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 Title A PROPOSED SAMPLING TECHNIQUE AND ELECTRONIC DATA PROCESSING

 PROGRAM FOR REPRODUCTION SURVEYS IN FOREST PLANTATIONS.

 Abstract approved
 Signature redacted for privacy.

 (Major professor)

The purpose of this thesis is to determine if the Oregon State Forestry Department's stocking survey system can be applied to planted acres as well as to seeded acres. Two computer programs were developed into a primary program. One produced a new stocking curve adapted to hand planting patterns, and the other determined the stocking from this and a natural reforestation curve in relation to sampling data. Also developed was a three-plot sequential technique to modify any one sampling point. Answers include total number of trees per acre, separated into naturally seeded and planted trees, projecting the answer on a line basis, a 40-acre basis and a project basis. Results of the study showed that: a) erroneous estimates of trees per acre in forest plantations may result from application of the present survey system; b) the proposed survey system has certain advantages over the present system in determining the degree of success in forest plantations; c) by recognizing spacing interval, the proposed survey system brings accuracy to the level necessary to meet present-day planning requirements; d) the proposed survey system will permit construction of sufficiently detailed mapping of voids due to mortality which may occur in forest plantations to develop reforestation plans; e) the proposed survey system will tend to estimate more correctly, where the present system tends to underestimate the number of surviving trees per acre in plantations having a high mortality rate; f) the proposed system permits using fixed radius plots, the radius of which is related to plantation spacing.

A PROPOSED SAMPLING TECHNIQUE AND ELECTRONIC DATA PROCESSING PROGRAM FOR REPRODUCTION SURVEYS IN FOREST PLANTATIONS

by

WALTER W. SCHUTT

A THESIS

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APPROVED:

Signature redacted for privacy.

Associate Professor of Forest Management In Charge of Major

Signature redacted for privacy.

Head of Department of Forest Management

Signature redacted for privacy.

Dean of Graduate School

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A PROPOSED SAMPLING TECHNIQUE AND ELECTRONIC DATA PROCESSING PROGRAM FOR REPRODUCTION SURVEYS IN FOREST PLANTATIONS

INTRODUCTION

Reproduction Surveys and Management Planning

There is growing awareness of the need for more specific reforestation survey information concerning utilization of lands managed by the Oregon State Forestry Department. Forest Management Division program objectives now include intensive forest management practices. One important objective of intensive management is maximum return on capital invested. This implies the most complete financial and/or biological site utilization as is feasible.

Stocking and stand density definitions were reviewed (4, 5, 7, 8). In this thesis, stocking will be defined as a biological expression of site utilization. It is expressed as percentage of area occupied at a specific minimum number of trees per acre. Stocking is frequently analyzed in terms of management objectives and planning. Intensive management planning requires precise stocking estimates for reproduction lands.

The stocking survey system used by the department (1, 2, 3) was developed by the Research Section, Oregon State Board of Forestry, forerunner of the present Forest Research Laboratory, School of Forestry, Oregon State University. This system has been applied without change to: (1) planted lands, (2) naturally seeded lands, and (3) lands having both natural and seeded reproduction. The system as applied does not recognize that stocking estimates based upon a random distribution of natural reproduction cannot correctly be applied to systematic spacing found in planted reproduction.

Survey information does not show specific locations requiring initial or supplemental planting. Stocking computations are based upon a series of plots established by a systematic grid. Attempts to establish boundaries of areas with different stocking levels have not been successful. No attempt is made to modify any one sampling point by (1) the adjacent plots one line, or (2) the overall average for the sampling area. As a result, present department surveys on forest plantations do not provide reliable or adequate information to: (1) appraise reforestation effectiveness, or (2) assess reforestation needs.

Purpose and Scope

The purpose of this thesis is to determine if the State Forestry Department's stocking survey system can be applied to planted areas as well as to naturally seeded areas. The present system is compared with a proposed system based upon the probability of seedlings occurring on a sample plot in a plantation. The proposed system is evaluated on the basis of field sampling tests.

BASIS FOR COMPARISON

3

An 8 x 8 foot spaced forest plantation was represented on cross section paper with a scale of 1 inch equals 4 feet. A transparent template of the same scale representing a 7.45-foot radius plot (four-milacres) was used to systematically "sample" the plantation. Separate tallies for nine sampling directions covering a 45 degree segment (Figure 1) recorded the number of times 1, 2, 3 or 4 quadrants of the 7.45-foot radius plot contained a "tree." A total of 2,376 four-milacre plots were tallied by taking plots at one-foot intervals. Figure 1 illustrates the technique of determining whether 1, 2, 3 or 4 trees are tallied on a given plot.

Individual tallies for each of the nine sampling directions were combined and converted to an 80-plot (320 quadrants) basis. The objective was to approximate the probability of selecting 1, 2, 3 or 4 "stocked" quadrants. Table I is a summary of the results.

Ta	b	le	T

Quadrants	Stocked	San Gang (1999) - Martin Carlos and a star	Plot Tally	announ an	Percent	(Probability
1			2			2
2			33			42
3			30			37
4			15			19
Total			80			100

Experimental Plot Tally soretical 8 x 8 Spaced Forest Plantatic

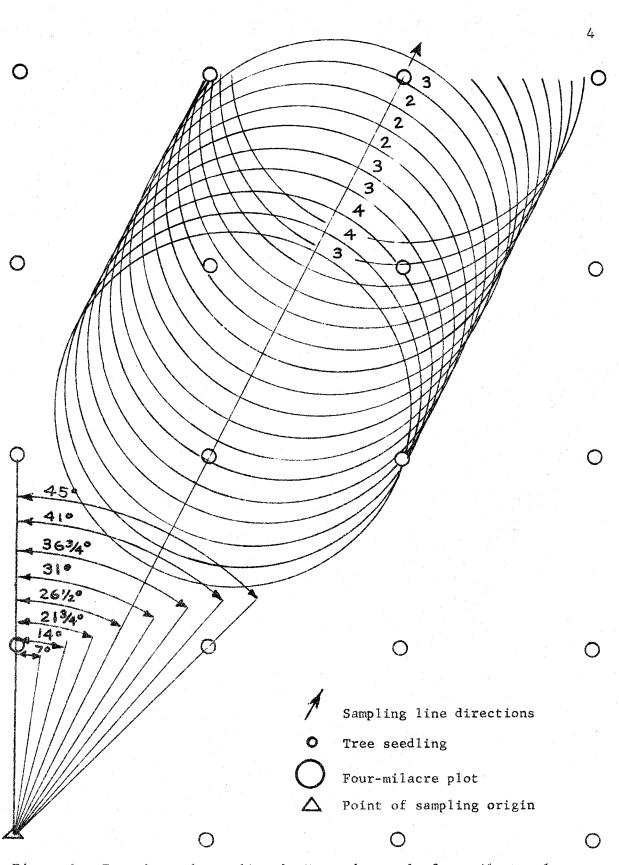


Figure 1. Experimental sampling design and example four-milacre plot counts - theoretical 8 x 8 spaced forest plantation.

Graphic Solution

A graphic solution to determine probabilities was also developed. An 8 x 8 foot spaced forest plantation was represented on cross section paper with a scale of 1 inch equals 2 feet. A compass representing a 7.45 radius was used to draw four arcs, one from each corner of a single 8 x 8 foot spacing set (Figure 2 illustrates the technique). The number of square inches within each figure thus created were determined by planimeter. Ratios of each figure representing the same number of tallied trees to the total area included within the 8 x 8 foot spacing set were determined. Table II is a summary of the results.

Table II

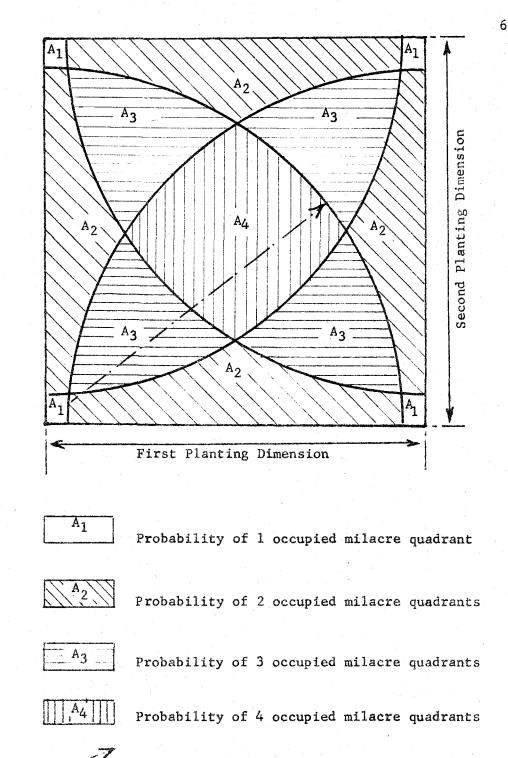
Quadrants Stocked	Square Inches	Ratio (Probability)
1 (total A ₁)*	. 34	.02
2 (total A ₂)*	6.71	.42
3 (total A ₃)*	6.02	.37
4 (total A ₄)*	2.93	.19
Total	16.00	1.00

Graphic Solution heoretical 8 x 8 Spaced Forest Plantation

*See Figure 2

Mathematical Solution

Mathematical probability expressions were developed to facilitate computer solution for many possible planting spacings and plot radii. The Oregon State Highway Department was consulted (6) to obtain equations used in engineering design to compute areas of circular segments inscribed



Four-milacre plot radius

Figure 2. Graphic method of determining expected number of occupied milacre quadrants for four milacre plots - theoretical forest plantation.

