DOUGLAS-FIR NURSERY STOCK SURVIVAL BY AGE CLASSES

by

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When this study was begun, little information was available on performance of various classes of Douglas-fir nursery stock. We felt that many persons were basing their choice of stock to be planted on sketchy, circumstantial evidence. Therefore in November 1966, we began this study to assess both survival and growth of several seedling and transplant classes of Douglas-fir stock. The study also included a comparison of transplants from Wind River and Westfir nurseries.

STUDY DESIGN

Nursery stock from three seed sources, one each of 3,000-, 3,500-, and 4,000-foot elevation, was planted in fall 1966 and spring 1967 at appropriate elevations on the Oakridge District of the Willamette National Forest. Included were 1-0, 2-0, and 3-0 seedlings from Wind River , and 1-1 and 2-1 transplants from both Wind River and Westfir nurseries.1 /

1/ Wind River and Westfir serve as short titles for the U.S.D.A. Forest Service's Wind River Nursery at Carson, Wash., and the Westfir transplant nursery at Westfir, Oreg., respectively.

Stock was planted in nine clearcut units, three units at each of three elevations. All classes of stock were represented by one row of seedlings planted in the fall and one row planted in the spring in each of three blocks in each unit. Stock classes were assigned randomly to the rows in each block. Spacing between trees was 8 by 8 feet. Three planters were used; block A in all units was planted by the same planter, block B by another, and block C by the third. Different teams planted in the fall and spring.

Throughout the study, an effort was made to eliminate all sources of variation except planting site and nursery stock. When storage was required, seedlings of all classes were stored together at Westfir on built-in racks in a refrigerated van.

Today, I will make three comparisons using the survival data collected at the end of one, the 1967, growing season. First, I will compare survival of nursery stock between the three units at each elevation to show variation among units. Next, I will combine data for all units at a given elevation and compare fall and spring survival among stock classes. Finally, I will compare data to see if survival of transplants from either the Wind River or Westfir nursery was consistently better.

STOCK SURVIVAL AMONG UNITS

At 3,000 Feet

Comparison of survival data among individual units proves enlightening. For instance, relative survival on the three units was essentially the same for all classes of stock (fig. 1). Survival was poorest on unit 1 which was free of competing vegetation but has somewhat rocky soil. Its aspects are south and west, and the slopes are moderate.

Survival on unit 2 was intermediate for most classes of stock. Unit 2 was also essentially free of competing vegetation, and the soil is less rocky than on unit 1. This unit is nearly flat.

Survival was best on unit 3--above 80 percent for all classes of stock. This unit was free of competing vegetation, and the soil is deep. Slope is moderate, aspect south.

Slash had been burned on all three units in the fall of 1966. Fall planting was completed on the three units 4 days after stock was lifted; spring planting was completed within 2 days of lifting on units 1 and 3, 3 weeks after lifting on unit 2. If planting delay were a factor, I would expect survival to be poorest on unit 2. This was not the case.

At 3,500 Feet

Survival was much poorer at the 3,500-foot elevation than at 3,000 feet but, again, quite consistent between units for all classes of stock (fig. 2). Survival on unit 4 was not spectacular, but it far surpassed survival on units 5 and 6. The reasons for the difference seemed obvious. Unit 4 received a good burn in 1965--competing vegetation and logging debris were reduced to a low level. In contrast, unit 5 was burned 2 years earlier--in 1963. Though a good burn

resulted, competing vegetation has taken over the site. Unit 6, created in 1964 to salvage blowdown, was also burned in 1965, but not sufficiently. Both logging debris and competing vegetation are present. Stock was planted on all three units within a month after lifting. Unit 4 is fairly flat, and units 5 and 6 have steep south aspects.

You may say, "Well, south aspect is the reason mortality was greatest on units 5 and 6." Then I would reply, "I don't think so, because at 3,000 feet the units with highest and lowest tree survival were both on south aspects, and we will see the same situation at 4,000 feet."

At 4 000 Feet

At 4,000 feet, the comparisons are not so complete. None of the units received 1-0's or Wind River 2-1's, and because of the late spring, units 8 and 9 received no spring-planted stock at all.

