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WHEN IT PAYS TO SHADE PLANTED TREE SEEDLINGS

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This 2-0 Douglas-fir seedling has been shaded on its south-southwest side by a seven-inch-wide shingle.

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Abstract

A graph is presented to suggest that shading seedlings can pay under certain circumstances. It illustrates what percentages would have to be achieved to make shading economical for planting costs of 11 and 12 cents a tree, and shading costs at 5 and 6 cents a tree.

The method used to prepare the graph is also presented. If planting is to be done on relatively severe sites where past planting survival has been relatively low, perhaps below 65 percent, shading can pay in terms of cost per surviving tree.

Introduction

Shading natural and planted conifer seedlings has improved survival considerably as exemplified in numerous California trials (Adams et. al. 1966; Adams et. al. 1967; Cecchettini 1967; Fritz and Rydelius 1966; Gordon 1971; Otter 1964; Schubert and Adams 1971). Shade material generally was either box shook or shingles that measured about 6 inches wide by 16 to 18 inches long. Shades are most effective when inserted in the ground on the south-southwest side of seedlings with about a 10-inch height providing shade. Hardware cloth cones or domes over seed spots afford shade also, as well as protecting them from animal damage (Cecchettini 1967; Otter 1964).

The degree of improved survival that shading affords depends on several factors such as, planting site environment, species planted, and condition of planting stock. Deciding whether shading will pay its way or not depends on five factors:

1) expected survival after planting without shade
2) cost of planting
3) cost of installing shade
4) cost of removing shade, if necessary, and
5) amount of expected survival improvement from shading

Computing costs

One way to determine costs is on an individual surviving tree basis. In other words, costs per surviving tree after shading must be less than costs per surviving tree without shade. If it costs 12 cents to plant a tree without shade, and survival is 60 percent, the cost per surviving tree will be 20 cents. If a tree is planted for 12 cents, shade is added at 5 cents, and survival is increased to 85 percent, the cost per surviving tree would again be 20 cents. Thus, to make shading pay, survival would have to be improved by better than 25 percent.

A graph (fig. 1) based on planting and shading costs has been prepared to aid the planter in determining whether or not it will be to his advantage to shade. To take care of some variations in costs the graph has been constructed for two planting costs and two shading costs. The two planting costs, including purchase of trees, are 11 and 12 cents a tree. Shading costs are 5 and 6 cents a tree, including removing the shade. Shaded trees on planting sites covered by snow may be crushed by the shades if the shades are not removed by late fall