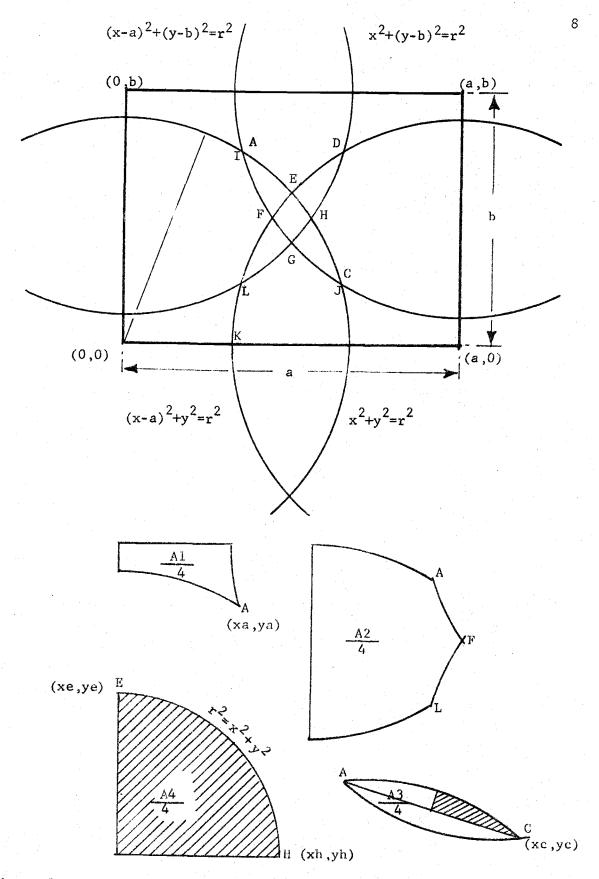
within rectangles (Figure 3). Basic equations supplied by the Highway Department (Table III) were adapted to the problem of computing probabilities. Derivation of the final equations is found in Appendix III. A Probability Generator Computer Program (Appendix IV) was developed to compute probabilities for all possible planting dimension and plot radii combinations.

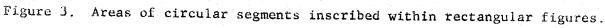
Table III

	Area Equations	For	Circular Segments Within Rectangles*
Area	·		
A ₁			$\left[\int_{0}^{xa} (b - \sqrt{r^{2} - x^{2}}) dx - \int_{xe}^{r} \sqrt{r^{2} - x^{2}} dx\right]$
A ₂			$2 (1/4 \pi^2 - 1/4A_1 - 3/4A_3 - A_4)$
A ₃			$8\int_{0}^{xj} \sqrt{r^2 - x^2} - yj)dx$
A ₄			$4\int_{xe}^{xh} (\sqrt{r^2 - x^2} - yh) dx$

*In the above equations A_{1-4} is area within 1, 2, 3 or 4 circles, r is circle radii, x and y are geometric distances, and b is dimension length.

Table IV is a summary of the mathematical computations for an 8 x 8 spaced forest plantation sampled with a four-milacre plot. Expected number of milacre quadrants for each four-milacre plot (column 4) is obtained by multiplying the number of milacres (column 1) times corresponding probability (column 3). The decimal ratio (column 5) is established as the full stocking base. Examples of computer output from the Probability Generator Program for several planting dimensions are shown in Appendix V.

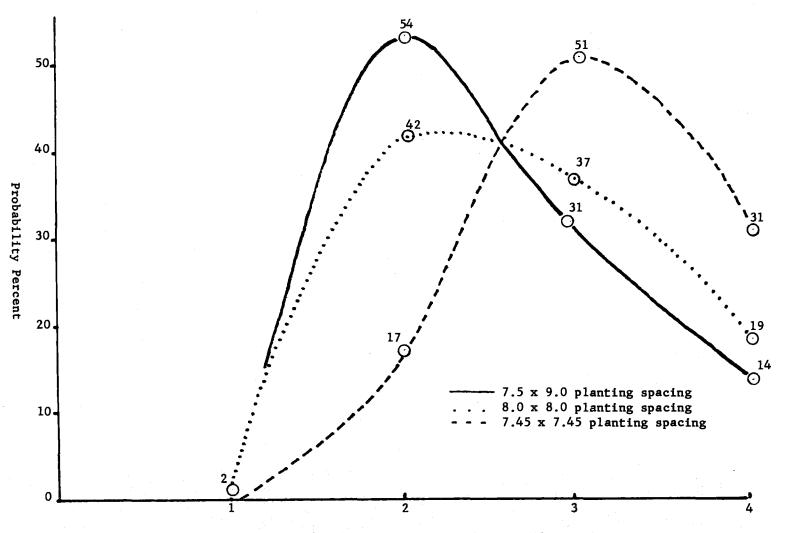




<u>Mathem</u> 1	atical Solut: 2	ion Theoretical 8	3 x 8 Spaced Forest P	lantation
Milacres Stocked	Area	Probability	Expected Milacres Per Four-milacre	Decimal Ratio
1,	1.2416	0.019400	0.019400	· · · · · · · · · · · · · · · · · · ·
2	27.1262	0.423847	0.847694	
3	23.6569	0.369639	1.108916	
4	11.9753	0.187114	0.748454	
Total	64.0000	1.000000	2.724464	0.681116

The mathematical solution shown in Table IV is illustrated in Figure 4. Two other spacings (7.5 x 9.0 and 7.45 x 7.45) are also shown for comparison.

Table IV



Occupied Milacre Quadrants For Each Four-milacre Plot

Figure 4. Graph showing mathematical probability solution for three planting dimensions - theoretical forest plantation.

10

STOCKING CURVES AND TABLES

Forest Plantation Stocking Regression

A plantation stocking equation was developed to compute the expected number of occupied quadrants for full stocking (no mortality). Probability percents for 7.45-foot radius plots and variable planting dimensions computed by the Probability Generator Program were subjected to a least squares regression program available at the Oregon State Highway Department. Table V lists the data used.

	÷		
Tab	7	-	V
Tran		ρ	- V

Planting Dimens	ion (Feet)	Square Feet	Full Stocking (Percent)
8 x 8		64	68.11
8 x 9		72	60.54
8 x 1	0	80	54.49
8 x 1	1	88	49.54
9 x 9		91	53.82
9 x 1	0	90	48.43
9 x 1		99	44.03
10 x 1	0	100	43.59
10 x 1	1	110	39.63

Planting Dimensions and Expected Full Stocking Percent

The unweighted least squares solution for the data in Table V was:

 $S = 160.9894 - 1.9365 (D_1 \times D_2) + .0076 (D_1 \times D_2)^2$

where S = full stocking percent

 D_1 = first planting dimension in feet

 $D_{2}^{=}$ second planting dimension in feet.

Naturally Seeded Stocking Regression

A revised ratio of milacre stocking percent to number of trees per acre on naturally seeded acres (3, p. 7) is shown in Figure 5. This relationship was subjected to a least squares regression program and expressed mathematically as follows:

 $N = 95.30348 + .431258P + .450251P^2$

where N = number of trees per acre

P = percent of milacre plots stocked.

Comparing Estimated Trees Per Acre

A series of computer programs were developed to further understand the problem of applying a survey system intended for naturally seeded lands to planted lands. The approach was to apply the two stocking equations to theoretical plantations of various planting dimensions and compare the two estimates of trees per acre. Appendix II presents a series of machine generated Forest Plantation Stocking Tables listing expected number of trees per acre by 20 percent stocking classes. Figure 6 illustrates the comparison for an 8 x 8 planting spacing.

An examination of the tables indicated the following general relationships:

a) In forest plantations with no mortality, the naturally seeded stocking regression overestimated the number of trees.

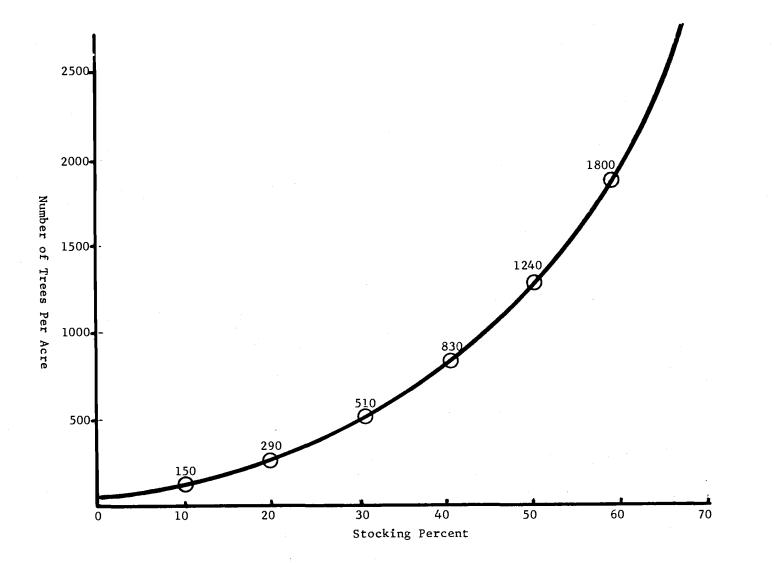


Figure 5. Ratio of milacre stocking percent to number of trees per acre on naturally seeded areas.

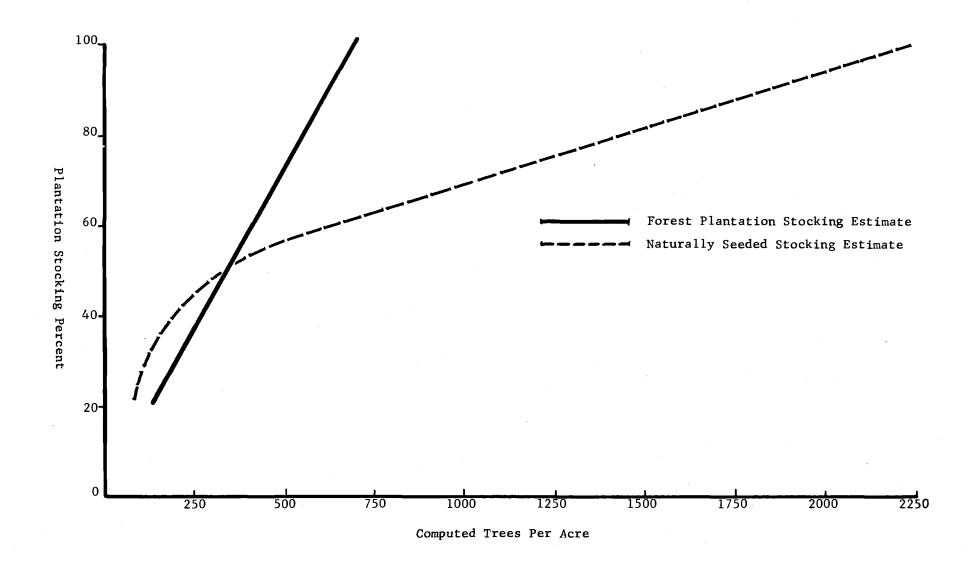


Figure 6. Graph comparing computed number of trees per acre - 8 x 8 planting dimension.