Again, relative survival among units was nearly the same for all classes of stock (fig. 3). Survival was intermediate on unit 7 which was burned over in 1965. Slopes on unit 7 are moderate, aspect is south. At time of planting, very little competing vegetation was present. Survival was best on unit 8, burned in 1966. Unit 8 is steeper than unit 7 and, like unit 7, has south aspect and very little competing vegetation. Survival was poorest on unit 9, burned over in 1963. Unit 9 is mostly flat and had dense competing vegetation.

To summarize the foregoing, survival of nursery stock was reasonably good on south aspects during a distinctly droughty summer where soil was not rocky and competing vegetation was absent. Even on the flat, survival was poor in the presence of competing vegetation. The apparent moral? Burn clean and plant as soon as ashes are cool.

FALL VERSUS SPRING PLANTING

In fall plantings at 3,000 feet, survival of 3-0's and all transplants average 79 percent or better (fig. 4). Survival was a respectable 73 percent for 2-0's; 1-0's were lowest at 54 percent. Mortality of 1-0's was due largely to soil movement which simply buried the small trees.

Survival of spring-planted stock was poorer than fall-planted for all classes except 1-0's; 3-0's and Wind River 2-1's had lowest survival, 48 and 57 percent, respectively. Other classes of transplants showed about 80-percent survival.

At 3,500 feet, average survival of both fall and spring planting was lowered by losses on the two heavily vegetated units (fig. 5). Fall-planted Wind River 2-1 stock was the only class to stay above the 50-percent level, with 55 percent surviving. Wind River and Westfir 1-1's and Westfir 2-1's had 46-, 47-, and 41-percent survival, respectively. Wind River 2-0's had 49 percent surviving. In spring plantings, success was lower yet; no stock class had better survival than Wind River 2-1's with 31 percent. As at 3,000 feet, spring-planted 1-0's had slightly higher survival than fall-planted 1-01s.

