

# Grading Specifications of Ponderosa Pine Seedlings at Lucky Peak Nursery

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## INTRODUCTION

Grading of bareroot planting stock is a necessary step in the process of reforestation. At Lucky Peak Nursery near Boise, Idaho, much effort and expense is expended on grading and counting seedlings each year at lifting time before the trees are packaged and shipped. The purpose is to screen out damaged and deformed seedlings or trees too small to survive harsh Intermountain planting conditions. Grading standards can be somewhat arbitrary at times because data on which to base them is not available.

The next step in the grading process takes place on the Ranger District. In preparation for planting, the wrapping crew discards any seedlings they feel do not meet their standards and the specifications are not necessarily those used at the nursery. Grading may also be done by the tree planters who ultimately decide whether a seedling will

be planted. Finally, it is the planting site that culls out all of the seedlings unequipped to survive where they are planted. It is this last culling process that we attempt to mimic in all the grading we do.

## IMPORTANCE

Nursery managers and foresters need better information on which to base grading specifications. It is likely that the process of bareroot seedling grading could be streamlined a bit. For example, grading at the nursery could be skipped altogether. The trees would be packed immediately after lifting to reduce expense and eliminate one more time the seedlings would be handled. The field forester can then assume full responsibility for grading the stock and reduce the cost per seedling.

The cost of grading is high in both labor and loss of trees which may be capable of survival and growth in the field.

Seedlings are often discarded on the basis of morphological characteristics which may not be indicative of field performance.

Also, we do not know the effects of culling all small seedlings on the future forest genetic makeup. If it is possible to reduce the amount of culling, we might better maintain the genetic diversity of a seed source.

## OBJECTIVES

- 1) To determine which kinds of damage to the root system reduce ponderosa pine seedling survival and growth in the field.
- 2) To determine how well a random sample of ungraded ponderosa pine seedlings (bedrun) will perform after outplanting.
- 3) To provide data on which to base ponderosa pine grading specifications.

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## METHODS

A ponderosa pine lot from 4500 feet elevation on the Boise National Forest was lifted at Lucky Peak Nursery and transported to the cooler. From those seedlings, a sample of ungraded trees (bedrun) were set aside as a treatment. The remaining trees were graded to the following minimum standards: 3 in. height, 3 mm caliper, and 10 in. root.

We selected seven different treatments for root growth potential tests and outplanting:

- 1) **Control**, good trees of average size and with good root systems.
- 2) **Bedrun**, sample of ungraded seedlings, variable size and root conditions.
- 3) **Large**, bigger than average seedlings with calipers in the 8-12 mm range.
- 4) **Stripped**, similar to controls but fine roots stripped during the lifting process.
- 5) **Split Taproot**, similar to controls but taproot split near the bottom near an intersection and torn up the root 4-5 cm.
- 6) **Scraped**, similar to controls but scarred on the root collar about .5 by 1.0 cm in size, going through the cambium and into the wood.
- 7) **Lost Roots**, seedlings which have lost 1/4 to 1/3 of their root systems.

Seedlings were stored at 34° F from lifting in mid March until planting in mid May. They were planted in auger holes on 2-ft hand made scalps in a Douglas-fir/Elk sedge habitat type on the Boise National Forest. We followed standards established by the U.S. Forest Service Intermountain Region.

## RESULTS

There was little difference in average caliper between treatments except for the **large** treatment which had a greater caliper. The top and root volume of the **large** seedlings was also much greater than the rest. Although the **Stripped** and **Lost Roots** seedlings did not have many fine roots, their root volumes were not diminished much (figure 1).

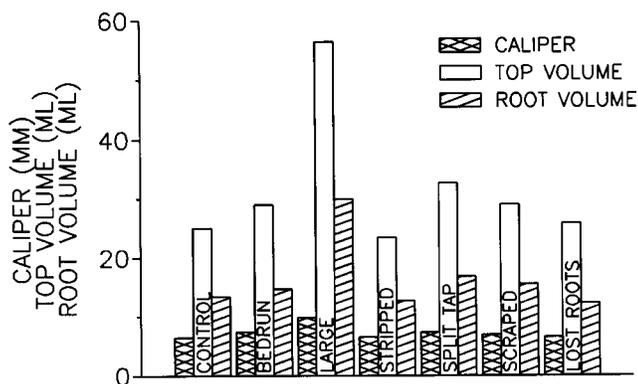


Figure 1. Mean size of seedlings in seven different treatments. The bars in each group depict average ponderosa pine caliper (in mm), top volume (in ml), and root volume (in ml) respectively. The large treatment was larger than the others in all three categories.