- b) In forest plantations with 60 percent mortality, the naturally seeded stocking regression underestimated the number of trees.
- c) In forest plantations with 80 percent mortality, a variable overestimate or underestimate occurred.

THE FIELD SURVEY

Effect of Adjacent Plots On Sample Plot

Present survey system analysis techniques are based upon a series of plots and a single stocking average determined for each 40-acre subdivision or project area. It is difficult to isolate small areas within subdivisions or areas in need of initial or supplemental planting. A three-plot sequential sampling technique (Figure 7) was developed to assist in locating "voids." Data collected from each sampling plot are averaged with the two associated plots. Plots next to sampling boundaries or non-sampled areas are averaged with the sampling unit's overall average. One stocked quadrant out of four was established as a minimum for the three-plot test. Two adjacent plots on the same line failing the sequential test constitutes a void.

Computer Programs

Computer programs were written to analyze field survey information. The following data analysis system was developed:

- a) Compute stocking and number of trees per acre as presently done. No separation between natural and planted trees.
- b) Separate natural and planted trees. Apply the plantation stocking curve to planted trees. Apply the presently used stocking curve to trees of natural origin. Compute an answer for each.
- c) Summarize the total number of trees per acre and compare this result with (a).

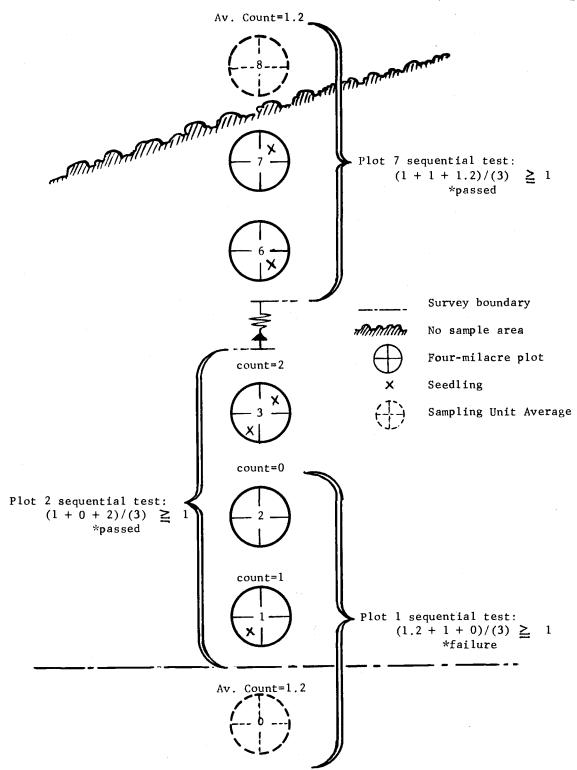


Figure 7. Illustration of the three-plot sequential sampling technique.

- d) Repeat (a) through (c) on a line basis, a forty basis, and a probject basis.
- e) Report survey results. Report locations not meeting the minimum requirement of one stocked quadrant out of every four for the three-plot sequential test.

Survey Test Area

A 200-acre tract in Township 5 North, Range 8 West, Clatsop County, Oregon, was selected to test the proposed stocking survey system. The area contained three to five-year old planted and natural seedlings.

Survey Instructions

Survey data were taken from equidistant (66 feet) four-milacre plots along four sampling lines running east and west and four sampling lines running north and south. Each 40-acre subdivision contained 160 plots. Field survey procedures and tally cards are presented in Appendix VI.

DISCUSSION

The standard of adequate stocking chosen by the Amended Conservation Act of 1947 was "300 established live seedlings per acre which are sufficiently spaced for individual normal growth and development and 100 of which are well distributed over the acre". The stocking survey system devised by the Oregon State Forestry Department (1,2) was developed to determine the degree of stocking in logged-off areas. The law required a decision be made as to when harvested lands were in need of reforestation. The system provides for tabulation of stocking by both milacre quadrants and four-milacre sample plots. Percentages derived are converted to number of trees per acre using stocking curves (3,p.7).

The department has applied the system without change to planted lands, naturally and artifically seeded lands, and lands having both natural and seeded reproduction. The system has frequently over-estimated trees per acre when applied to forest plantations with low mortality and underestimated trees per acre when applied to forest plantations with high mortality. The present survey system based upon a random distribution found in natural reproduction cannot correctly be applied to systematic spacing found in planted reproduction.

One of the problems of the forest administrator is to remain informed as to the growing stock status of his lands. A reliable stocking survey system is required to determine and describe the condition of denuded and restocking areas. An electronic computer was utilized to determine the

effectiveness of the State Forestry Department's stocking survey system. Phase I of the study developed theoretical Forest Plantation Stocking Tables (Appendix II) based upon the probability of selecting occupied milacre quadrants in variable spaced forest plantations. The naturally seeded stocking estimate (present system) was compared to the revised forest plantation stocking estimate. The present system overestimated the number of trees in low mortality plantations and incorrectly estimated the number of trees in high mortality plantations. Example comparisons of the two estimates are shown in Table VI. Comparisons for other planting spacings are found in Appendix II.

Table VI

Present and Revised Estimates of Trees per Acre in Forest Plantations

Planting	Mortality	Milacre Stocking	Trees	Per Acre
Dimension	(Pct.)	(Pct.)	Present System	Plantation System
8 x 8	0	68.18	2218	681
	20	54.54	1458	544
	40	32.72	592	408
	60	13.09	178	207
	80	2.61	100	136
9 x 9	0	54.99	1431	538
	20	43.19	954	430
	40	25.91	408	323
	60	10.36	148	215
	80	2.07	98	108
10 x 10	0	43.33	960	435
	20	34.67	651	348
	40	20.80	299	261
	60	8.32	130	174
	80	1.66	77	87

A proposed survey system using an electronic computer was developed in Phase II of the study. This system provides for simultaneous but separate field recording of natural and planted trees on each milacre quadrant of the four-milacre sampling plot. It can be applied to naturally seeded lands, to planted lands, or lands having both natural and planted seedlings. System design provides for separate as well as combined field data analysis. Natural reproduction estimates are based upon the presently used milacre stocking curve. Planted reproduction estimates are based upon the plantation stocking curves. Natural and planted quadrant tallies are then combined and analyzed on the basis of presently used milacre stocking curve. The three-plot sequential sampling technique is optional.

The proposed stocking survey system was field tested in January, 1965. Survey data were processed at the Oregon State Highway's computer installation in March, 1965. Computer reports are shown in Appendix I. The Rehabilitation Stocking Survey-Stocking Summary Report illustrates the three-plot sequential sampling analysis (7777 code indicates a void) and lists the computed trees per acre and stocking percents for each 40-acre subdivision

The Field Data Listing Report lists survey plot card tallies and indicates reproduction distribution for each 40-acre subdivision.

Survey results indicate the estimated number of trees per acre is (1) less if natural and planted seedlings are computed separately (each with the appropriate stocking curve), or (2) greater if natural and planted seedlings are combined and computed as presently done. The two methods are compared in Table VII.

Table VII

Forty Number	Proposed		Estimate ¹⁾	Present System Estin (Trees/Acre)	
1		394		609	54.6
9		336		415	23.5
10		408		585	43.4
11		709		1138	60.5
12		423		539	27.4
Project	Average	445		663	48.9

Comparison of Computed Trees Per Acre on the Stocking Survey Test Area

1) (natural trees by naturally seeded stocking regression) plus (planted trees by plantation stocking regression)

2) Determined without classification by naturally seeded stocking regression.

CONCLUSIONS

Reforestation survey methods used by the State Forestry Department are valid only if applied to naturally or artificially seeded lands. Stocking estimates based upon a random distribution of natural or seeded reproduction cannot correctly be applied to systematic spacing found in planted reproduction. From the results of this study it is concluded that:

- (a) Erroneous estimates of trees per acre in forest plantations may result from application of the present survey system. Such estimates vary inversely with uniformity of spacing.
- (b) The proposed survey system has certain advantages over the present system in determining the degree of success of forest plantations.
- (c) By recognizing spacing interval, the proposed survey system brings accuracy to the level necessary to meet present-day planning requirements.
- (d) The proposed survey system will permit construction of sufficiently detailed mapping of voids due to mortality which may occur in forest plantations to develop reforestation plans.

- (e) The proposed survey system will tend to estimate more correctly, where the present system tends to underestimate the number of surviving trees per acre in plantations having a high mortality rate. This is important on areas which must conform to the 300 tree per acre standard of the Oregon Forest Conservation Act.
- (f) The proposed system permits using fixed radius plots, the radius of which is related to plantation spacing. This is in contrast to the present survey system, which has a plot size related only to a specified stocking standard. Computer programs developed in this study can permit investigation of other size plots.

