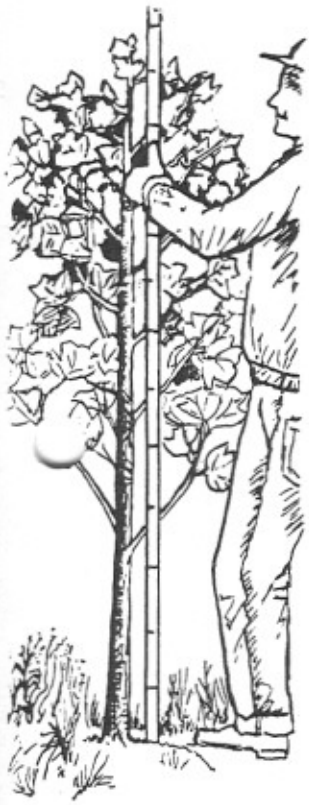

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SURVIVAL AND GROWTH OF LOBLOLLY PINE SEEDLINGS DAMAGED BY AN EARLY WIND STORM

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SURVIVAL AND GROWTH OF LOBLOLLY PINE SEEDLINGS DAMAGED BY AN EARLY WIND STORM

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Abstract

In May of 1988, a severe wind storm struck the New Kent nursery, with estimated wind speeds of 50 miles per hour. The loblolly crop varied slightly in age, as seeding had been done 20 to 29 days before the storm. Younger seedlings, particularly those in more exposed seedbeds, experienced significant amounts of damage. To assess the effect of the wind damage on survival and growth, four categories of seedlings were individually marked in the more heavily damaged areas and followed through lifting. Three categories consisted of different damage levels and the fourth consisted of "late germinants," seedlings that emerged after the wind storm. At the end of the season, survival clearly reflected the original level of damage, ranging from 100 percent for slightly damaged to 80 percent for severely damaged. Survival of late germinants was 95 percent. Height and diameter of surviving seedlings were similarly related to original level of damage. The percent of seedlings that attained plantable size (at least 7/64 inch root collar diameter) was 100, 80, 20, and 85 percent for the slightly, moderately, and severely damaged seedlings and late germinants, respectively.

INTRODUCTION

On May 24, 1988, at approximately 12:30 A.M., the New Kent nursery experienced a severe windstorm, not accompanied by rain. Wind speeds were estimated to have exceeded 50 miles per hour and the duration of the storm was at least one hour. Seeding had been done 20 to 29 days before the storm occurred and some seedlings were still emerging. The younger and more exposed seedlings (those away from field edges where trees blocked the wind) were the most vulnerable to damage.

The morning after the storm, the most striking visible damage was the twisting, shrinking and complete loss of any green color in the cotyledons of many seedlings. The cotyledons were a very pale brown or straw color. Many seedlings that had just emerged and were still in the cotyledon stage died. The soils at New Kent are sands and loamy sands. No rain occurred with the wind, but fortunately the seedlings had been irrigated the previous afternoon so that little damaging sand blowing occurred. Most of the damage resulted

from dessication. Abrasion from blowing sand usually causes lesions, which were not present following this particular storm. If we had not irrigated, and the soil had been dry, the losses would have been much greater.

Ten days after the storm, we could better assess the damage to the growing tips and primary needles as well as to the cotyledons. By this time, the primary needles on damaged seedlings were killed back from the tips for varying distances. Slightly damaged seedlings had only the tips killed, but severely damaged seedlings had primary needles killed back almost all of the way, with just short, green stubs remaining. There was a strong relationship between seedling age (and size) and extent of damage. The older, larger seedlings withstood the wind better.

We had no previous experience with wind damage like this, and this study was installed to provide information on survival and growth of damaged seedlings. The data would serve as a guide for predicting numbers of plantable seedlings following similar storms in the future. On June 2, the tenth day after the storm, 160 seedlings with different degrees of damage were individually marked to be monitored through the season until lifting.

PROCEDURE

Within the most heavily damaged areas, four 5-foot-long plots were laid out. In each plot, 10 seedlings in each of 4 categories were identified by placing a color-coded steel ring around each individual seedling. A total of 160 seedlings were marked, 40 each in the following four categories (illustrated in Figure 1):

a. Slightly damaged - At least half of the cotyledons and approximately the basal 1/2 inch of primary needles still green.

b. Moderately damaged - Cotyledons mostly dead and only the basal 1/4 inch of primary needles still green.

c. Severely damaged - Cotyledons dead and approximately 1/8 inch at the base of primary needles still green (little more than a growing point).

d. Late germinants - Seedlings that germinated after the storm.

