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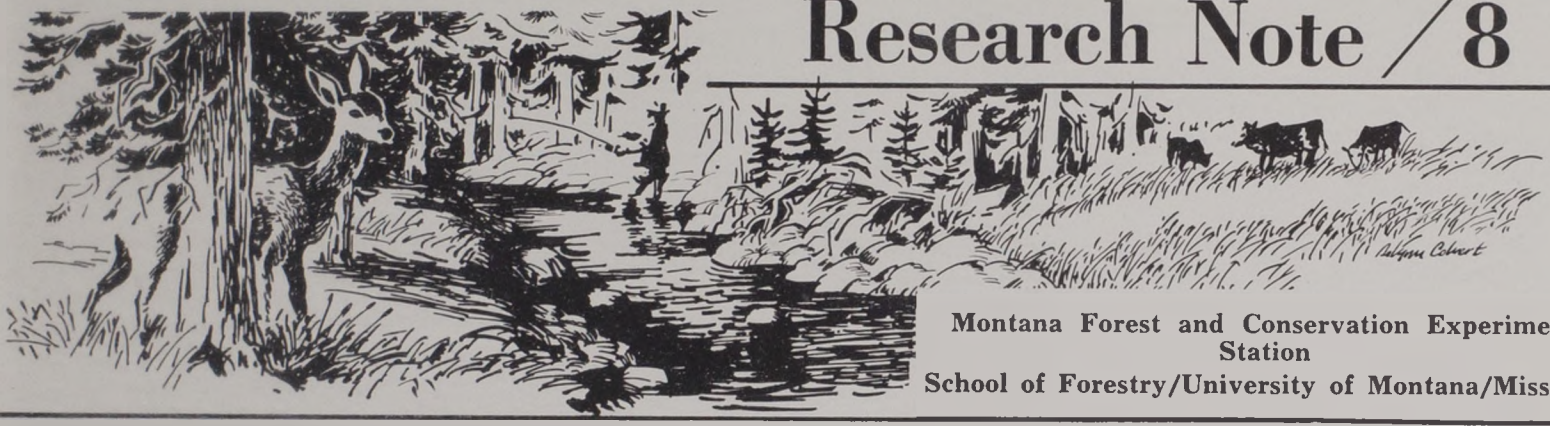

Research Note / 8

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A COST ANALYSIS OF THE 1967 HAND-PLANTING PROJECTS IN THE NORTHERN ROCKY MOUNTAIN REGION

By George M. Blake[1] and Cole Snyder[2]

Introduction

As forestry becomes more intensive, greater emphasis is being placed on returning forest land to production after logging. Although in some areas, natural regeneration presents no problem, it is generally a risky proposition. Thus, artificial regeneration is rapidly becoming an accepted and a recommended practice throughout the northern Rocky Mountain region.

The objectives of this study[3] were twofold. The first was to determine the critical factors affecting the cost of one artificial regeneration method used in the northern Rocky Mountain region—hand planting. The second was to attempt to refine the cost prediction equations formulated by Wikstrom and Alley.[4]

Procedure

The United States Forest Service Progress Work Plan Summary (PWP) provided information as to the total number of hand-planting projects in the Northern Region in 1967. Additionally, the PWP supplied the following data:

1. Location of the hand planting project
2. Total project cost
3. Total acreage
4. Finance class (planted by Forest Service (force account) or contract crews)
5. Season of planting
6. Paid travel miles to planting site (Forest Service only)

We obtained the following physical characteristics of the planted sites from the Forest Service Master Forest List:

1. Soil characteristics
2. Habitat type
3. Physiographic site
4. Average slope
5. Elevation
6. Aspect

A questionnaire, sent to all involved ranger districts, furnished additional data. The following information resulted from the questionnaire:

1. Site preparation, planting method used, site quality and the year planting was completed
2. Amount of brush and slash on the site immediately prior to planting
3. Experience of the planting crew
4. Planting stock, age class and quality
5. Paid travel time for projects handled by Forest Service crews
6. Type of planting tool
7. Whether the cost of the planting stock was included in the PWP

We selected a total of 256 projects; seven of those were later rejected, however, because their high per

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[3]C. Snyder, Cost Analysis of the 1967 Hand Planting Projects in the Northern Rocky Mountain Region, M.F. Thesis, School of Forestry, University of Montana, 38 pp., 1968. This study was partially supported by the United States Forest Service under a cooperative agreement effective from March 1, 1968 to January 1, 1969.