BIBLIOGRAPHY

- Bever, D. N. A study of stocking survey system and the relationship of stocking percent as determined by this system to number of trees per acre. Salem, 1949. 40 p. (Oregon State Board of Forestry. Research Bulletin 1)
- Bever, D. N. and D. P. Lavender. The relationship of stocking percent to number of trees per acre on artificially seeded areas. Salem, 1955. 13 p. (Oregon State Board of Forestry. Research Note 25)
- 3. Bever, D. N. Surveying forest lands for stocking. Corvallis, 1961. 8 p. (Forest Research Laboratory, School of Forestry, Oregon State University. Research Note 44)
- 4. Bickford, C. A. et al. Stocking, normality and measurements of stand density. Journal of Forestry 55:99-104. 1957.
- Gingrich, S. F. Criteria for measuring stocking in forest stands. In: Proceedings Society of American Foresters Meeting, Denver, 1964. p. 198-201.
- 6. Kowitz, D. D. Research Analyst, Oregon State Highway Department. Personal communications. Salem, Oregon. September, 1964.
- Society of American Foresters. Forest terminology. 3d ed. Washington D. C., Society of American Foresters, 1958. 97 p.
- 8. Spurr, S. H. Forest inventory. New York, Ronald Press, 1952. 476 p.

APPENDICES

	APE	PENDIX	Ι
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FTELD	SURVEY	RESULTS

PROJEC	7 NAME - 5	AMPLING C	ESIGN RESEAU	CH AREA	PROJEC	7 ACRES -	200 SURVEY	DATE - J	ANUARY 1964	
STOCK	NG SURV	EY LOC	A710N .	STOCKIN	G SURVEY ANAL	YSIS BY	STOCKING PERC	ENT AND	NUMBER OF SI	EOLINGS
SECTION	FORTY :	LINE .	PLOF	NATURAL	LY SEEDED	PL	ANTEO	OVE	RALL .	707AL _
	NUMBER	NUMBER	NUMBER	PERCENT STOCKED	SEEOLINGS . PER AGRE ,	PERCENT .	SEEOLINGS . PER ACRE .	PERCENT	SEEOLINGS . PER ACRE .	
14 14	9	1	1 70 10 11 70 20	18 2	NO ESTIMATE 265	27 8	NO ESTIMATE 245		NO ESTIMATE 681	UNKNOW 510
	_	_								UNKNOW
14	9	2	1 70 10	13 8	<u>NO ESTIMATE</u> 178	15 8	NO ESTIMATE	13 8	ND ES71MATE	316
14		ź	12 70 12	111 1	1111	117 8	1111	111 8	1111	1111
14	3	ź	13 70 16	111 1				111 8	1111	1111
14	,	2		35 8	661			35 8	661	661
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14	2	,	1 70 10	777 8	ND ESTIMATE 7777	111 8	7777	777 8	1111	7777
14		3	12 70 14	25 8	387	0 8	0	25 8	387	387
14	ġ	í	15 70 17	777 1	1111	111 8	ั ที่ที่ไ	177 8	1111	1111
14	9	3	18 70 20	25 8		7.8	69	25 8	394	463
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14 .	9	7	13 70 18	28 2	485	. 14 8	130	37 8	737	615
14	9	7	19 10 50	777 t	1111	117 8	1111	777 E	1111	1111
14	9	9	1 70 10	20 8	294	29 8	266	43 8	957	560
14	9	å	11 70 15	111 \$	1111	111.5	1111	117 8		1111
14	9	8	16 70 18	33 8	609	0 1	0	33 X	609	609
14	9		19 70 20	117 8		111.8			1117	1111
14	9									
ORTY	9 TUTALS		S 83 PL075	16.8	221	12 8	115	26 \$	415	336