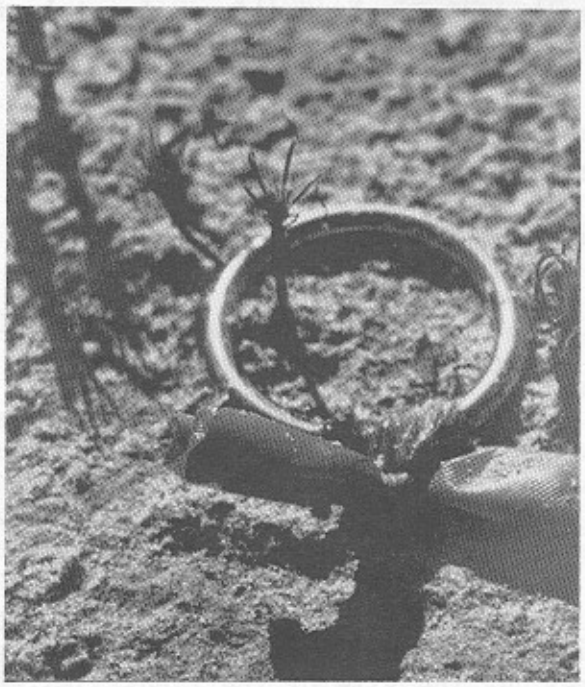
Undamaged seedlings were not included, because few could be found within these heavily damaged areas.

Seedling selection was as evenly distributed as possible within the interior six drill rows. Selection of individual seedlings was representative of the full range within each damage class, but the size of the rings limited selection to seedlings that were at least 1/4 inch away from their nearest neighbors.

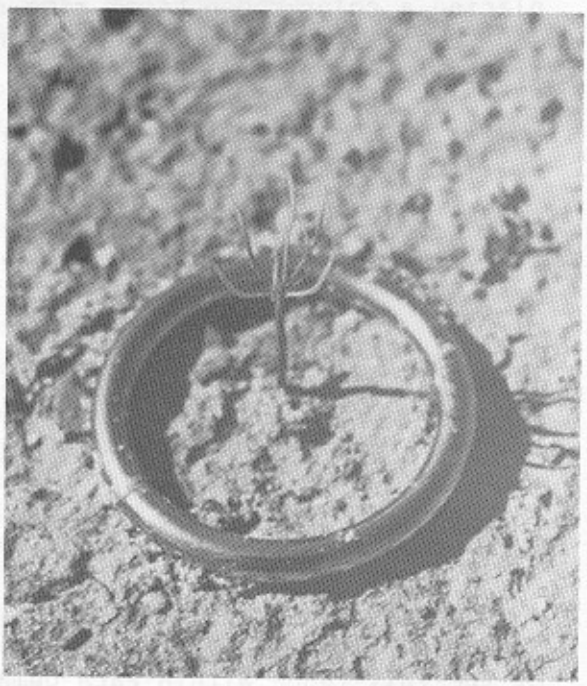
In early December, seedling survival was tallied and root collar diameter and height measured.

Slightly damaged seedling

Moderately damaged seedling



Severely damaged seedling



Late germinant

Figure 1. Examples of the four damage categories.

RESULTS AND DISCUSSION

This study does not address the number of seedlings that died during or soon after the wind storm. Rather, it provides estimates of survival and growth for seedlings damaged, but still alive, 10 days after the storm.

Table 1 gives the results of the final measurement at the time of lifting. Percent survival was clearly related to the original level of damage, with a range of 100.0 percent for slightly damaged seedlings to 79.5 percent for severely damaged seedlings. Ninety-five percent of the late germinants survived. Root collar diameter and height of surviving seedlings were also clearly related to extent of damage (Table 1).

Late germinants performed better than we had expected, based on an earlier study involving hail damage./1 Two factors may help to explain the better performance of late germinants in this study. First, seedbed density was lower in this study (22 to 25 seedlings per square foot compared to 33 to 35 in the earlier study). Second, practically all seedlings were damaged to some extent in the 4 plots in which seedlings were marked. Consequently, growth was probably reduced, at least slightly, for all seedlings. In the earlier study, although the majority of seedlings suffered some hail damage, many did not. The undamaged seedlings then grew normally and tended to suppress damaged seedlings. These two factors, lower bed density and less competition from undamaged seedlings, may have resulted in the better survival and growth of late germinants in this study.