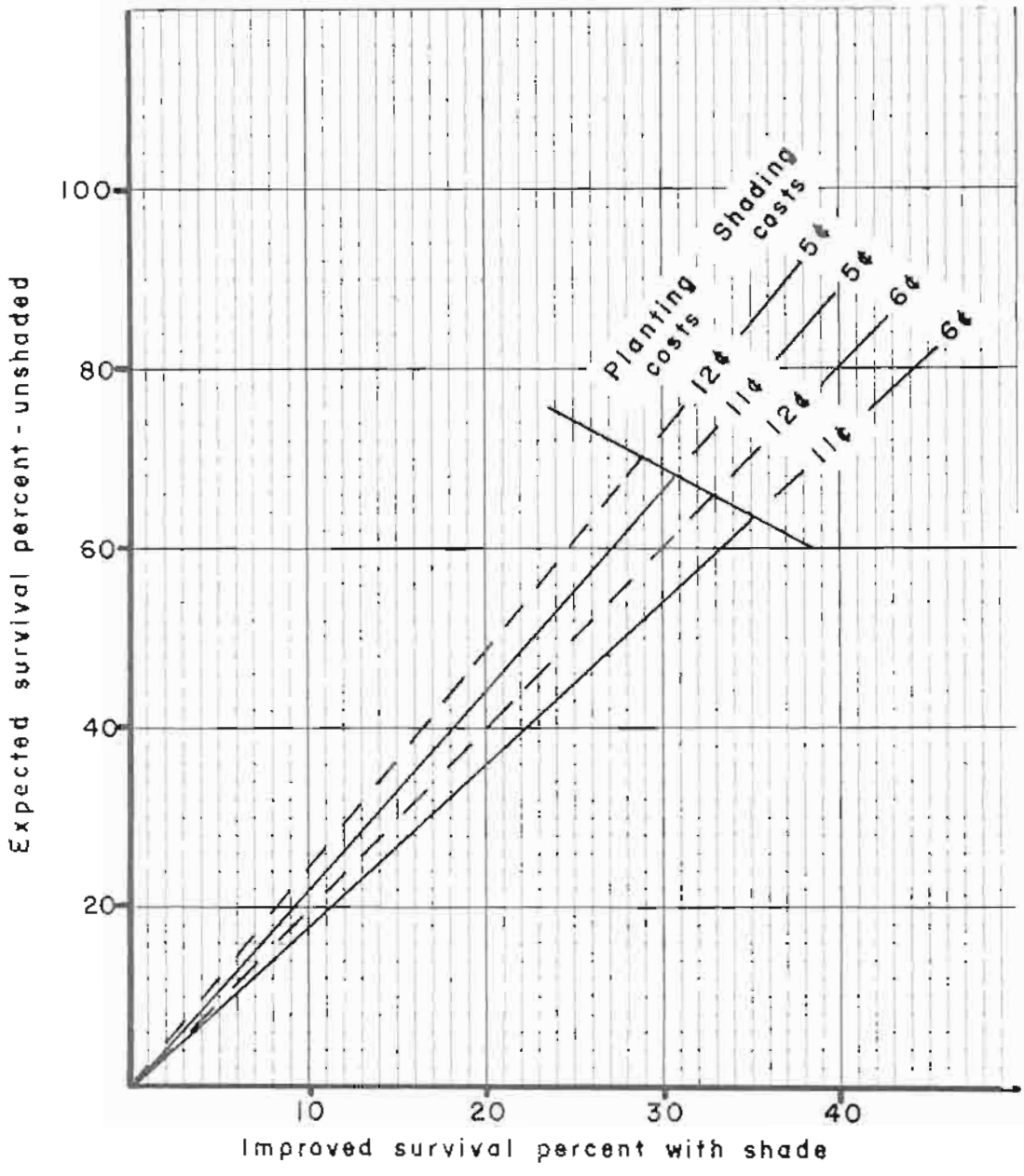

Fig. 1 Minimum improved survival required to make shading seedlings pay at two planting costs and two shading costs.

A survival history from a number of past plantings either on the planter's or his neighbors' land is most important in determining whether or not shading should be considered. With such information the graph (fig. 1) described below can aid in making the decision.

Table 1 shows results of 11 test plantings made by the California Division of Forestry and Fritz and Rydelius (1966) where shading would have paid for itself if planting and shading costs were 12 and 5 cents a tree respectively. Granted that sites were relatively severe, but no more so than those by which many landowners are frequently confronted.

Table 1. Examples of improved survival by shading that are economical if planting is assumed to cost 12 cents a tree and shading 5 cents.

Species	Age Class	Percent survival	
		Unshaded	Shaded
Monterey pine	1-0	32	55
" "	1-0	60	90
Douglas-fir	1-0	34	96
" "	2-0	55	92
" "	2-0	25	86
" "	2-0	3	75
" "	1-1	32	72
White fir	1-0	50	80
" "	1-0	64	84
" "	1-0	45	89
Coast redwood a/	1-0	49	69 (marginal)

a/ From Fritz and Rydelius 1966.

The Graph

The graph can best be described by using an illustration of what a planter might expect by shading his seedlings. Suppose that he is planting white or red fir, and his survival in the past generally has been about 50 percent. His planting cost has been 12 cents a tree. We enter the graph, then, at 50 percent on the vertical axis and follow the 50 percent line horizontally to either of the dashed sloping lines which represent a 12-cent planting cost at 5-, or 6-cent shading costs. In this case use the 5-cent shading cost. To determine the minimum improved survival that the planter would have to achieve at this shading cost follow vertically down from the intersection of the 50 percent line and 12+ 5-cent line to the horizontal axis. Improved survival then needed is at least 21 percent with shading. Thus, shading that improves survival more than 21 percent will more than pay for itself.

If we use 60 percent vs. 90 percent (30 percent improvement). Monterey pine survival indicated in the second line of table 1, we find that shading at 5 cents per tree with planting at 11 and 12 cents would have paid while 6-cent shading with 12-cent planting would be marginal, and 6-cent shading and 11-cent planting would not have paid.

If our survival was 70 percent without shading, any costs with shading shown on the graph would not pay.

Costs of planting and shading may differ from those illustrated in figure 1. For persons wishing to compute their own break-even point beyond which shading will pay, the following procedure may be used to construct a graph.

Graph paper with 10 squares to the inch is satisfactory. Axes can be laid out as shown in figure 1. Points to determine the cost lines may be located by using the following formula.

$$SS = \frac{CS \times SU}{CU} - SU$$

SS = Improved survival percent with shade.
CS = Total cost in cents per shaded tree.
SU = Expected survival percent without shade
CU = Cost in cents per tree without shade.

To draw the cost lines it is necessary only to locate points on the horizontal 100 percent expected survival line. Thus, if a person figured his planting cost at 9 cents a tree plus 4 cents for shading, improved survival percent on the graph would be:

$$SS = \frac{13 \times 100}{9} - 100$$

$$= 44.4 \text{ percent}$$

A line can now be drawn from the point located at 44.4 horizontally and 100 vertically to the 0 point at intersection of the horizontal and vertical axes. On this graph, then, if an expected survival of 50 percent without shade could be improved by more than 22 percent it would pay to shade.

Obviously, the full length of this cost line cannot be used. Any expected survival without shade of more than 69 percent will provide an improved survival with shade of more than 31 percent or a total of more than 100 percent. Thus, the line should be terminated at this point.

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