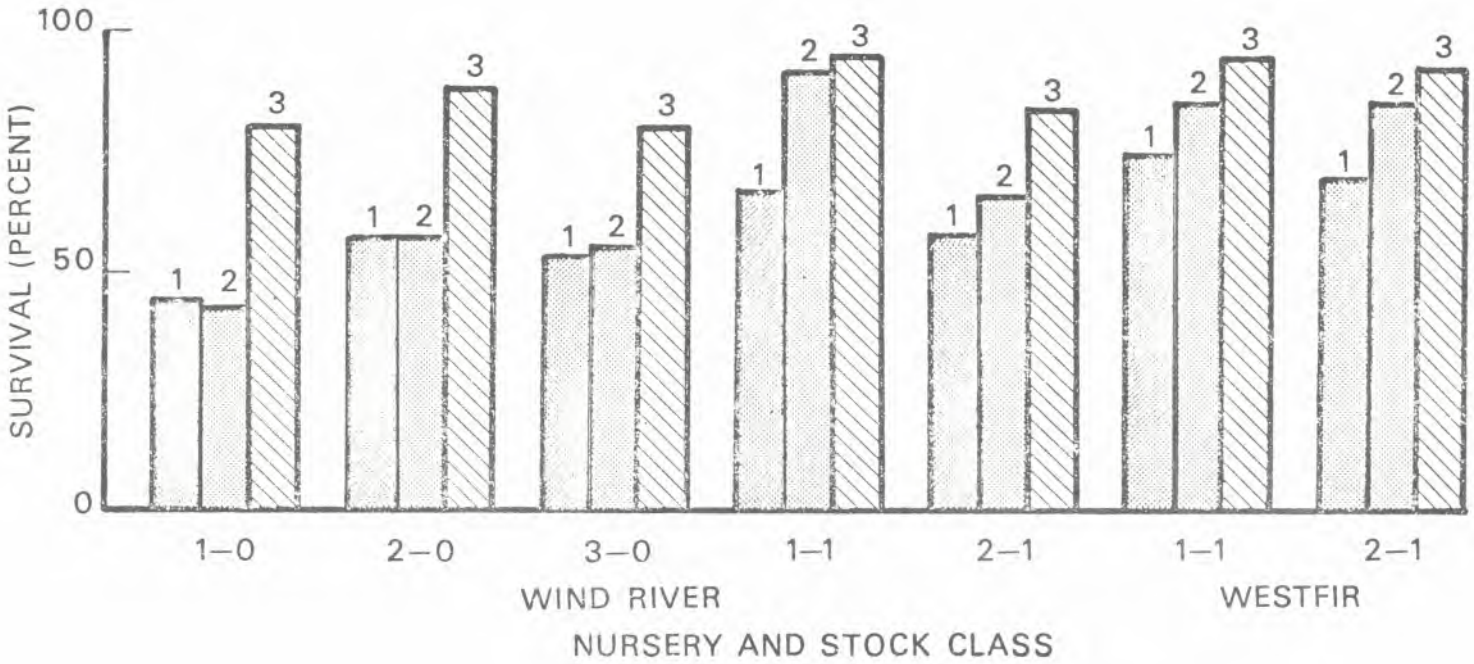

Figure 1.--Survival of Douglas-fir nursery stock in three clearcuts at 3,000-foot elevation after one growing season. Both spring and fall planting are included. Each class of stock represented by 150 trees per unit.

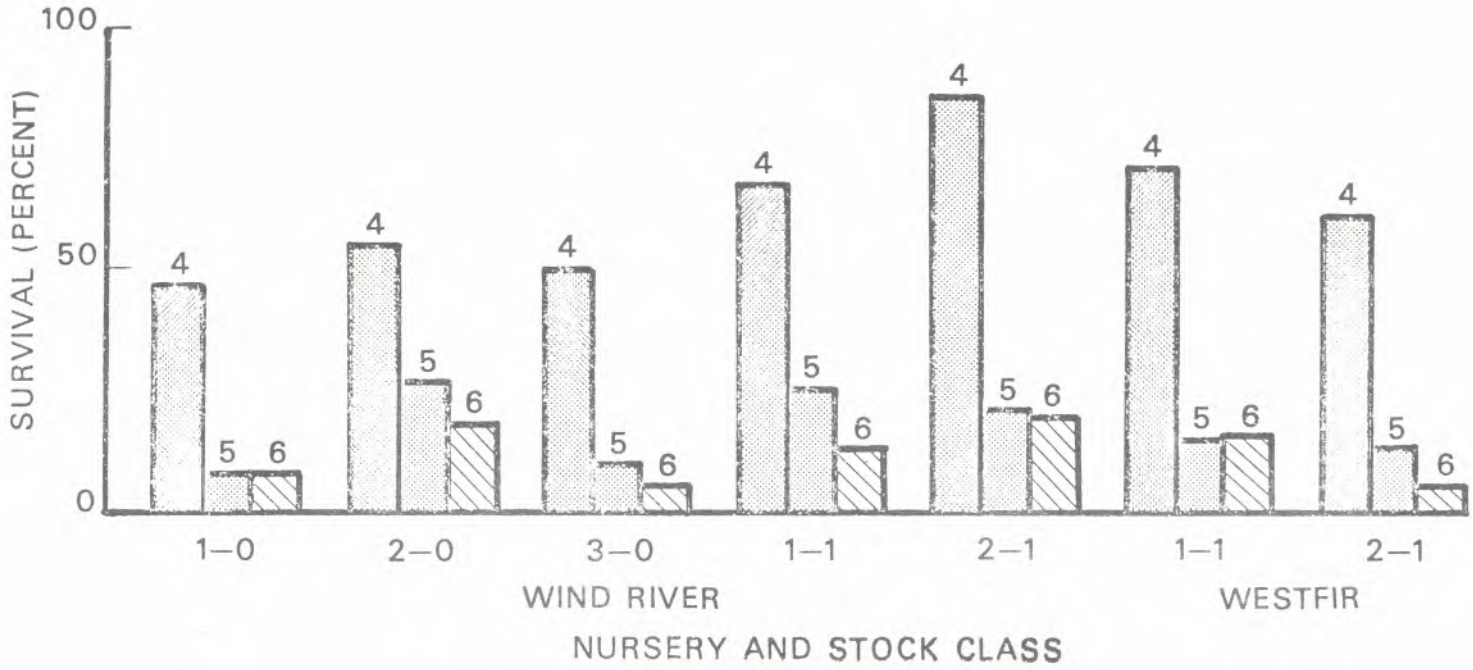

Figure 2.--Survival of Douglas-fir nursery stock in three clearcuts at 3,500-foot elevation after one growing season. Both spring and fall planting are included. Each class of stock represented by 150 trees per unit.

