

Root Regeneration Potential

R. Daniel Dolata²

Abstract. --Evaluating root regeneration potential using an intermittent mist chamber is being operationally conducted at the U. S. F. S., Lucky Peak Nursery in Boise, Idaho.

INTRODUCTION

Back in 1970, Dr. E. Stone (1970) gave a paper where he started out chastising foresters and nursery operators for (1) planting "dead trees", and (2) not going beyond the outward physical characteristics of a seedling in their grading of trees. Lucky Peak Nursery has taken one of their first steps to operationally evaluating root regeneration potential of our bareroot nursery stock.

In 1981 Dr. Day piqued our interest in finding a way to economically and efficiently evaluate the root regeneration potential of our seedlings. Are we growing trees that given the proper conditions, will re-establish intimate contact with the soil? Or are they dead? Are we lifting at the right time? Lucky Peak Nursery would like to welcome the advancement of root regeneration potential.

WHAT IS IT? WHAT CAN IT TELL US?

Root regeneration potential, what is it? Day, (1981) recommended this definition; the potential of transplanted or outplanted nursery stock root systems to initiate or elongate new white roots shortly after transplanting or outplanting.

What is it really telling us? We think that in the future we will be better able to help predict survival and establishment of each "source" of seedlings we produce.

How can you do it operationally? (Test the root growth potential that is). First of all we had to look at what we were trying to do. Stone grows his transplants in pots in a warm water bath for twenty eight days then washes the roots off. Day has tried (1) pot bioassay methods, (2) root mist chambers, and (3) root growth boxes. Following MacDonnel's (1981) work we decided to build our Root Growth Capacity System utilizing an intermittent root mist chamber. Now we can evaluate RRP before the stock is shipped.

How large of scale can this be? Is it expandable? Is it faster than the 28 days of Dr. Stone's process? How much did it cost to build? How much does it increase the cost of your stock per thousand? For more information also see paper titled Root Growth Capacity System by Gary Hileman.

HOW DO WE (LPN) DO IT OPERATIONALLY?

Operationally we follow this sort of scenario, (1) during the packing season we have a team doing "THE TESTING" of each source of seedlings as they come into the packing shed. We added to their responsibility that of obtaining a sample of seedlings for testing from each source for RRP evaluation. They are placed into cold storage until the next days batching to go into the RRP system

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²R. Daniel Dolata is the Forester for Lucky Peak Nursery, U. S. D. A., Forest Service, Boise National Forest, Boise, ID.

The next morning the seedlings are taken down to the RRP room to be measured as they are placed into the holding slats. Height, caliper are recorded and any new "white" roots are removed. A sample of ten seedlings from each lot are tested and not placed in adjacent slats.

We've even been able to evaluate seedlings in the summer by using a chamber temperature of 80 degrees Fahrenheit and adding a swamp cooler for cooling and humidity.

Most pines are kept in the chambers for 10 days. This is long enough for the majority of the new growth to occur without the tips turning brown and becoming obscured from the counting and measuring. East side Douglasfir and Engelmann spruce may take up to twenty eight days before quantifiable growth has taken place.

The work really begins when the seedlings are removed from the chambers. Each replication trees are re-measured for height, caliper, and bud burst, as well as the total number of new roots greater than 1.5 centimeters, the length of the three longest roots in centimeters and the root class of the number of roots less than 1.5 centimeters. See Table 1

At first this was the most time consuming part but with practice it becomes faster. the counting and measuring takes from one minute to five minutes depending on what species and the fibrousness of the root system. As Gary has said it cost us about \$5,500 to build this system. To run it cost us last packing season about \$1,000 for 4mm trees shipped. That works out to about twenty one cents per thousand seedlings. (\$849.00/4,000m seedlings shipped)

Root class originally started out as a way to at least acknowledge that those roots less than 1.5 cm in length could still be of value to the plant in establishing contact with the soil and be faster and more accurate than using a volumetric measurement on the total root system. After a year of trying to average the length of the longest three roots and coming up with some obscure numbers we decided to try and use the same root classes for the longest roots. See Table 11

Table II.--Root Class

Root Class	<1.5cm	>1.5cm
0	None	None
1	1-5	1-5
2	6-15	6-15
3	16-30	16-30
4	30+	30+
5	Dead	Dead

To simplify coding and record keeping (we enter this into the U.S.F.S. NMIS Data Base) we record the two classes as RRP 3/4.

Table 1.--Sample data taken after 10 days in Root Mist Chamber

Lot ID	Tree #	Top Height cm	Caliper mm	#New Roots 15cm	Length of 3 longest -----cm-----			Root Class
LP02850065	1	20	3.5	37	5.0	4.5	4.0	4
	2	18	3.0	40	5.5	4.5	4.5	4
	3	22	3.8	35	5.0	5.0	4.0	3

RECORDS

We realize that this data is important from the product we produce, but more important is how this information relates to the survival through the fifth year. To understand and relate these classes to survival is our hope and project. Lucky Peak Nursery will continue to operationally test each seedlot that is produced in the future. It has taken fifteen years but Lucky Peak is going beyond the outward physical characteristics.

NOTE IN CLOSING: Various authors over the years have tried to quantify these measurements, in many different ways, each a little different than the other. Ours too is unique and I personally feel uneasy in trying to compare my "apples" to anyone else's. A standardized way of expressing the results will be the key to further operationally testing seedlings at the nursery and justifying the cost to the buyer rather than relying on whether or not the minimum morphological grade standards were met.

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