				51	OCKING SUP	MARY REPORT C	ONTINUED				
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10N19 -	CLA750P	PRO	JEC7 - 2	6	TOWNSH	P 5 N R	ANGE O W	PLANTING	OIMENSION	S 6.0 8Y	8.0 F7.
								STOCKING PER	LENT AND	NUMBER OF	SEEUL 1403
SEC710N	FORTY	LINE	: PLC		NATURALI REPRO	Y SELOEO	REFO	LANTED . RESTATION .	OVE REPR	RALL DOUCTION	. 707AL SEEOLING
NUMBER	NUMBER	NUMBER	NUM	ER .	PERCENT STUCKED	SEEDLINGS . PER ACRE .	PERCENT STOCKED	SEEDLINGS . PER ACRE .	PERCEN7 STOCKED	. SEEULINGS	•
14	9										· .
F0877	9 Total										
AND AV			NES 83	PL075	16 2	221	12 8	115	26 \$	425	336
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14	10	2	170		717 1	7777	37 8	7777	31 \$	564	337
14	10	2	16 10			1111	···· • • • •		111 1		1111
14	10	2	18 70	20	26 2	432	31 \$	285	39 8	810	717
14	10	,	. 170	1 12	17 8	247	41 8	373	44 2	1018	620
14	10	í	13 7		777 2		. 111 1	1111	117 8	7777	1111
14	10	3	16 70	20	5 8	110	40 \$	366	34 8	648	476
14	10		1 70			NO ESTIMATE		NO ESTIMATE		NO ESTIMATE	UNKNOW
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14	10	4	9 70		0 t	0	58 8	530	50 \$	1242	530
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14	10	5	1 70	. э	39 8	810	16 8	152	45 8	1052	962
14	10	5	4 70	1 4	777 8	7177	777 🐔	1111	111 2	7111	7777
14	10	5	5 70		777 X	1111	111 8	1111	177 1	1111	1111
14	10	5	7 11		117 8	7777	777 8	1111	777 8	7777	1111 35
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14	10	6	1 70			NO ESTIMATE		NO ESTIMATE		NO ESTIMATE	
14	10	6	7 70		22 1	324	30 \$	278	38 \$	788	602 1111
14	10	6	12 70		111 2	1777		391	177 8	7777	528
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· 11 · · ·	10	· · · · · · · · · · · · · · · · · · ·		15	14 \$	196	35 1	319	41 8	873	515
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					MARY REPORT CO					
PRDJ	EC7 NAME - 1						200 SURVE			
DUN7Y - 1	CLA75DP						PLANTING			
	KING SUR	/E¥ LD	CA710N .	STOCKING	SURVEY ANAL	YSIS BY	STUCKING PER	CENT AND	NUMBER OF	SEEDLINGS
SEC710N	FORTY :	LINE	PLD7	NATURALL REPRO	Y SEEDED	PL	ANTED .	REPRO	ALL DUCTION	707AL
NUMBER	NUMBER .	NU*8FR	. NUMBIR .	PERCENT . STOCKED .	SCEDLINGS . PER ACRE .	PERCENT . STOCKED .	SEEDLINGS . PER ACRE .	PERCENT .	SEEDLINGS	•
14 14	10 10	;	16 ID 17 18 70 20	777 X	7777 295	777 8	7777	777 E 58 E	7777 1641	1111 119
14	10	8					300		768	496
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	10 101ALS ERAGES	3 UN	rs 43 FLO75	12	125	31 8	283	32 8	585	408
14		!	1 10 5	37 X 777 X	731	19 8	172	41 8	880 7777	103 7777
14	11	i	6 10 7 8 10 9	111 2	1111	111 1	1111	777 2	1111	7777
14	11	1	10 70 11	-111 1		777 2 38 8		32 8	. 1777 591	1111
14	11	,	1 70 5	62 8	1 85 8	9 2	84	62 8	1858	1942
14	11	2	6 70 6	111 E	1111	mi	,,,,,	777 8	1111	7777
14	11	ł	1 10 20	23 2	347	38 🖣	351	51 X	1312	678
14 14	11	3	1 10 10 11 10 14	47 \$	1132	15 8	142	49 🛊	1232	1274
14	11	3	15 10 14	18 t	261	777 X 21 Z	7777 198	777 X 37 X	7777	1777
14	11	3	19 10 20	117 1	1111	111.2	1111	111 2	1111	nii
14	11	4	1 10 1	23 8	361	27 8	252	21.8	361	613
14	11		2 10 2	111 2 111 2	1111	111 2	7777	111 X 117 X	1111	1111
- i4	ii	4	5 70 12	28 8	471	7 8	69	37 2	754	540
14	11	*	13 10 15	111 8	1111	7 X 777 X 9 X	1111	777 8	1111	,,,,,
14	11 .	•	16 10 20	45 2	1044			45 E	1044	1128
14	51	5	1 70 20	52 X	1337	31 8	287	67 8	2204	1624
14	11	6	1 10 2	24 8	369	47 8	433	49 X	1207	802
14	11	6	3 70 4	mi i	1111	777 8	1111	777 2	,,,,,	1111
14	11	6	5 10 19 20 20 20	49 8	1167	35 T 717 B	310	68 X 111 X	2221	1485
14	11	,	1 IO 1	23.5	361	42 8	385	36 8	705	746
14	11	,	2 IG 2	111 1	1111	777 %	1111	777 8	1111	7777 PAGE
						· · · ·				
					MARY REPORT CO					
							200 SURVEY			
JUNTY - 1							PLAN7JNG		6.0 BY	8.0 F7.
\$700	KING SURV	rev La	CA7109	S7DCKING	SURVEY ANAL	Y515 BY	STOCKING PERC	ENT AND		********
	•	×.	• PLOI •	REPRO	SEEDED	REFDR	ESTATION .	REPROC	ALL . DUC710N .	SEEDI ING
NUMBER	• NUMBER •	NUMBER	NUMBLA	PERCENT . STOCKED .	SEEDLINGS . PER ACRE .	PERCEN7 . S7DCKED .	SEEDLINGS . PER ACRE .	PERCENT . STOCKED .	SEEDLINGS .	
14	п	,	2 70 2	111 8	1111	111 8	1111	777 2	,,,,,	,,,,,
14	11	;	3 70 18		107	24 3	997	50 8	1242	604
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IUNTY - CL	A750P	PROJ	EC7 - 26	TOWNSHI	P 5 N	RANGE 8 W	PLANTING	DIMENSIONS	6.0 87	8.0 #7.
S7DCK1	NG SUR	VEY LO	CA7101	STOCKING	SURVEY AN	ALYSIS BY	STOCKING PER	CENT AND	NUMBER DF	EEDLINGS
SECIION	FURTY	LINE	• PLOI •	REPRO	Y SEEDED DUC71DN		ANTED ESTATION	REPRO	DUC710N .	707AL_
NU ^M BER	NUMBER		. NUMBLA .	PERCENT .	SEE OL INGS	• PERCENT • • STOCKED •	SEEDLINGS .	PERCEN7 .	SEEDLINGS .	
14	п	,	2 70 2	111 8	,,,,,	777 8	7777	777 2	,,,,,	,,,,,
14	11	7	3 70 18	4 8	107	54 8	497	50 8	1242	604
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14	ii	8	14 70 14	111 1		mi		777 8	,,,,,	1111
74	11	9	15 10 20	21 %	304	53 \$	488	53 8	1 3 9 4	792
14	11									
FD37V 11	TOTALS									
AND AVER		1114	25 60 PLOTS	29 3	463	27 %	246	47 8	1138	709
14	12	1	1 10 7	53 4	1424	19 \$	173	60 \$	1748	1597
14	12	1	8 70 10	777 8	1111	777 2	7777	117 8	1111	1111
14	12	-1	11 10 12	25 t	387	14 8	1 32	37 8	744	519
14	12	1	13 70 16	777 X	1111.	777 X	1111	777 8	1111	1111
14	12	1	17 10 19	16 %	227	29 X	265	25 8	387	492
14	12	ı	50 10 50	777 X	,,,,	777 E	1111	111 E	1111	,,,,
14	12	2	1 73 7	777 8	7777	777 8	7777	777 8	1111	,,,,
14	12	2	8 70 11	777 2	1111	777 8	1111	777 X	1111	1111
14	12	2	12 10 14	6 %	116	36 E	332	39 Z	821	44 B
14	12	,	15 10 15	777 2	,,,,	111 2	1111	777 X	1111	,,,,,
14	12	2	16 70 19	25 %	387	5L X	464	50 X	1242	851
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14	12	,	9 10 15	111 X	1111	777 8	1111	777 \$	1111	1111
14	12	3	16 70 20	n হ	0	18.2	166	19 8	281 .	166
14	12	4	1 73 16	777 2	7777	777 8	1111	777 8	1111	1111
14	12	4	17 70 19	8 2	130	29 8	265	33 X	609	395
14	12	4	20 70 20	777 8	1111	177.8	7777	777 8	1111	1111
14	12	5	1 10 9	40 5	854	44 8	404	60 E	1774	1250
14	12	Ś	10 70 10	111 8	1111	111 \$	1111	777 2	1111	
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			ST	OCKING SUM	MARY REPORT CO	NTINUED				
PRO JE	C7 NAME - 1	SAMPL ING	OESIGN RESEA	ACH AREA	PROJEC	7 ACRES -	200 SURVE	OATE - JA	NUARY 1964	
1UN7Y - (LATSOP	PROJ	EC7 - 26	TOWNSHI	PSN RA	NGE OW	PLANTING	OTHENSTONS	6.0 BY	8.0 F7.
5706	ING SUR	VEY LO	CA710N .	STOCKING	SURVEY ANAL	YSIS BY	STOCKING PER	CEN7 AND	NUMBER OF	SEEDLINGS
SECTION	FURTY :	LINE	PL07	NATURALL REPRO	Y SEEDED . OUC710N .		AN7EO . ES7A77DN .	OVER REPRO	ALL	TOTAL
NUPRER	NUMPER	NUMBER	NUMBER .	DEDETNE	SEEULINGS . PLR ACRE .	PERCENT . STOCKED .	SEEDLINGS . PER ACRE .	PERCENT . STUCKED .	SEEDLINGS PER ACRE	•
14	12	5	10 70 10	,,,,,,,,		- 111 -	7111	777 8	****	1111
14	12	5	11 70 16	41 8	894	29 8	265	50 \$	1242	1159
14	12	3	11 10 10	777 8	1171	111 8	7777	777 8	671	7171
14	12	5	19 70 20	35.8	671	12.8	109	35 8	0/1	
14	12	6	1 70 6	47 2	1121	26 8	236	54 8	1451	1357
14	12	6	7 70 7	777 1	7777	777 \$	7177	717 8	1111	1111
14	12	6	0 10 11	37 8	744	29 8	265	62 8	1880	1009
14	12	6	12 10 12	777 R	115	771 2 26 T	1111 242	25 \$	402	357
14	12		13 10 20		112					
14	12	7	1 70 1	777 8	1111	777 8	1111	777 8	1111	1111
14	12	,	2 70 13	16 %	261	34 8	309	43 8	975 7777	570
14	12		14 70 16	111 X	115	53 8	1777	46 1	1075	604
14	12	'	17 10 20		115	<i>,,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	407			
14	12	9	1 10 3	171 \$	7717	777 1	1111	177 8	1111	1111
14	12	8	4 70 10	14 8	193	58 E	530	53 \$	1410	123
14	12	8	11 70 14	777 2	1111	111 2	7777	777 % 40 %	7777	509
14	. 12		15 70 20	11 8	160	38 8	344			
	72							·····		
FORTY AND AV	12 701ALS ERAGES	8 11	ES 60 PLU75	16 8	228		1 95	30 %	539	423
23			1 10 2	27 8	454	12 1		27 8	454	571
23	i	i	3 10 8	111 2	7717	111 2	1111	777 E	1111	7777
23	i	i	9 70 16	21 2	320	10 X .	99	31 8	548	419
23	1	1	17 10 20	777 \$	1111	777 8		177 8	1111	
23		•	1 70 10	3 8	100	61 \$	562	53 \$	1384	662
- 23		· · · · · · · · · · · · · · · · · · ·	11 10 17	717 2	- 111			111 8	7777	1177
23	i	ž	18 70 20	39 2	917	17 8	154	45 8	1060	971
23		,	1 70 2	777 8	1171	777 \$	7777	777 8	1717	7777
23	1	3	3 70 8			48 8	442	41 8	894	442
23	i	5	970 9	117 8	1117	177 \$	1717	777 8	7111	7117
- 23 -	i	3	10 10 20		155	34 8	316	30 \$	768	471
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						CONTINUED	200 SURVE		NUARY 1944	
PRUJI							PLANTING			8.0 FT.
										SEEDI INGS
\$700)	KING SI	JRVEY I	OLATION .	STOCKING.	SURVEY	NALTSIS OT	STOCKING PER			
SEC710N	FORTY	LINE.	PL07	NATURALLY REPROD	ÚC710N	. REFO	RESTATION .	OVE REPR	10UC710N	. 707AL SEEDLING
NUMBER	NUMBER	NUMBE	R NUMBER	PERCENI .	SEEDI INGS	PERCENT	• SEEDLINGS • • PER ACRE •	PERCENT .	SEEDLINGS	•
23	1	3	10 70 20	11.8	155	34 t	316		768	471
23	· ·		1 10 2	11 \$	155	61 \$	559	52 %	1372	714
23	i	4		117 %	7171	777 \$		177 8	1117	1171
23	1	4	5 10 15	0 7	C	45 E	409	38 %	784	409
23 23	1	:	16 70 16	117 2		<u> </u>		777 %	7177	,,,,,
23	1	•	17 10 20							
23	1	5	1 70 1	777 \$	1111	171 8	1111	777 8	1117	1171
23	1	5	2 10 8	0 2		45 \$	416	39 8	807 7777	416
23	1	5	9 70 9	117 Z	7777	177 8	1111	111 1	1111	1111
23	1	5	10 70 11	171 2	1111	717 8		27 2	454	305
23	1	5	12 70 17	2 8	99	22 % 777 %	206	111 2	1111	1111
23 23		5	18 70 18	11 2	155	51 \$		44 8	1003	626
	•	-				-				
23	1	6	1 10 1	29 X	470	19 8	176	29 3	490	666 7777
23	1	6	2 10 2	777 \$	7777	111 2	1171	111 1	7777	265
23	1	6	370 5	0 2	0	29 2	265	25 X 777 X	1111	1111
23	1	6	6 70 9	111 1	7777	111 8		25 \$	367	265
23	1	6	10 10 13	0 8	0	29 8 777 8	265 7777	111	1111	1111
23	1	6	14 10 14 15 TO 20	177 8 15 8	209	26 2	239	33 8	609	448
. 23	•	v	13 10 20							
23	1	7	1 70 1	777 8	1111	777 8	1111	777 %	1111	1111
23	1	7	2 70 5	28 8	4 75	16 🖏	151	39.8	807	626 7777
23	1	,	9 10 13	111 8	7117	111 2	1111	117 1	1017	617
23	1	7	14 70 20	, 22 t		30 E	276	** *	1017	011
23	1	8	1 70 B	50 \$	1284			56 X	1555	1382
23	1	8	9 70 10	777 8	1111	777 %		777 %	1111	1111
23	i	3	11 10 16	26 2	415	47.3	429	58 %	1652	844 E 1000
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AND AV	LRAGES	al	INES 56 PL 07	<u> </u>	156	26 \$	6 90			