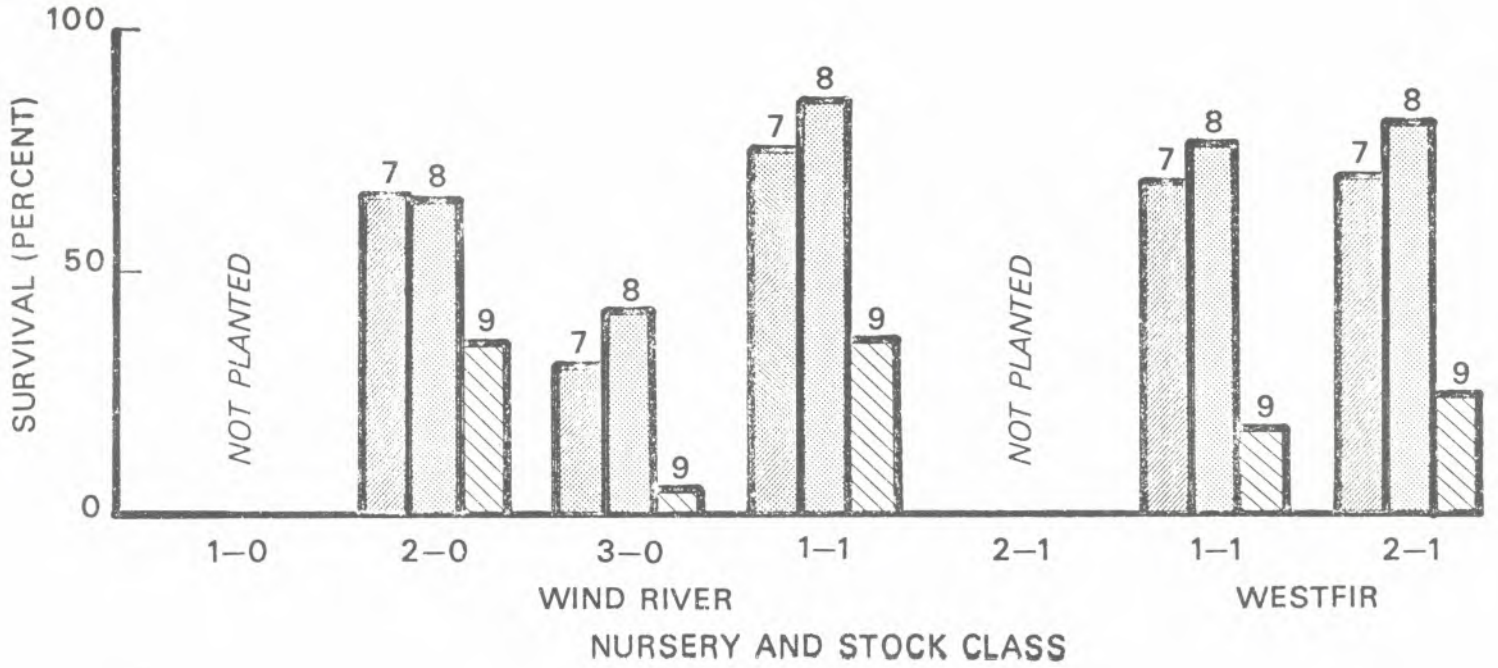

Figure 3.--Survival of Douglas-fir nursery stock in three clearcuts at 4,000-foot elevation after one growing season. No spring planting was done in units 7 and 8. Each class of stock represented by 150 trees on unit 7; 75 trees on units 8 and 9.

