

Growing Conservation Seedlings by the Square Foot: Making it Pay

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Abstract - In your nursery, do you really know which species and stock types are making or losing money? I have developed an exercise to help nursery managers check their species/stock types and determine if the resulting plants are yielding profit or loss. A computer spreadsheet can quickly provide information on how changes in cell density (changing container types) affect seedling price and nursery income, and rank the contribution each species or stock type makes toward financial objectives.

BACKGROUND

The University of Idaho has served as Idaho's state nursery, providing reforestation and conservation seedlings since 1909. The University of Idaho nursery has roles in teaching, research and service. Our nursery facility serves as a classroom/laboratory for forestry students and offers practical work experience for graduate students interested in nursery management and regeneration projects. Research in seedling production technology and in vegetative propagation by students, research associates and faculty are essential to our mission and we work closely with the nursery industry to pass on the benefits of our research program. We continuously seek methods to improve production technology, seedling quality and outplanting performance. Our service role involves technology transfer, various outreach and continuing education activities and, importantly, seedling sales. Sales must provide funds for operating expenses.

Recently, we placed a greater emphasis on providing relatively few seedlings to each of many landowners, a niche not occupied nor sought by regional private nurseries. This emphasis required us to change stock types from smaller seedlings suitable for reforestation to larger seedlings better able to survive and grow under harsher conditions, especially in the hands of good-intentioned, poorly-trained seedling handlers and planters. Although seedling shipments include handling and planting instructions, seedlings may not receive the best care. Many of our conservation seedlings are shipped to southern Idaho where planting sites are hot and dry, heat girdling is a concern, site preparation is often poor and shipping and storage conditions are less than ideal. A larger, tougher seedling was required better to survive under these conditions.

INTRODUCTION OF SUPERSTOCK

Plug size of our conservation stock has evolved and increased over the years from 4 cubic inches to 20-cubic-inch capacity (45/340 (615A)) copperblocks. We call seedlings grown in this larger container "SuperStock" to differentiate them on our order form from smaller stock of the same species. Introduction was gradual, taking several years as we slowly built up

sales by creating demand. Our marketing focused on benefits of bigger seedlings: larger calipers withstand heat stress, bending, trampling and other mechanical damage better; larger stock are more visible so they are less likely to be run over with mowers; larger stock survive better and grow faster meeting planting objectives sooner; and chemically root pruned stock eliminate many root-related planting problems. We also found that with higher seedling prices, better pre- and post-planting care was taken, further increasing survival and growth potential. Landowners began with small orders for SuperStock seedlings, found they did survive and grow better on harsh sites (and on mesic sites) and as word has spread, demand has increased each year. This past season we provided 10 conifer and 27 hardwood SuperStock species (Table 1).

The conversion of stock type to larger seedlings reduced the total number of seedlings produced. With reduced production it became increasingly important that each species and stock type be analyzed for its contribution to financial objectives.

Table 1. Species grown as SuperStock.

Ponderosa pine	Sugar maple	Wild apple	Black locust
Western white pine	Serviceberry	Western syringa	Rugosa rose
Austrian pine	Sagebrush	Hybrid poplar	Golden willow
Scotch pine	River birch	American plum	Arctic willow
Western larch	Siberian peashrub	Sand cherry	Buffaloberry
Blue spruce	Russian-olive	Nanking cherry	White lilac
Norway spruce	Autumn-olive	Chokecherry	
Engelmann spruce	Honeylocust	Bur oak	
Rocky Mt. juniper	Amur honeysuckle	English oak	

PRICING CONSIDERATIONS

Expenses for owning and operating a nursery must be matched or exceeded by income from the seedling production area. If this expense is expressed on a unit area of production, such as per square foot of bench space, then different container types and species can be readily compared. I use total bench area rather than floor area since bench surface area is the actual production area. A spreadsheet makes comparison an easy task. First sum all costs (salary, benefits, labor, travel, operating, capital outlay, taxes, profit etc.) that must be covered by seedling sales income and divide by total bench area to determine a "target return". If production is effectively increased by growing multiple crops, count that bench area multiple

times. Target return varies among nurseries due to the nature of expenses and the economics of scale. I estimate the target return for a 2 million capacity nursery in the Intermountain Northwest to be about \$11 per square foot, and that a 5 million capacity nursery would have a target return reduced to about \$9. The Research Nursery has a target return of over \$17 due to high research and service expenses, and a small (<12,000 ft²) production area.