UNIY -	ει	ATSOP		PRO	JUECI		26		TO		P '	5 N.	R	ANGE			PLANTI	NG	DIME	42104	> P		•	.0 F1.
STO	CKI	NG	SURV	EV L	DC A1	TION		•	\$100	KING	su	RVEY	ANA	LYSIS	BY.	stoc	KING	PERC	ENT	AND	NUMB	ER OF	sc	EDLINGS
SECTION	N :	F091	• :	LINE	:	PL:			NAT	RALL	V OUC 1	SEEDE 10N	v :		P Refò	LANTE RESTA	D T 1 ON	-:		OVE REPR	RALL	101	•	TOTAL SEEDLING
NUMBER		ŇUP8		NUMBER	::		S.R		PERCI	ENT . CED .	SF PE	EOL TH	GS. RE.	PER STC	CENT	SE PE	EDLENG R ACR	S. E.	PER	ENT KED	SEI	EULÍNG R ACR	5.	PER ACE
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FORTY AND A	L VER	TOF	ALS	3 LI	l∶4E S	56	PLC		11													609		394
PROJEC AND A				40 L1	LINE S	102	-							2			225		3	5 8		663		445
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		PRO.	JECTN	A 91	E - SAMPL	ING	OESI	GN R	ESEARC	H_AR	EA		PROJ	IECT AC	RES -	200	SU	AAEA O	ATE	- JANU	ARY 19	<u>64</u>			
PN RU	ç	Ľ	R	3	PLANT Space	SN FU	FN	LN	- 80	- 19	NAT.		-PN	NAT.	PLT.	PN	NAT.	PLT.	PN	NAT.	PL1. QUAD	PN.	NAT.		
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APPENDIX II

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FOREST PLANTATION STOCKING TABLES

		FORE	ST PLANTAT	ION STOCKIN	IG 7ABLE	5		
PLANTING DIMENSIONS	NUMBER	THEOR 17 ICAL	PL	ANTED SCEDLIN	IG ESTIMAT	г н	ATURAL SEEDL	ING ESTIMAT
IN FEET	SQUARE FELT	DF TREES/AGRE	COMPUTED TREES/ACRE	AV. CUUNT PER 4 QUADS	QUAUS PERCENT	STOCK PERCENT	COMPUTED TREES/ACRE	DIFFERENCE TREES/ACRE
7.5 BY 7.5	56.25	774.40	774.40 619.52 464.64 309.76 154.88	3.04432 2.43546 1.46127 .58451 .11690	76.10 60.88 36.53 14.61 2.92	100.00 80.00 60.00 40.00 20.00	2735.89 1790.53 711.88 197.73 100.40	1961.49 1171.01 247.24 -112.02 -54.47
7.5 BY 8.0	60.00	726.00	726.00 580.80 435.60 240.40 145.20	2.88637 2.30910 1.38546 .59418 .11083	72.15 57.72 34.63 13.85 2.77	100.00 80.00 60.00 40.00 20.00	2470.60 1620.47 650.34 187.69 99.95	1744.60 1039.67 214.74 -102.70 -45.24
7.5 BY 8.5	63.75	683.29	683.29 546.63 407.97 273.31 136.65	2.73697 2.18958 1.31374 .52549 .10509	68.42 54.73 32.84 13.13 2.62	100.00 80.00 60.00 40.00 20.00	2232.60 1467.89 595.10 178.67 99.54	1549.31 921.26 185.12 -94.64 -37.11
7.5 BY 9.0	67.50	645.33	645,33 516.26 387.19 258.13 129.06	2 • 59612 2 • 07690 1 • 24614 • 49045 • 09969	64.90 51.92 31.13 12.46 2.49	100.00 80.00 80.00 40.00 20.00	2019.72 1331.41 545.67 170.58 99.17	1374.39 815.14 158.47 -87.54 -29.89
7.5 DY 9.5	71.25	611.36	611+36 489-09 366-82 244-54 122-27	2-46382 1-97106 1-18263 -47305 -09461	61.59 49.27 29.56 11.82 2.36	100.00 80.00 60.00 40.00 20.00	1829.93 1209.72 501.59 163.37 98.84	1218.57 720.62 134.77 -81.17 -23.43
7.5 BY 10.0	75.00	580.80	580.80	2.34007	58,50	100.00	1661-33	101053

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PLANTING DIMENSIONS	NUMBER OF	THEORITICAL NUMBER	PL	ANTED SEPOLIN	G ESTIMAT	1.	NATURAL SUEDL	ING CS72DAT
IN FEET	SQUARE FECT		COMPUTED TREES/ACRE	AV. COUNT PER 4 QUADS		STOCK PERCENT	COMPUTED TREES/ACRE	DIFFERENCE TREES/ACRE
7.5 BY 10.0	75.00	580.80	464.64	1.87206	46.80	80.00	1101.59	636.95
			348.40	1.12323	28.08	60.00		113.93
			232.32	.44929	11.23	40.00		-75.37
		***********	116.16	.08985	2.24	20.00	98.54	-17.61
7.5 BY 10.5	78.75	553.14	553.14	2.22487	55.62	100.00	1512.12	958.97
			442.51	1.77990	44.49	80.00		563.39
			331.88	1.06794	26.69	60.00	427.72	95.84
			221.25	.42717	10.67	40.00		-70.00
**********			110.62	.08543	2.13	20.00	98.27	-12.35
7.5 BY 11.0	82.50	528.00	528.00	2.11822	52.95	100.00		852.63
			422.40	1.69458	42.36	80.00		499.17
			316.80	1.01674	25.4l	60.00		80.34
			211.20	.40669	10.16	40.00		-64.97
****			105.60	.08133	2.03	20.00	98.04	-7.55
7.5 BY 11.5	86.25	505.04	505.04	2.02012	50.50	100.00		760.30
			404.03	1.61610	40.40	80.00	847.61	443.58
			303.02	. 96 966	24.24	60.00	370.31	67.29
			202.01	.38786	9.69	40.00	141.01 97.83	-60.20
		****	101.00	.07757	1.93	20.00	97.83	-3.17
7.5 BY 12.0	90.00	484.00	484.00	1.93057	48.26	100.00	1164.83	680.83
			387.20	1.54446	38.61	80.00	783.13	395.93
			290.40	-92667	23.16	60.00	346.92	56.52
			193.60	.37067	9.26	40.00	137.96 97.64	-55.63
**********			96.80	.07413	1.05	20.00	97.04	•0•
8.0 BY 8.0	64.00	680.62	680.62	2.72731	68.18	100.00		1537.03
0.0 07 0.0	04.00	NBV. 02	544.50	2.18185	54.54	80.00	1458.31	913

				FORE	ST PLANTAT	LON STOCKIN	IG 7ABLE			
	AN71 EN51	NG	NUNBER	THEORITICAL		ANTED SEEDLIN	G ESTINAT	-	ATURAL SEEOL	
	IN IN FEET		SQUARE FEE7	NUMBER OF TREES/ACRE	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUADS	QUADS PERCEN7	STOCK PERCENT	COMPUTED TREES/ACRE	DIFFERENCI TREES/ACR
8.0	BY	8. 0	64.00		272.25 136.12	1.30911 .52364 .10472	13.09	40.00 20.00	178.10	-94.14 -36.60
8.0	BY	8.3	68.00	640.58	512.47 384.35 256.23	2.57799 2.06239 1.23743 .49497 .09899	51.55	100.00 80.00 60.00 40.00 20.00	1993.13 1314.36 539.50 169.57 99.12	801.89
.0	8¥	9.0	72.00	605.00	484.00	2.43839 1.95071 1.17042 .46817 .09363	60.95 48.76 29.26 11.70 2.34	100.00 80.00 60.00 20.00	1794.58 1187.04 493.37 162.02 98.78	703.04
8.0) B¥	9.5	76.00	573.15	573-15 458-52 343-89 229-26 114-63	2.30851 1.84681 1.10808 .44323 .08864	57.71 46.17 27.70 11.08 2.21	100.00 80.00 60.00 40.00 20.00	1619.71 1074.91 452.74 155.36 98.47	1046.55 616.38 108.84 -73.90 -16.16
a.0) BY	10.0	80.00	544.50		2.18837 1.75070 1.05042 .42016 .08403	54.70 43.76 26.26 10.50 2.10	100.00 80.00 60.00 40.00 20.00	1466.40 976.58 417.09 149.50 98.19	921.90 540.98 90.39 -68.29 -10.70
8.0	BY	10.5	84.00	510.57	518.57 414.85	2.07795	51.94 41.55	100.00	1332.66 890.79	814.09 475.94