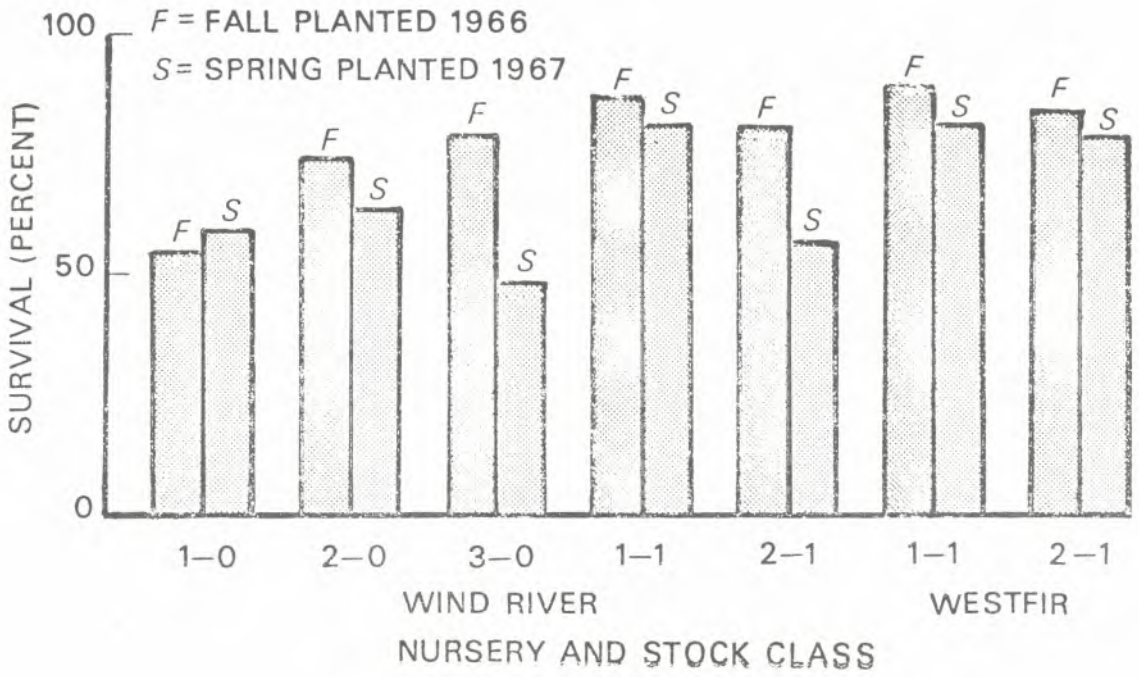

Figure 4.--Survival comparison of fall- and spring-planted Douglas-fir nursery stock at 3,000-foot elevation after one growing season. Each class of stock represented by 225 trees.