Once target return is established, set up a spreadsheet by container type. Enter the number of trays per table or bench, and calculate actual density per square foot of bench area, where: *density = (trays per bench x cells per tray) / bench area.*

Then divide target return by density to determine the equivalent seedling price. For example, to generate \$11.00 per square foot of bench space, Ray Leach pine cell seedlings (PRL 200/66) would cost \$0.11 each (Table 2). A PSB 160/90 seedling would have to cost \$0.16 to generate the same income per square foot and a PSB 45/340 seedling would cost \$0.59. These are the minimum prices to charge for each container type to pay its "fair share".

Table 2. Equivalent seedling price determination (target return = \$11/Bench Ft²).

<u>Container Type</u>	<u>Tray Dimensions</u>	<u>Trays/Bench Ft²</u>	<u>Density/Bench Ft²</u>	<u>Equivalent Seedling Price</u>
PRL 200/66	12" x 24"	48	100.0	\$0.11
PRL 98/164	12" x 24"	48	49.0	\$0.22
PSB 160/90	14" x 24"	40	66.7	\$0.16
PSB 112/80	14" x 24"	40	46.7	\$0.24
PSB 77/170	14" x 24"	40	32.1	\$0.34
PSB 45/340	14" x 24"	40	18.8	\$0.59

The above density per square foot of bench space assumes all cavities sown will yield seedlings available for sale. Unfortunately, this is not the case. Nurseries, however, can easily adjust the density factor and produce an equivalent price by species, as well as by container type. Adjusted density is the density of cells per square foot of bench space times the yield expressed as a percentage. Yield percentage for a species is the number of seedlings meeting specifications divided by number of cells sown. Species equivalent prices may illustrate where improvements need to be made. For example, Table 3 shows river birch should cost \$5.24 per seedling to pay its way. Since this is far more than the actual selling price, we are losing opportunity income by devoting space to this species. We must either determine ways to increase the yield factor, raise prices or suffer the loss.

Table 3. Species equivalent seedling price (target return = \$11/Bench Ft²).

<u>Container Type</u>	<u>Species</u>	<u>Yield %</u>	<u>Adjusted Density/Ft²</u>	<u>Equivalent Seedling Price</u>
PSB 160/90	Ponderosa pine	98 %	65.4	\$0.17
PSB 160/90	Grand fir	63 %	42.0	\$0.26
PSB 45/340	Ponderosa pine	99 %	18.6	\$0.59
PSB 45/340	Juniper	72 %	13.5	\$0.82
PSB 45/340	Rugosa rose	33 %	6.2	\$1.77
PSB 45/340	River birch	11 %	2.1	\$5.24

Last year the target return for the Research Nursery was \$17.63, substantially higher than the factor illustrated in Table 3. Table 4 shows the yield adjusted equivalent seedling price for a target return of \$17.63. The spreadsheet has been expanded to include a "Market Price" and the "Profit or Loss" which is the difference between "Equivalent Price" and "Market Price". Our market price for conservation seedlings was adjusted in consideration of the extra costs involved in dealing with small lots and individual landowner customers. Larger SuperStock seedlings are priced at \$1.50 each for all species in order to, on average, cover increased operating costs.

Table 4. Species profit or loss with a target return of \$17.63.

<u>Container Type</u>	<u>Species</u>	<u>Equivalent Seedling Price</u>	<u>Market Price</u>	<u>Profit or (Loss)</u>
PSB 160/90	Ponderosa pine	\$0.27	\$0.28	\$0.01
PSB 160/90	Grand fir	\$0.42	\$0.28	(\$0.14)
PSB 45/340	Ponderosa pine	\$0.95	\$1.50	\$0.55
PSB 45/340	Juniper	\$1.31	\$1.50	\$0.19
PSB 45/340	Rugosa rose	\$2.84	\$1.50	(\$1.34)
PSB 45/340	River birch	\$8.40	\$1.50	(\$6.90)

CONCLUSIONS

Each square foot of bench space must contribute to nursery income. Once a minimum target is established, a spreadsheet can enable managers to compare container types or species by establishing equivalent seedling prices. No attempt is made to account for varying costs of seed or labor required to grow different species. No extra charges are made to larger seedlings that use more of the facility, utilities or fixed costs. The spreadsheet does show how each species is distributed about the minimum income needed to cover all expenses (target return). This information is of benefit in establishing minimum prices by container type and/or species.

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