		FORE	ST PLANTAT	ION STOCKIN	IG 7ABLE	5		
PL AN7 LNG	NUMBER	THEOR ITICAL	PL	ANTEO SEEDLIN	IG ESTIMAT	E N	ATURAL SEEOL	ING ESTIMA
DIMENSIONS	OF SQUARE	NUMBER		AV. COUNT	QUADS	STOCK	COMPUTEO	DIFFERENC
FEC7	FEET	TREES/ACRE	COMPUTED	PER 4 QUADS			TREES/ACRE	TREES/ACR
F 6 6 7		7REE37AGRE	TREESTAURE	PER 4 QUADS	PERCENT	PERCENT	TREESTACKE	TREES/ AGR
8.0 BY 10.5	84.00	518.57	311.14	.99742	24.93	60.00	385.98	74.84
			207.42	.39896	9.97	40.00	144.39	-63.03
		~~~~	103.71	.07979	1.99	20.00	97.95	-5.75
8.0 BY 11.0	88.00	495.00	495.00	1.97727	45.43	100.00	1216.68	721.68
0.0 07 IL.V	00.00	.473 VV	396.00	1.58181	39.54	80.00	816.40	420.40
			297.00	.94909	23.72	60.00		61.99
			198.00	.37963	9.49	40.00		-58.05
			99.00	.07592		20.00	97.74	-1.25
8.0 BY 11.5	97.00	473.47	473.47	1.88631	47.15	100.00	1116.82	643.34
0.0 07 11.5	76.00	473447	378.78	1.50904	37.72	80.00	752.33	373.54
			284.08	.90542	22.63	60.00	335.73	51.65
			189.39	.36217	9.05	40.00	136.11	-53.27
			94.69	.07243	1.81	20.00	97.56	2.86
8.0 BY 12.0	96.00	453.75	453.75	1.80507	45.12	100.00	1031.57	577.82
	,	1,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	363.00	1.44406	36.10	80.00	697.63	334.63
			272.25	.86643	21.66	60.00	315.87	43.62
			181.50	.34657	8.66	40.00	132.83	~48.66
			90.75	.06931	1.73	20.00	97.40	6.65
8.5 BY 8.5	77.78	602.90	602.90	2.42998	60.74	100.00	1782.98	1180.07
0.3 01 0.3	12.23	002.070	482.32	1.94399	48,59	80.00	1179.61	697.28
			361.74	1.16639	29.15	60.00	490.68	128.94
			241.16	.46655	11.66	40.00	161.58	-79.57
			120.58	.09331	2.33	20.00	98.75	-21.82
8.5 87 9.0	76.50	569.41	569.41	2.29296	57.32	100.00	1599.41	1030.00
			455.52	1.83437	45.85	80.00	1061.89	606.36
			341.64	1.10062	27.51	60.00	448.02	106.37

		FDRE	ST PLANTAT	ION STOCKIN	IG TABLE	5		
PLANTING	NUMBER	THEDRITICAL		ANTED SEEOLIN	G ESTIMAT		ATURAL SEEOL	ING ESTIMAT
OIMENSIONS IN FEET	OF Square Feet	OF	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUAOS	QUADS	STOCK	COMPUTED TREES/ACRE	
8.5 B¥ 9.0	76.50	569.41		.08805	2.20	20.00	154.58 98.43	
8.5 BY 9.5	80.75	539.44	431.55 323.66 215.77 107.88	2.16693 1.73354 1.04012 .41605 .08321	54.17 43.33 26.00 10.40 2.08	20+00	148.49 98.14	900.44 528.02 87.26 -67.28 -9.73
8.5 8¥ 10.0	85.00		512:47	2.05187 1.64150 .98490 .39396 .07879		100.00 80.00 60.00	1302.07 871.17 378.86 143.22 97.89	789.60 461.19 71.38 -61.76 -4.59
8.5 BY 10.5	89.25	488.06	488.06 390.45 292.84 195.22 97.61	1.94780 1.55824 .93494 .37397 .07479	48.69 38.95 23.37 9.34 1.86	80.00 60.00 40.00	1183.82 795.31 351.34 138.68 97.68	695.75 404.86 58.50 -56.53 .07
8.5 BY 11.0	93.50	465.88	465.88 372.70 279.52 186.35 93.17	1.85470 1.48376 .89026 .35610 .07122	46.36 37.09 22.25 8.90 1.78	100.00 80.00 60.00 40.00 20.00	1083.21 730.76 327.91 134.82 97.49	617.33 358.06 48.38 -51.52 4.32
8.5 BY 11.5	97.15	445.62	445.62 356.50 267.37	1.77259 1.41807 .85084	44.31 35.45 21.27	100.00 80.00 60.00	998.52 676.42 308.17	552.90 319.92 40.80

			ST PLANTAT	IDN STOCKIN	IG TABLE			
PLANTING 01MENS10NS	NUMBER	THEORITICAL NUMBER		ANTEO SEEOLIN	G ESTIMAT	E N	NATURAL SEEDLING ESTIMA	
IN FEET	SQUARE FEET	OF TREES/ACRE	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUAOS	QUADS	STOCK	COMPUTED TREES/ACRE	DIFFERENCI TREES/ACRI
0.5 BY 11.5			80.12	.34033	1.70	20.00	131.56 97.34	
8.5 BY 12.0		427.05	427.05 341.64	1.70147	42.53	100.00	631.31	289.66
			256.23 170.82 85.41	.81670 .32668 .06533	20.41 8.16 1.63	60.00 40.00	291.78 128.85 97.20	35.55 -41.96 11.79
9.0 BY 9.0	81.00	537.77	537.77		53.99	100.00	1431.20	893.42
			322.66 215.11 107.55	1 07473	25.91	60.00	408,90 148,16 98,13	86.24 -66.94 -9.42
9.0 BY 9.5	85.50	509.47		2.03906	50.97	100.00	1287.18	
			305.68 203.70	.39149	9.78	40.00	142.03	69.71 -61.13
			101.89	.07829	1.95	20.00	97.87	-4.02
9.0 BY 10.0	90-00	484.00	484.00 387.20 290.40	.92667	48.26 38.61 23.16	80.00 60.00	1164.83 783.13 346.92	395.93 56.52
			193.60 96.80	.37067 .07413	9.26 1.85	40.00	137.96	-55.63
9.0 BY 10.5	94.50	460.95	460.95	1.83440	36.68	100.00	1061.91 717.10 322.94	600.96 348.33 46.37
			276.57 184.38	.88051 .35220	22.01	40.00	134.00	-50.37

		FORE	ST PLANTAT	ION STOCKIN	IG TABLE	S		
PLANTING		THEOR ITICAL	PL	ANTEO SEEOLIN	IG ESTIMAT	E N	ATURAL SEEOL	ING ESTIMAT
OIMENSIONS IN FEE7	OF SQUARE FEE7	NUMBER OF TREES/ACRE	COMPUTEO TREES/ACRE	AV. COUNT PER 4 QUADS	QUADS PERCENT	STOCK PERCENT	COMPUTED TREES/ACRE	OIFFERENCE TREES/ACRE
9.0 87 10.5	94.50	460.95	92.19	.07044	1.76	20.00	97.45	5.26
9.0 B¥ 11.0	99.00	440.00	440.00 352.00 264.00	1.75053 1.40043 .84025	43.76 35.01 21.00	100.00 80.00 60.00	976.42 662.23 303.02	536.42
			176.00 88.00	.33610 .06722	8.40 1.68	40.00 20.00	130.71 97.29	-45.28 9.29
9.0 BY 11.5	103.50	420.86	336.69 252.52 168.34	1.67 <b>898</b> 1.34319 .80591 .32236	33.57 20.14 8.05		128.01	
9.0 BY 12.0	108.00	403.33	322.66 241.99	.06447 1.61975 1.29580 .77748 .31099	32.39	80.00 60.00	97.16 850.98 581.73 273.77 125.87	447.64
			161.33 90.66	.31099 .06219	1.55		97.06	16.39
9.5 87 9.5	90.25	482.65	482.65 386.12 289.59 193.06 96.53	1.92490 1.53992 .92395 .36958 .07391	48.12 38.49 23.09 9.23 1.84	100.00 80.00 60.00 40.00 20.00	1158.63 779.15 345.47 137.72 97.63	675.97 393.02 55.87 -55.34 1.10
9.5 BY 10.0	95.00	458.52	458.52 366.82 275.11 183.41	1.82447 1.45958 .87574 .35029		100.00 80.00 60.00 40.00	1051.59 710.47 320.54 133.60	593.06 343.65 45.42 -49.80

PLANTING	NUMBER	THEORITICAL		ANTED SEEOLIN			ATURAL SEEOL	ING ESTIMAT
OINENSIONS IN FEET	OF SQUARE FEE7	<b>TREES/ACRE</b>	COMPUTED	AV. COUNT Per 4 Quads	QUADS PERCEN7	STOCK PERCENT	7REES/ACRE	TREESTACRE
9.5 87 10.0	95.00	458.52	91.70	.07005	1.75	20.00	97.44	5.73
9.5 BY 10.5	99.75	436.69	262.01	1.73775 1.39020 .03412 .33364 .06672	20.85 8.34 1.66	60.00 40.00 20.00	963.73 654.10 300.06 130.22 97.27	304.74 38.05 -44.45 9.93
9.5 BY 11.0	104.50	416.84	333.47 250.10 166.73 83.36	1.33180 .79908 .31963 .06392	41.61 33.29 19.97 7.99 1.59	100.00 80.00 60.00 40.00 20.00	893.06 608.74 283.58 127.49 97.14	ATA 77
9.5 BY 11.5	109.25	398.71	398.71	1.60548 1.28438 .77063 .30825 .06165	40.13	100.00	837.07	439.16 254.34 31.46 -34.12 17.29
LO.O BY 10.0	100.00	435.60	435.60 345.48 261.36 174.24 87.12	1.73357 1.39696 .83211 .33284 .06656	43.33 34.67 20.80 8.32 1.66	100.00 80.00 60.00 40.00 20.00	959.60 651.44 299.10 130.06 97.26	524.00 302.96 37.74 -44.11 10.14

		FORE	ST PLANTAT	10N STOCKIN	IG TABLE			
PLANTING		THEORITICAL	PL	ANTEO SEEDLIN	IG ESTIMAT	E N	ATURAL SEEDL	ING ESTIMAT
DIMENSIONS IN FEET	OF SQUARE FEET	NUMBER OF TREES/ACRE	COMPUTED	AV. COUNT PER 4 QUAOS	QUADS PERCENT	STOCK PERCENT	COMPUTED TREES/ACRE	DIFFERENCE TREES/ACRE
10.0 BY 10.5	105.00	414.85	414.85 331.80 248.91 165.94 82.97		41.44 33.15 19.89 7.95 1.59	80.00 60.00 40.00	282.06	471.69 272.67 33.15 -38.69 14.15
10.0 BY 11.0	110.00	396.00	396.00 316.80 237.60 158.40 79.20	1.59737 1.27790 .76674 .30669 .06133	31.94 19.16	60.00 40.00	568.57 268.98	434.48 251.77 31.38 -33.32 17.82

