

tivated plots was pulverized with hand tools in the same way as on the Krilium plots.

Results

On the basis of this test, Krilium offers little promise in loblolly erosion-control plantings on hard-packed kaolinitic subsoils typical of north Mississippi gully bottoms.

TABLE 1.—AVERAGE SURVIVAL AND HEIGHT GROWTH OF LOBLOLLY SEEDLINGS AFTER THREE GROWING SEASONS, 1954

Treatment	Survival	Height growth
	Percent	Inches
Krilium #6	80	10
Krilium #9	87	10
Cultivated	91	12
Control	71	8
Average	82	10

Three growing seasons after treatment, overall survival of the loblolly seedlings averaged 82 percent (Table 1). Survival was highest (91 percent) on the cultivated plots and lowest (71 percent) on

controls. By chi-square analysis, variation in survival among treatments was not significant although variation among blocks (from 44 to 97 percent) was highly significant.

Growth was generally very slow because of the severity of the sites. Overall height growth during the three growing seasons averaged 10 inches and ranged from 12 inches on cultivated plots to 8 inches on controls (Table 1). Block averages ranged from 18 to 4 inches, with average growth on the two blocks of extremely adverse Coastal Plain parent materials being only 6 and 4 inches. Differences in height growth among treatments were not significant, and those among blocks were highly significant.

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Freezing Injury to Young Sugar Pine

Twice in recent years young sugar pines have proved more susceptible to freezing than ponderosa and Jeffrey pines. Many young seedlings—up to 6 weeks old—were killed; older plants—those that had completed at least 1 year's growth—were severely damaged.

The first striking case of freezing damage was observed at the Stanislaus Experimental Forest nursery in 1950. Evidently it was associated with a sharp drop in temperatures during the period September 30 to October 2. Maximum and minimum air temperatures in a weather shelter 4.5 feet above the ground before, during, and immediately following the critical period were:

	Minimum (°F.)	Maximum (°F.)
Previous week	34-37	74-76
Sept. 30	18	57
Oct. 1	18	57
Oct. 2	23	70
Following week	27-34	65-81

By October 10 all of the terminals of the 1-0 sugar pines in two 4- by 12-foot seedbeds had turned brown. Ponderosa and Jeffrey pines of the same age in adjacent seedbeds showed no evidence of injury.

The second instance was associated with a late spring frost in 1954. Considerable damage occurred to young sugar pines in a test planting near Fish Camp in Mariposa County. Minimum temperatures of 27°F. were recorded at the south entrance to Yosemite National Park on June 5, 6, and 10. The minimum temperatures at the planting site, which was on an exposed ridge about 1,000 feet higher in elevation than the recording station, may have been considerably lower—possibly as much as 10 degrees.

The freeze was more damaging to new sugar pine seedlings in seed spots than to 3-year-old transplants set out the preceding spring. Some of the seed spots were protected

from rodents by wire screens. In unscreened seed spots, 74 percent of the seedlings were killed. No transplants were killed even though all or most of the new growth was damaged on 66 percent of the transplants. Ponderosa and Jeffrey pines randomly intermingled among the sugar pines sustained very little damage. Only 7 percent of the 2-year-old ponderosa pine transplants were affected by the freeze, and none died; only 9 percent of the ponderosa pine and 8 percent of the Jeffrey pine seedlings in unscreened seed spots were killed.

Wire screens, besides keeping rodents out, protected the young seedlings from freezing. Only 31 percent of the sugar pine seedlings under wire screens were killed compared to the 74 percent that were destroyed in unscreened seed spots. Losses among screened ponderosa and Jeffrey pine seedlings were also lower. For ponderosa pine, only 4 percent of the seedlings under wire screens were killed by the freezing; for Jeffrey pine, only 1 percent.

In all instances, the seed from which the subject trees originated were collected from natural stands in seed zone No. 4.¹ This is the same seed zone in which the plantings were conducted. Hence, considerable reason exists to suppose that geographic origin of the stock had not biased the results.

The differences in susceptibility to freezing may contribute, in part, to differences in natural distribution of the species.

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¹Fowells, H. A. Forest tree seed collection zones in California. California Forest and Range Expt. Sta. Res. Note 51, 5 pp., illus.

²The California Forest and Range Experiment Station is maintained at Berkeley, Calif., in cooperation with the University of California.