[4]J. H. Wikstrom and J. R. Alley, Cost Control in Timber Growing on the National Forest of the Northern Region, U. S. Forest Service Research Paper INT-42, Intermountain Forest and Range Experiment Station, 37 pp., 1967.

acre costs were not representative of normal Forest Service or contract projects. Where two or more stands were listed under one project, we developed and used a weighted average. We removed the unit cost per seedling, which was constant for all projects, and calculated the number of seedlings per acre.

We used an N. C. Breaks[5] program, developed by the U. S. Forest Service for preliminary data analysis, to summarize distribution and check for apparent relationships. Two stepwise multiple-hypenate regression programs were used to develop prediction equations. The first regression program was a stepwise addition starting with the most significant variable and adding to it other variables which substantially increased the variation in the dependent variable. The second program made possible the stepwise elimination of the variable factors, in the order of increasing significance.

Results

The average cost per acre of hand planting was $29.80 plus the cost of the planting stock. The size of the average project was 77.4 acres (range = 6 to 619 acres). Interestingly, the force accounts averaged 8.6¢ per planted seedling, while contract plantings averaged only 6.6¢ per planted seedling. No significant difference existed between the cost of spring and fall planting.

The additive regression program generated the following prediction equation.

Project cost - planting stock cost = Y = 30.44 + 27.72 (area in acres). This equation had an R^2 of .7206, a mean of $2176.00, and a standard error of estimate of ± $1380.42. Wikstrom and Alley[6], in a study of cost control in timber growing, isolated two important variables—area[2] and the total number of trees planted. The results of our study indicated that only area had a bearing on the cost of hand planting; however, because the standard error was so great, the regression equation is of questionable value. In an attempt to reduce the error, we sorted the data according to force accounts, contracts, and spring and fall jobs, and again analyzed the information. (See Figure 1). Because a high error was again encountered we concluded that this prediction equation is of little use.

The final stage of analysis involved the use of stepwise removal regression program. We entered 25 variables in this computation, but the results showed that only the size of the area planted accounts for any significant variation in the dependent variable (F^2 = .721).

Conclusion

This study indicates that subsequent planting analyses should relate the amount of brush and down material in a plot to planting costs. Furthermore, a system of regional cost accounting should be developed that will allow practical cost comparisons. If such a system is not feasible, an itemization of costs common to all planting projects should be made available for analysis.

[5]D. L. Schweitzer, A Computer Program for Preliminary Data Analysis, U. S. Forest Service Research Note NC-33, North Central Forest Experiment Station 24 pp., 1967.

[6]*Op. Cit.*

FIGURE 1

	Force Accounts		Contracts	
	Spring	Fall	Spring	Fall
Avg. Size in Acres	66.0	52.7	92.9	99.1
Avg. No. of Trees Per Project	21,723	19,420	42,074	41,784
No. of Observations	116	23	79	31
Mean of Y	$ 1,691.61	$ 1,873.53	$ 2,702.11	$ 2,872.23
Standard Error ±	$ 876.82	$ 690.30	$ 1,266.66	$ 1,343.54
Equation Y =	161.15 + 5.56A* + .0536 TNT**	−210.29 + 31.0A + .0232 TNT	−382.13 + 55.7A − .0497 TNT	−778.01 + 42.3A − .0131 TNT
R^2	.772	.942	.841	.835

*A = Acres
**TNT = Total Number of Trees