

A New Hybrid Christmas Tree

By W. B. CRITCHFIELD

A hybrid pine developed in the course of forest-tree improvement research by the U. S. Forest Service has caught the interest of Christmas tree growers. It is a hybrid between two races of lodgepole pine (*Pinus contorta*) produced at the Institute of Forest Genetics at Placerville, California, and has some desirable attributes for use as a Christmas tree: good form and color, relatively rapid growth, and early production of persistent cones.

So far we know very little about how this hybrid is likely to perform outside California, but this past year several cooperators have started testing it on a small scale in the East and Pacific Northwest. As additional seed becomes available, we plan more extensive tests of the suitability of this hybrid for regions other than the low-elevation California climate in which it was developed.

One parent of this new tree is shore pine, a race of *Pinus contorta* that extends along the Pacific Coast from northern California to Alaska; the

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other is the mountain strain of lodgepole pine, a tree that grows at upper elevations in the mountains of the West. Of the two, shore pine has the better Christmas tree characteristics.

The mountain form of lodgepole pine is much too slow-growing (four to seven feet in height at 10 years at Placerville), and it lacks the shore pine's multinodal growth, persistent cones, and thick green foliage.

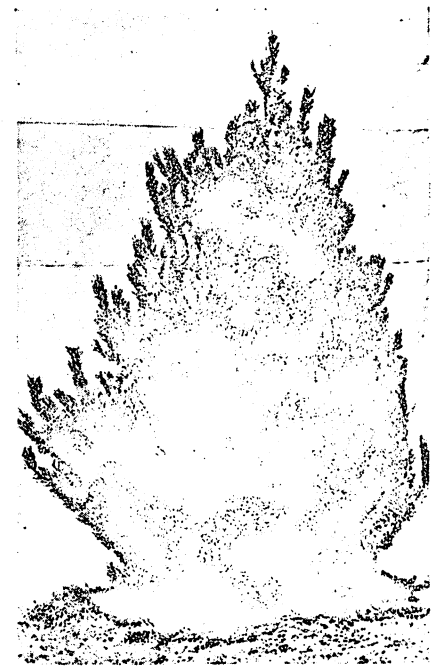
The much faster-growing shore pine (eight to twelve feet at 10 years) also has some undesirable characteristics. It often has an irregular crown form and internodes that are undesirably long for a Christmas tree. The better Southern strains of shore pine have another bad feature: they break up badly under a snow load, even in the mild foothill climate of Placerville, where snow is uncommon.

The hybrid combines some of the desirable features of the two parents. It has the sturdy, well-formed crown of mountain lodgepole pine, it grows about as fast as shore pine (10 to 11 feet at 10 years), and it has shore

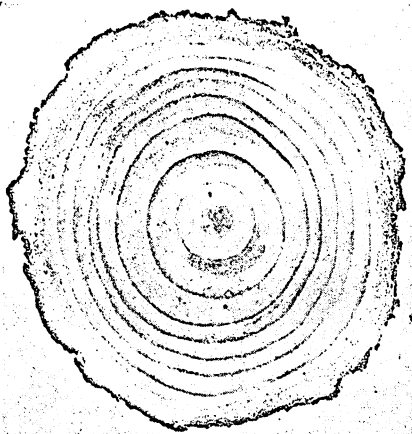
pine's multinodal growth, thick green foliage, and persistent cones.

Lodgepole pine grows in a wider range of environments than almost any other Western conifer. The shore pine variety grows near sea level, and the mountain variety extends up to timberline in some regions. The species extends south into Mexico and north into Canada, where it hybridizes naturally with jack pine, a tree of Canada and the Northeastern U. S. Lodgepole pine can also be crossed artificially with jack pine, but we have not yet succeeded in crossing it with any other pine. The lodgepole x jack cross, like most crosses between different species of pine, yields much less sound seed than crosses between different trees of the same species. This problem is not encountered in crossing the shore and mountain varieties of lodgepole pine, since they are races of the same species and do not show any genetic barriers to crossing.

We first made the cross between shore pine and mountain lodgepole pine at Placerville in 1946, in the course of our exploratory hybridization of the pines. The desirable Christmas tree characteristics of the hybrids prompted a California grower of Christmas trees to finance an expanded series of crosses between these two varieties of lodgepole pine in 1957.



Desirable characteristics of both the shore pine (left) and the Sierra Nevada lodgepole pine (center) were combined in the new hybrid Christmas tree (right). The hybrid develops more than one whorl of branches each year and has a conical shape and a straight trunk.



This cross section of the lower trunk of a young hybrid illustrates the rapid growth that is made by the hybrid Christmas tree. Note the width of its annual rings.

Pollen from shore pine was used to pollinate lodgepole pine growing on Mount Rose, near Reno, Nevada. About 4,500 seed were harvested from these crosses. High travel expenses and heavy losses of seed to insects increased the costs to about 11 cents per sound seed.