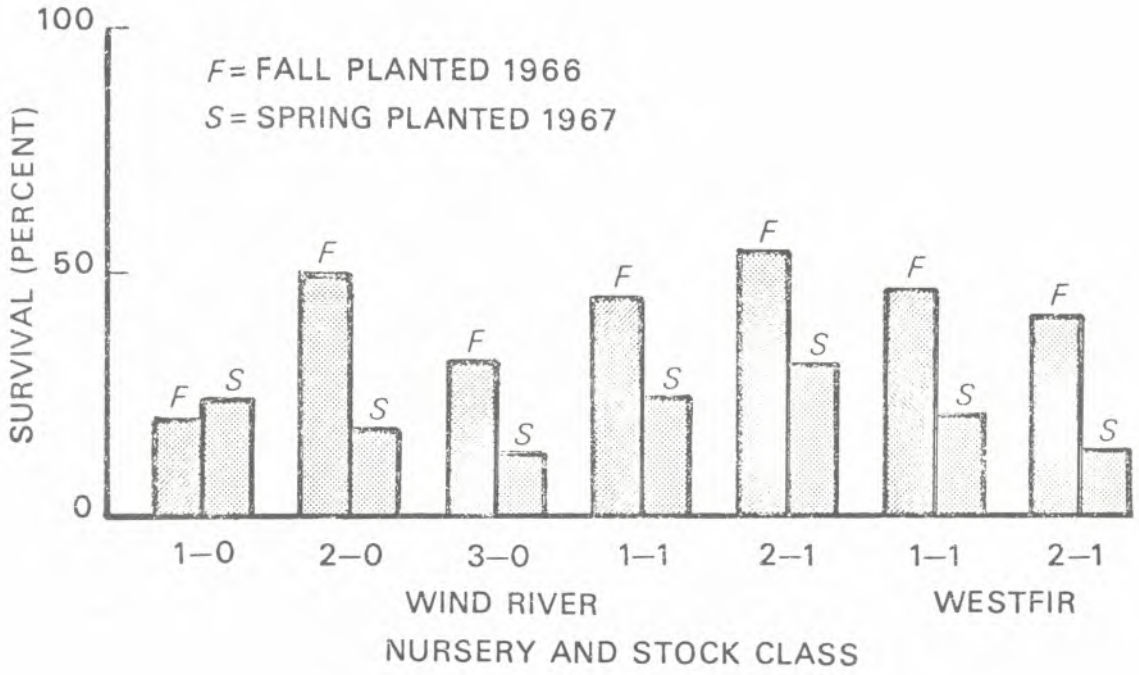

Figure 5.--Survival comparison of fall- and spring-planted Douglas-fir nursery stock at 3,500-foot elevation after one growing season. Each class of stock represented by 225 trees.

At 4,000 feet, fall-planted Wind River 1-1's came through best with 73-percent survival and 3-0's worst with 26 percent surviving (fig. 6). Survival of both Westfir 1-1 and 2-1 stock was 61 percent. Wind River 2-0's survival was 59 percent. In the spring planting, stock classes were represented by only 75 seedlings each instead of the usual 225. I do not consider the survival averages sufficiently indicative and will not discuss them.

In summary, trees planted in the fall of 1966 survived better than those planted in the spring of 1967, with only three exceptions: 1-0's at both 3,000 and 3,500 feet and Westfir 2-1's at 4,000 feet. Since food reserves build up in late fall, both seedlings and transplants should be in best condition for lifting during winter and early spring. Thus, spring-planted trees might be expected to survive better. However, in spring 1967, lifting and planting were delayed by adverse weather, and late planting was followed immediately by a long dry season. Thus, the spring-planted seedlings were not exposed to normal conditions and survival suffered.

WIND RIVER VERSUS WESTFIR TRANSPLANTS

Since the inception of the Westfir transplant bed on the Willamette National Forest, a question of primary interest has been: "Does transplanting Wind River seedlings for a year at Westfir increase their future field survival?" So far, our data indicate that the answer to this question will be "No."

At 3,000 feet, 88 percent of Wind River 1-1's planted in the fall survived; of Westfir's 1-1's, 89 percent survived (fig. 7). Survival of fall-planted 2-1's from Wind River and Westfir was 80 and 84 percent, respectively.

Wind River and Westfir spring-planted 1-1's also survived equally well- and 81 percent, respectively. A large difference in survival occurred between 2-1's: Wind River, 57 percent; Westfir, 79 percent.

At 3,500 feet, Wind River 2-1's survived better than the other classes in both fall and spring plantings. Survival of Wind River and Westfir fall-planted 1-1's was 46 and 47 percent, respectively; 2-1's, 55 and 41 percent. For spring-planted stock, survival was 25 and 21 percent for Wind River and Westfir 1-1's, respectively, and 31 and 13 percent for corresponding 2-1's.

I shall not make comparisons for the 4,000-foot elevation since stock classes are missing in all units as is the entire spring planting in two out of three units.

Clearly, it would be very difficult on the basis of these data alone to favor either Wind River or Westfir transplants. Factors other than survival also need consideration.

SUMMARY AND CONCLUSIONS

Comparisons of stock survival on individual units revealed that south aspects may not be the regionwide scourge they have been thought to be. Most classes of stock had adequate survival on the three moderate-to-steep south slopes at 3,000- and •,000-foot elevation where soil was good and competing vegetation scarce.

