

CONE AND SEED YIELDS IN WHITE SPRUCE SEED PRODUCTION AREAS

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Seed Production Areas

The source of seed is an important consideration in the reforestation program on the National Forests in the North Central Region. Thirty-five seed production areas have been set up in the Region, along the lines proposed by the North Central Forest Experiment Station, to provide control of seed source. Red pine, white pine, shortleaf and loblolly pine, and white spruce areas have been established. Including isolation zones, 1,500 acres are involved. Anticipated average annual yield is about 2,000 pounds of cleaned seed.

Nine of these seed production areas are established for white spruce. During the autumn of 1964, cone collections were carried out in four of them and cost records carefully kept. Table 1 summarizes the yields and costs.

Cost of Seed

White spruce seed production areas on National Forest lands are set up with an average anticipated life of 20 years. Average cost of establishment runs about \$250 per acre. This includes selection of area, marking, road construction, signs, supervision, and overhead costs. Compounded at 4 percent for 20 years this investment would yield \$547.78. Prorated amortization is \$27.39 per acre per year. Annual maintenance costs for roads, brush, insect and disease control, etc., run about

\$8 per acre per year. Total amortization is therefore $\$27.39 + \$8.00 = \$35.39$ per acre per year.

Average seed yield is expected to be 2.4 pounds per acre per year. Each pound of seed would therefore carry the investment and maintenance costs of operating the seed production area. This amounts to \$14.75. To this is added the cost of collection and extraction, which amounted to \$28.34 per pound in 1964. The total cost of tree seed from white spruce seed production areas for the 1964 collection was \$43.09 per pound.

The average cost of cleaned white spruce seed obtained from buying cones in the fall of 1964 was \$9.84 per pound. Seed from white spruce seed production areas was costing us \$33.25 more per pound, or about 3 1/2 times the cost of buying cones from general collections.

Cost of Planting Stock

Anyone who has had nursery experience realizes that the cost of seed is a minor part of the cost of producing planting stock. But just what was this "expensive" seed doing to our stock costs? Could we afford to continue this program?

Referring to table 1, we find that seed production area seed gives us more, pure, live seed per pound. This means fewer pounds of seed are needed to yield any given number of seedlings. An analysis of the seed cost per thousand plantable seedlings shows the following:

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Table 1.--Yield and cost comparison for collections from seed production areas and general collections, 1964

Seed production area	Cone yield	Clean seed	Yield	Cost/lb. clean seed	Adjusted cost/lb. ^{1/}	Plantable seedlings/lb. ^{2/}	Seed cost per thousand	Stock cost per thousand
	Bushels	Lbs.	Lbs/bu.	Dollars	Dollars	Thousands	Cents	Dollars
Oconto River	12.0	14.8	1.2	29.12	43.87	144.7	30.3	24.39
Gates Lake	32.0	39.4	1.2	33.83	48.58	176.4	27.5	24.36
Watersmeet	10.5	10.7	1.0	47.65	62.40	160.3	38.9	24.48
Gilfillan	16.0	24.8	1.6	10.83	25.58	126.3	20.2	24.29
Total or (average)	70.5	89.8	(1.3)	(28.34)	(43.09)	(155.4)	(27.7)	(24.37)
General collection								
Superior Nat. Forest	98.5	71.1	.7	11.52	11.52	146.1	7.9	24.09
Chippewa Nat. Forest	305.0	262.9	.9	9.39	9.39	142.9	6.6	24.09
Total or (average)	403.5	333.9	(.8)	(9.84)	(9.84)	(144.4)	(6.8)	(24.09)

^{1/} Actual cost of collection and extraction plus annual prorated investment costs. No adjustment for general collections.

^{2/} $(0.746)(\text{purity} \times \text{germination} \times \text{no. seeds per pound}) = \text{number plantable seedlings per pound.}$

144,000 seedlings at \$9.84/lb.
=6.8¢ per thousand
155,000 seedlings at \$43.09/lb.
= 27.7¢ per thousand

The resultant increase in the cost of planting stock produced from seed production area seed is 21¢ per thousand.

Program Cost

The average selling price for the 3,620,000 white spruce seedling transplants produced in our nurseries for the 1964-1965 planting season was \$24.09 per thousand. The use of seed production area seed would increase the cost 21¢ per thousand to \$24.30. This would represent a total program cost increase for white spruce of \$756 for a production of 3,600 thousand.

Putting it another way, the use of seed collected from our seed production areas would increase the planting program cost by less than one percent. Using our 1964-1965 regional average of 750 trees per acre, we are investing 16¢ per acre of planting to obtain improved stock.

Cost of Direct Seeding

The use of seed production area seed in direct seeding programs produces a more drastic cost difference than in the planting program.

Generally, about one-half pound of white spruce seed is required to sow one acre of forest land. At \$43.09 per pound for seed production area seed vs.

\$9.84 for general collection seed, we can expect to increase the average cost of direct seeding by \$16.62 per acre. Cost of seed treatment, site preparation, application of seed, and overhead would be about the same for general collection seed or seed production area seed.

In this situation, our seed costs very closely approach our stock costs on a per-acre basis. The only advantage lies in the lower cost of applying the seed in comparison to the cost of planting trees.

Benefits

We spent \$756 last year over and above previous production costs as a result of operating white spruce seed production areas. This is our total net investment in this phase of our white spruce tree improvement program. What are we buying with this \$756? Several things:

(1) We now have a positive geographic source. Not only can we pinpoint the source; we can also identify the broad climatic zone for planting and seeding. If we are willing to accept the early results of provenance tests now being conducted, we can expect better growing stock.

(2) We have made a phenotypic selection of parent trees. Whatever slight improvement we can anticipate in the way of increased growth rate and better form will tend to offset our investment and operating costs. A modest overall increase of only one-fourth of one percent in volume growth would mean an increase of \$500 in total merchantable value.²

(3) The seed production area has a residual value when we no longer have use for it. A timber sale can be made in the area to harvest the saw-timber, piling, and pulp. The net value received for these timber products, if applied to our initial establishment costs, would also reduce our total investment.

(4) There are certain intangible benefits which we realize from using seed production area seed. Some nurserymen indicate that such seed gives better seedbed densities and more vigorous stock. Better initial survival of field plantings is also indicated, resulting in improved stocking of planted acres.

Conclusion

While initial establishment and operating costs for white spruce seed production areas may seem high, analysis of the total program costs in relation to benefits received indicates a sound investment. Cone and cleaned seed yields from white spruce seed production areas are consistently higher than those from general collections. Knowledge of seed source and parent phenotypes provides for greater confidence in forest management planning.

The cost of collecting cones from standing trees is the largest single item in the operation of our seed production areas. We are now working on reducing this cost item by developing our own experienced cone collection crews, by contracting for the collection job, and by trying out new equipment and ideas.

² Figuring 0.8 cord per acre per year growth and a \$6 per cord selling price for 4,000 acres of annual planting.