Current Studies

In 1963 the California Christmas Tree Growers Association financed a second effort to produce this hybrid in quantity. Costs were reduced in two ways. Travel and other expenses were cut down by making about half of the crosses on lodgepole pine females in the native stand nearest our headquarters at Placerville. The rest of the crosses were made on 10-year-old shore pines growing in the arboretum at Placerville. Using these trees as females was risky, because young pine trees just entering their reproductive phase are often poor seed producers.

All of these crosses were made in the spring of 1964. To pollinate the shore pines, we used pollen that had been collected from several mountain lodgepole pines the previous year and stored in a deep-freezer. Frozen pollen was used because the planted shore pines flower six or seven weeks before the native lodgepole pines growing at higher elevations. We chose as female parents a dozen shore pines grown from seed collected in several coastal localities: three in California, three in Oregon, and one in British Columbia. We pollinated from 25 to 190 female strobili per shore pine parent. The parents were chosen for their desirable Christmas tree characters, including the precocious production of cones.

The early production of small but ornamental cones is another desirable feature of shore pine, but individual trees vary greatly in the age at which

they begin to produce cones and in the number of cones they produce. Many shore pines begin producing female conelets as early as their fifth growing season, and in their sixth growing season our trees produced as many as 80 conelets on a single tree. Fortunately, we had detailed flowering records for the sixth to ninth growing seasons of these shore pines, and this information was helpful in selecting parent trees for these crosses.

The rest of the crosses were made on several mountain lodgepole pines growing at an elevation of 5,300 feet near Placerville. We used fresh shore pine pollen from six trees on these female parents.

The cones from these crosses were harvested in the fall of 1965. From controlled pollination of the mountain lodgepole female parents we obtained about 870 cones, yielding more than 11,000 hybrid seed—an average of more than 13 sound seed per cone. This is a much better yield than the eight sound seed per open-pollinated cone on the same trees. From the shore pine females, 350 ripe cones—about half of the total crop that we expect—had been harvested by October. These young trees produced about nine sound hybrid seed per cone—more than we had anticipated.

From these preliminary results we estimate the cost of one-year-old seedlings at a little more than three cents apiece. This cost can be further reduced when we can rely entirely on the shore pines at Placerville for fe-

male parents, and thus eliminate the major expense of travel.

We are not yet able to recommend this hybrid for planting in other parts of the country. However, a small amount of hybrid seed harvested in 1964 was shared with several research organizations in other parts of the U. S., including western Washington, New York, Pennsylvania, and West Virginia. We plan further small tests in other parts of the country, and within a few years we should know more about the adaptability of this Christmas tree hybrid to regions outside California.



Better Trees

The Georgia Forestry Commission's selected superior trees are now being evaluated for high gum yield. Trees, which are already under tests for superiority in growth rate and timber quality, are being evaluated for this additional trait.

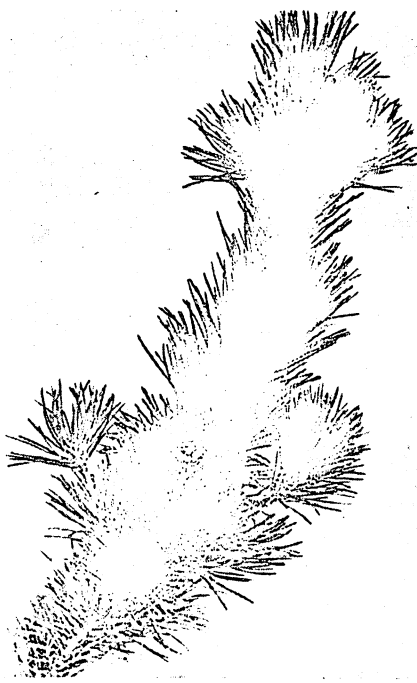
Commission Director Ray Shirley stated that the study is being made at the Commission's Arrowhead Seed Orchard near Cochran and the Horse-shoe Bend Seed Orchard near Glenwood. The study is being conducted cooperatively with the U. S. Forest Service. Shirley pointed out that the Commission will be able to produce seedlings with high gum yielding traits, as well as other desirable characteristics, when the study is complete.

Commission Reforestation Chief Sanford Darby stated that 179 carefully selected slash pine trees are being used in the study. Darby stated that once tests are complete on the selected trees, appreciable genetic gains in gum yield can be made if the top five or ten per cent are bred.

Trees involved in the study were selected originally for fast growth, resistance to insects and disease, good form, cone bearing ability and high specific gravity.

In conducting the study, the microchipping method will be used. In microchipping, the normal procedure is to make four one-inch square bi-weekly chips. The chipping wounds are then treated with five per cent sulphuric acid. Gum yields from the various trees, in the study, will be weighed periodically in evaluating the selected trees.

Shirley emphasized that the current study will give the Georgia trees an additional test, thus insuring Georgia land-owners of truly elite trees.



A bough from the new hybrid has its own pine-cone decorations, which develop when the tree is five years old.