established. Beech (*Fagus sylvatica*), chestnut (*castanea vulgaris*) are commonly used in the Cevennes and in the Pyrenees.

At the beginning of 1909, 629,488 acres had been reforested at a cost for establishing the forest cover of \$8,000,000, or \$12.70 per acre. Of the total, 363,151 acres have been reforested by the State, 134,005 by the communes, and 132,332 by private owners. The State has given valuable assistance to both the communes and the private owners, having paid 55 per cent. of the cost of the work accomplished by the communes and 37 per cent. of the cost of the reforestation carried on by private owners. The departments have also made small money grants for reforesting in the mountains amounting to 23.5 per cent. in the case of work done by communes and 5 per cent. in the case of plantation by private individuals. The total cost of the reforestation work to the State up to 1909 has been \$5,568,683 on State projects; \$812,807 subventions to communal projects; \$348,744, subventions to private works; total, \$6,730,234.

The remainder of the expense of establishing cover on the catchment areas of mountain torrents has been shared as follows: Private owners, \$546,488; departments, \$400,723; communes, \$320,921.

Costs of Land Purchase.

The programme of work is by no means completed. The land already purchased by the State, 325,265 acres, represents only about 55 per cent. of the area for the acquisition of which plans have been completed. There still remain 266,047 acres, the purchase of which will be necessary. The average cost of the land purchased in France for stream control is \$18.50 per acre. The expenditure in the purchase had reached in 1909 \$6,022,644, and it was estimated that a further \$3,500,000 would be required.

Over 92 per cent. of the land already purchased will be reforested. The remainder consists of rock outcrops and areas above timber line.

Reforestation alone is not always sufficient; where the catchment area of the stream is very small, where the immediate control of waterflow is an important consideration, where the slopes are very steep and the banks lack stability or where a very rapid fall of water must be broken, recourse must be had to the erection of barriers. The French Engineers in the Department of Waters and Forests are credited with leading the world in the construction of works for the artificial control of mountain streams. Over half a century of experience has developed several well-defined methods of correcting the flood tendencies of runaway streams.

The small tributaries, high in the mountains, which are dry during a portion of the year, but down which in the season of melting snow or rain the water sluices without obstruction, are first attacked. The most common method here is to cover the bed with a woven network of branches, held down by stakes or by poles criss-crossing the bed and driven into the banks. The bed of brush catches material