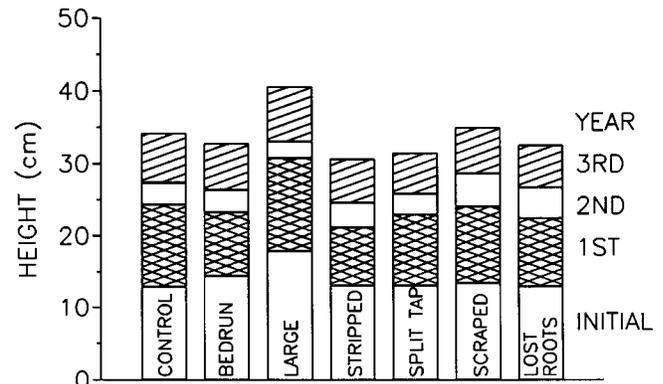


Figure 2. Mean seedling heights of seven different treatments planted on the Boise National Forest. Bars show the ponderosa pine height growth for three growing seasons after outplanting.

Treatments had little effect on first-year seedling heights. Rather, initial height seems to be more important in determining the height after one growing season (figure 2).

Eighty-three percent of the seedlings survived a late planting and a very dry summer. Root growth potential (figure 3) and survival (figure 4) both showed that incidental damage to the root system was not detrimental to seedling establishment. The **Split Taproot** and **Scraped** treatments performed as well as the **Control** treatment.

**Large** seedlings can be successful if they are planted well and the root systems are large enough to support the top.

**Bedrun** seedling survival was 5 percent less than the **Control**. This will vary with each seedlot and could also depend on the sample selected. Culling of high risk seedlings should be done at some stage in the process.

Loss of fine roots reduces the likelihood of seedling survival considerably. The **Lost Roots** treatment produced a lower root growth potential and survival than the **Control**. The seedlings on which the fine roots had been **Stripped** away showed the lowest root growth potential and survival of all the treatments.

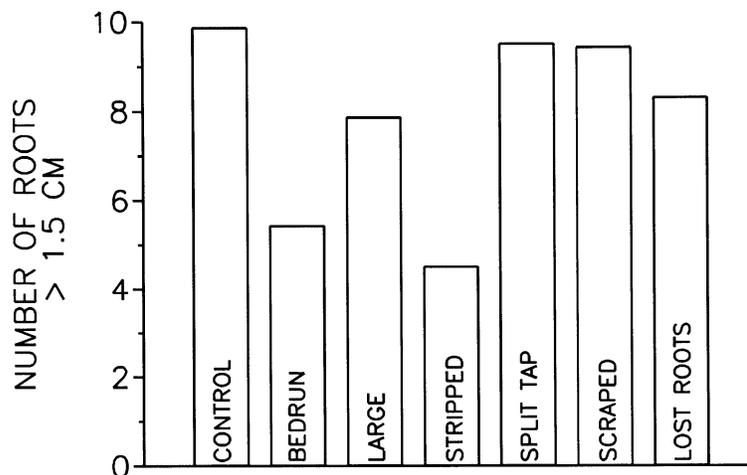


Figure 3. Mean root growth potential for seven different treatments. Bars depict the average number of new ponderosa pine roots greater than 1.5 cm after a 14 day test.

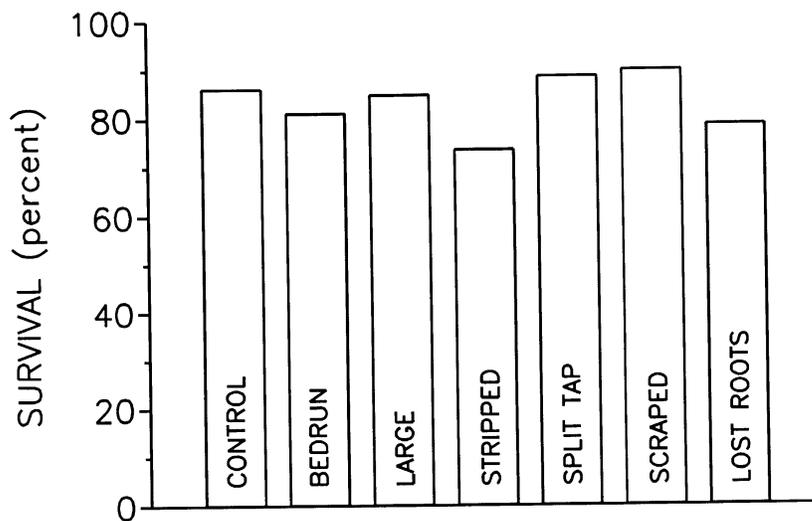


Figure 4. Mean first-year seedling survival of seven different treatments. Ponderosa pine seedlings were planted on the Boise National Forest.