In this particular year (1967), fall planting resulted in better survival than spring planting for nearly all classes of stock at both 3,000- and 1,500-foot elevations. Fall-planted transplants survived better on the average than fall-planted seedlings. However, at 3,000 feet, where nearly all stock survived well, 2-0's and 3-0's did nearly as well as transplants. At 3,500 feet, where survival was generally poor, 2-0's survived as well as most classes of transplants.

Comparison of data from Wind River and Westfir transplants revealed no consistent differences in survival. Survival of 1-1's was nearly identical at each elevation. The class with poorest survival at 3,000 feet was Wind River 2-1's; at 3,500 feet, Westfir 2-1's.

Statistical comparisons of the data have not been made. I believe statistical tests would have limited value applied to a single year's data. Weather conditions in a different year could cause entirely different survival. A second round of this study was installed last fall (1967) and this spring. We hoped to get a year with different summer weather on the second round and were fortunate enough to do so. If survival data from the second year's plantings are consistent with those of the first year's plantings, preliminary trends will be reinforced and very difficult to ignore.

I cannot state now, and will not be able to say flatly at the end of the study, which class of stock should be planted in a given location. This study should show which classes of stock survive best. It just might be that the stock with second- or third-best survival will furnish satisfactory stocking at lowest total cost. If such stock grows as fast as the class that survives best and is cheaper to produce and plant, then that is the stock to use. The decision on what to order from the nursery will be up to the reforestation forester. My purpose today was to acquaint you with the study and to report on preliminary trends in the data.

Question: How long will you examine the plots?

Answer: For another year.

Question: Are you going to make any comparison tests of survival?

Answer: Yes.

Question: If you see any difference will you make additional tests?

Answer: Yes.

Question: Are you familiar with the use of retardants?

Answer: No.

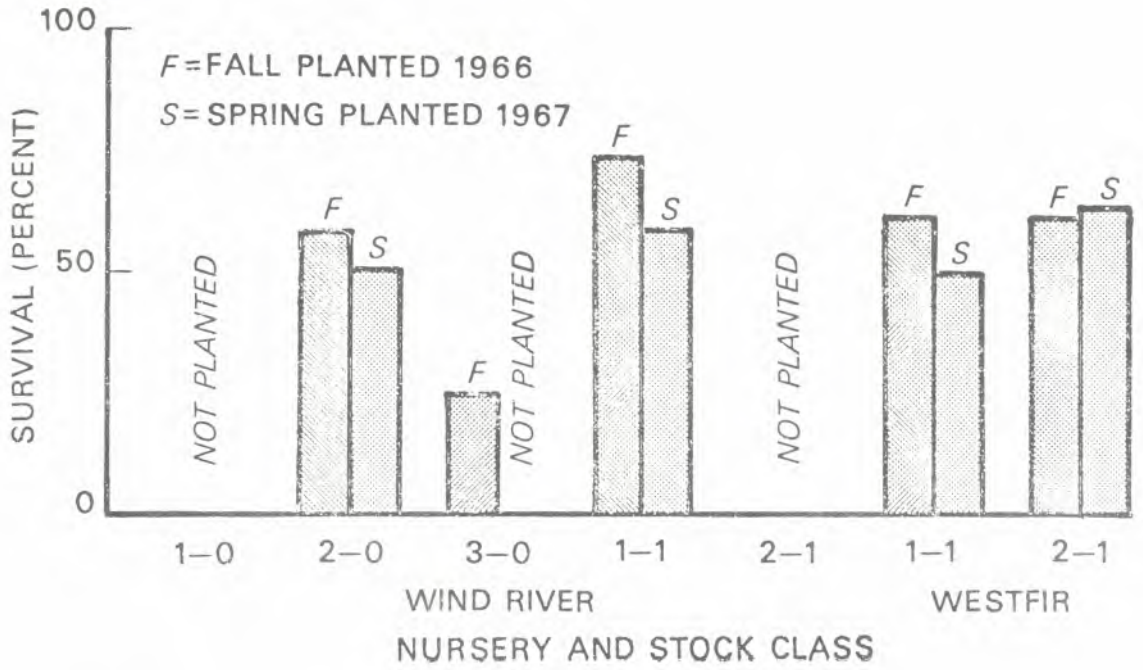

Figure 6.--Survival comparison of fall- and spring-planted Douglas-fir nursery stock at 4,000-foot elevation after one growing season. Fall-planted stock represented by 225 trees in each class; spring-planted stock by 75.