We count and grade seedlings at our New Kent nursery, and consider all seedlings less than 7/64 inch root collar diameter as culls or not plantable. Table 1 includes the percent of seedlings plantable for each damage class, and Figure 2 compares percent survival and percent of seedlings plantable.

In conclusion, seedlings at this stage of development appear to need at least the basal 1/4 inch of primary needles alive in order to survive and grow satisfactorily after a wind storm of this type.

1/ See Occasional Report No. 71

Table 1. Percent survival, percent plantable, average root collar diameter, and height at time of lifting.

Class	Percent survival	Percent plantable	Average root collar diameter (32nds of an inch)	Average height (inches)
Slight	100.0	100.0	6.6	8.0
Moderate	92.5	80.0	4.5	6.9
Severe	79.5	20.5	3.2	5.5
Late Germinants	95.0	85.0	4.8	6.9
Overall mean	91.8	71.4	4.8	6.8

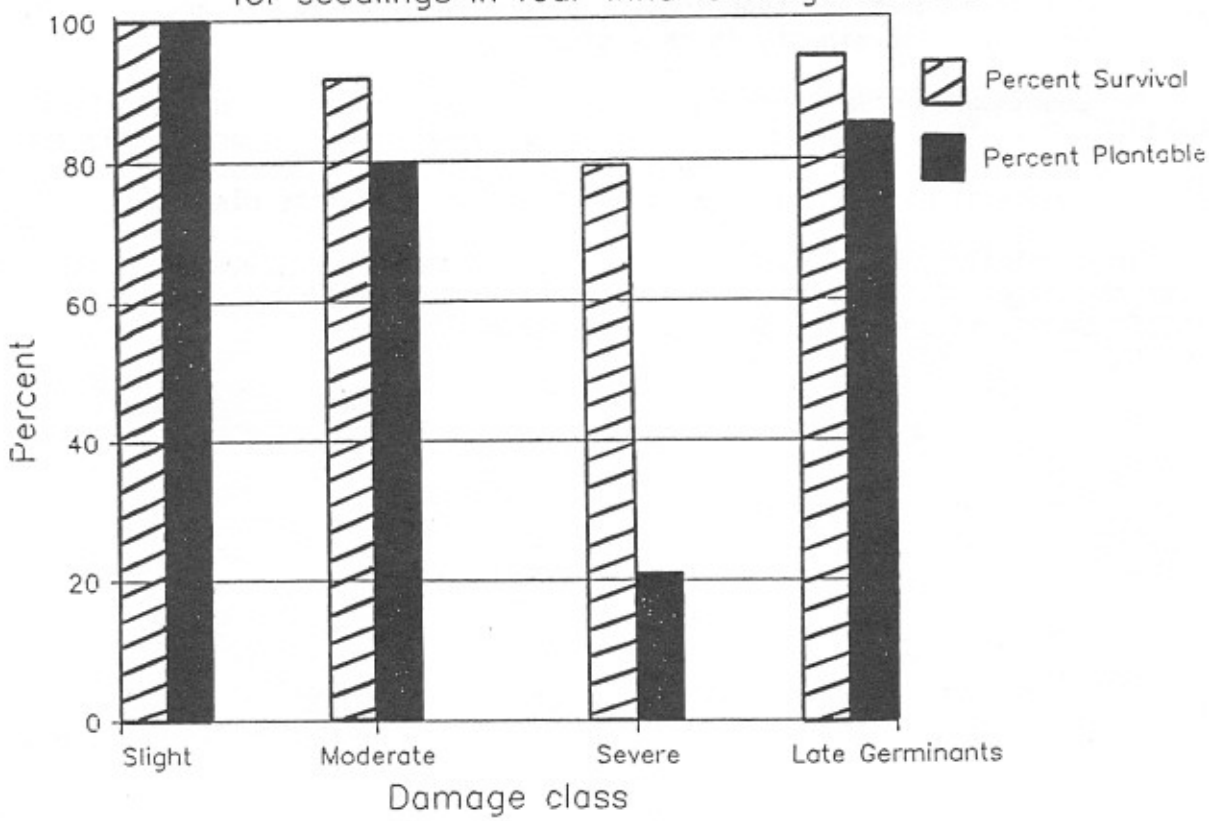



Figure 2. Survival and plantable percentages for seedlings in four wind-damage classes.