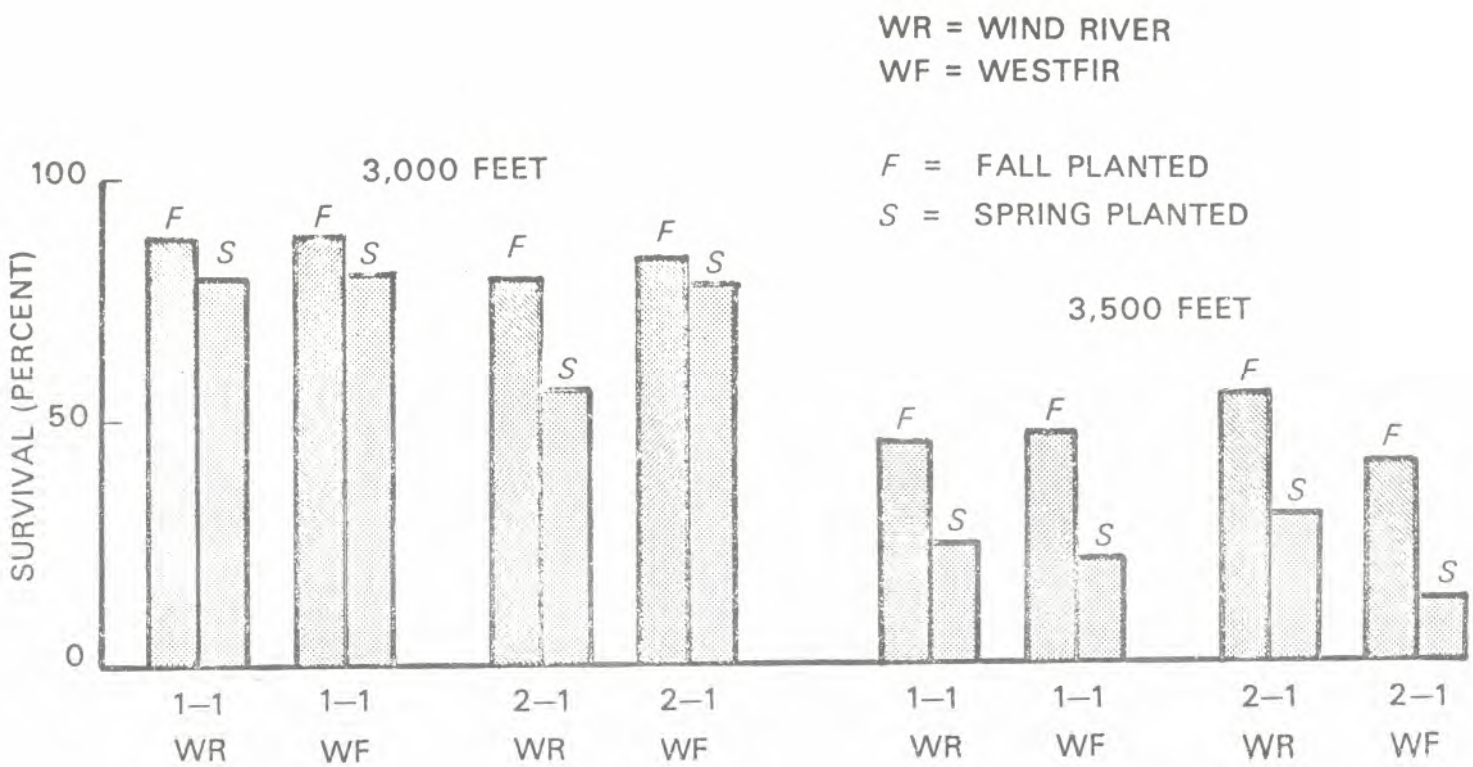

Figure 7.--Survival of fall- and spring-planted Douglas-fir transplants from Wind River and Westfir nurseries at two elevations after one growing season. Stock from each nursery represented by 225 trees per class.