			FURE	ST PLANTAT	10N STOCKIN	IG TABLE	S		
PLANT		NUMBER	THEORITICAL NUMBER	PL	ANTEO SEEDLIN	G ESTIMAT	E N	ATURAL SEEDL	ING ESTIMAT
DIMENS In Fee		SQUARE FEET	OF TREES/ACRE	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUADS	QUADS PERCENT	STOCK	COMPUTED TREES/ACRE	DIFFERENCE TREES/ACRE
8.0 BY	7.5	60.00	726.00	726.00	2.88637	72.15	100.00	2470.60	1744.60
		00000		580.80	2.30910	57.72	80.00	1620.47	1039.67
				435.60	1.38546	34.63	60.00		214.74
				290.40	.55418	13.85	40.00	187.69	-102.70
				145.20	.11083	2.77	20.00	99.95	-45.24
						68.42	100.00	2232.60	1549.31
8.5 BY	7.5	63.75	683.29	683-29	2.73697	54.73	80.00	1467-89	921.26
				546.63	2.18958 1.31374	32.84	60.00	595.10	185.12
				409.97 273.31	.52549	13.13	40.00	178.67	-94.64
					.10509	2.62	20.00	99.54	-37.11
			**********	136.65	.10303				
8.5 HY	. 8.0	68.00	640.58	640.58	2.57799	64.44	100.00	1993.13	1352.54
				512.47	2.06239	51.55	80.00	1314.36	801.69
				384.35	1.23743	30.93	60.00	539.50	155-14
				256.23	.49497	12.37	40.00	169.57	~86.65
				128.11	.09899	2.47	20.00	99.12	-28.98
			645.33	645.33	2.59612	64.90	100.00	2019.72	1374.39
9.0 87	7.5	67.50	092.33	516.26	2.07690	51.92		1331.41	815.14
				387.19	1.24614	31.15	60.00	545.67	158.47
				258.13	.49845	12.46	40.00	170.58	-87.54
				129.06	.09969	2.49	20.00	99.17	-29.89
						40.00	100.00	1794.58	1189.58
9.0 BY	8.0	72.00	605.00	605.00	2.43839	60-95	80.00	1187.04	703.04
				484.00	1.95071	48.75	60.00	493.37	130.37
				363.00	1.17042	11.70	40.00	162.02	- 79.97
				242.00	+46817	2.34	20.00	98.78	-22.21
				121.00	.07363				
9.0 AV	8.5	16.50	569.41	569.41	2.29296	57.32	100.00	1599.41	1030.00

			FORE	ST PLANTAT	10N STOCKIN	IG TABLE	5		
PLANT1 01MENS1		NUMBER	THEORIFICAL	PL	ANTED SEEDLIN	IG ESTIMAT	E N	ATURAL SEEDL	ING ESTIMAT
IN	0113	SQUARE	NUMBER OF	COMPUTEO	AV. COUNT	QUAOS	STOCK	COMPUTED	DIFFERENCE
FEET		FEET	TREES/ACRE	TREES/ACRE			PERCENT	TREES/ACRE	TREES/ACRE
9.0 BY	8.5	76.50	569.41	455.52	1.83437	45.85	00.00	1061.89	606.36
				341.64	1.10062	27.51	60.00	448.02	106.37
				227.76	.44025	11.00	40.00	154.58	-73.17
				113.08	-08805	2.20	20.00	98.43	-15.44
							100.00	1830 03	1218.57
9.3 BY	7.5	71.25	611.36		2.46382	61.59	100.00	1829.93 1209.72	720.62
				489.09	1.97106	49.27 29.56	80.00 60.00	501.59	134.77
				366.82 244.54	1.18263	11.82		163.37	-81.17
				122.27	.09461	2.36	20.00	98.84	-23.43
				122.27	• • • • • • • • • • • • • • • • • • • •				
9.5 BY	8.0	76.00 57	573.15	573.15	2.30851	57.71	100.00	1619.71	1046.55
				458.52	1.84681	46.17	80.00	1074.91	616.38
				343.89	1.10808	27.70	60.00	452.74	102.84
				229.26	.44323	11.08	40.00	155.36	-73.90
				114.63	.08864	2.21	20.00	98.47	-16.16
		80.75	539.44	539.44	2.16693	54.17	100.00	1439.89	900.44
963 01	0.7	00.19	337.44	431.55	1.73354	43.33	80.00	959.57	528.02
				323.66	1.04012	26.00	60.00	410.92	87.26
				215.77	.41605	10.40	40.00	148.49	-67.28
				107.88	.08321	2.08	20.00	98.14	-9.73
9.5 BY	9.0	85.50	509.47	509.47	2.03906	50.97	100.00	1287.18	777.70
				407.57	1.63124	40.78	80.00	861.62	69.71
				305.68	.97874	24.46	60.00	375.40	-61.13
				203.70	.39149	9.78 1.95	40.00	97.87	-4.02
				101.89	.07829	1.97		91.01	-4402
0.0 BY	7.5	75.00	580.80	58ú.80	2.34007	58.50	100.00	1661.33	1080.53

				FORE	ST PLANTAF	10N STOCKIN	FOREST PLANTATION STOCKING TABLES							
PLA 01ME		NG	NUMBER	THEORIFICAL NUMBER	PL	ANTEO SEEDLIN	IG ESTIMAT	E N	ATURAL SEEOL	ING ESTIMAT				
	IN EET		SQUARE FEET	OF	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUAOS	PERCENT	PERCENT						
								******	********	******				
		7.4	75 00	680 80		1.87206	46.80	80.00	1101.59	636.95				
			12.00	300.00	349.48	1.07206	28.08	60.00	462.41	113.93				
					232.32	.44929	11.23	40.00	156.94	-75.37				
					116.16	.08985		20.00	156.94 98.54	-17.61				
							84 TO	100.00	1466.40	921.90				
10.0	8 Y	6.0	80.00	544.50		2.18637 1.75070	43.76	80.00	976.58	540.98				
					435.60 326.70	1.05042	26.26		417.09	90.39				
						.42016	10.50	40.00	149.50	-68.29				
					217.80 108.90	.08403	2.10	20.00	98.19	-10.70				
			*******											
10.0	B۷	8.5	85.00	512.47		2.05187	51.29		1302.07	789.60				
						1.64150	41.03	80.00	871.17	461.19				
					307.48	.98490 .39396	24.62	60.00	378.86	71.30				
					204.98	.39396	9.84		143.22	-61.76				
					102.49	.07879	1.96	20.00	97.89	-4.59				
10.0	8 Y	9.0	90.00	484.00	484.00	1.93057	48.26	100.00	1164.83	680.83				
			,	404000	387.20	1.54446	38.61	80.00	783.13	395.93				
					290.40	.92667	23.16	60.00	346.97					
					193.60	.37067	9.20	40.00	137.96	-55.63				
					96.80	.07413	1.85	20.00	97.64	. 84				
			95.00	458.52	458.52	1.82447	45.61	100.00	1051.59	593.06				
10.0	87	4.2	93.00	428.76	366.82	1.45958		80.00	710.47	343.65				
					275.11	.87574	21.89	60.00	320.54	45.42				
					183.41	.35029	8.75	40.00	133.60	-49.80				
					91.70	.07005	1.75	20.00	97.44	5.73				
10 5	۵v	7.5	78.75	553.14	553.14	2.22487	55.62	100.00	1512.12	958.97				
10.2	DT	142	10.17	222+14	442.51	1.77990	44.49	80.00	1005.90	563.39				

		FORE	ST PLANTAT	10N STOCKIN	IG TABLE	S .		
PLANTING		THEUR1TICAL		ANTED SEEDLIN	IG ESTIMAT	e •	ATURAL SEEDI	LING ESTEMAT
DIMENSIONS IN FEET	OF SQUARE FEET	NUMBER OF TREES/ACRE	TREES/ACRE	AV. COUNT PER 4 QUADS			COMPUTED TREES/ACRE	
10.5 BY 7.	5 78.75	553.14	221.25 110.62	1.06794 .42717 .08543	10.67 2.13	40.00 20.00	151.25 98.27	
10.5 BY 8.	0 84.00	518.57	518.57 414.85 311.14 207.42 103.71	2.07795 1.66236 .99742 .39896 .07979	41.55	107.00 80.00 60.00 40.00 20.00	890.79 385.98	475.94 74.84
10.5 BY 8.	5 89.25	408.06	488.06 390.45 292.84 195.22 97.61	1.94780 1.55824 .93494 .37397 .07479	9.34	80.00 60.00 40.00	1183.82 795.31 351.34 138.68 97.68	695.15 404.86 58.50 ~56.53 .07
10.5 B¥ 9.	0 94.50	460.95	460.95 368.76 276.57 184.38 92.19	1.83440 1.46752 .88051 .35220 .07044	45.86 36.68 22.01 8.80 1.76	100.00 80.00 60.00 40.00 20.00	1061-91 717-10 322-94 134-00 97-45	600.96 348.33 46.37 -5C.37 5.26
10.5 B¥ 9.	5 99.75	436.69	436.67 349.35 262.01 174.67 87.33	1.73775 1.39020 .83412 .33364 .06672	43.44 34.75 20.85 8.34 1.66	100.00 80.00 60.00 40.00 20.00	963.73 654.10 300.06 130.22 97.27	527.04 304.74 38.05 -44.45 9.93
10.5 BY 10.	0 105.00	414.85	414.85 331.88	1.65787	41.44	100.00	886.55 604.56	471.69 272.67

		FURE	ST PLANTAT	10N STOCKIN	IG TABLE	5		
PLANTING DIMENSIONS	NUMBER	THEORITICAL NUMBER		ANTED SEEDLIN			ATURAL SEEDL	
IN FEE7	SQUARE FEET	OF	COMPUTED		QUADS	570CK	COMPUTED TREES/ACRE	DIFFERENCE
10.5 BY 10.0	105.00	414.85		.79578 .31831 .06366	19.89 7.95 1.59	60.00 40.00 20.00	282.06 127.24 97.13	33.15 -38.69 14.15
11.0 BY 7.5	82.50	528.00	528.00 422.40 316.80 211.20 105.60	2.11822 1.69458 1.01674 .40669 .08133	52.95 42.36 25.41 10.16 2.03	100.00 80.00 60.00 40.00 20.00	1380.63 921.57 397.14 146.22 98.04	852.63 499.17 80.34 -64.97 -7.55
11.0 8¥ 8.0	88.00	495.00	495-00 396-00 297-00 198-00 99-00	1.97727 1.58181 .94909 .37963 .07592	49.43 39.54 23.72 9.49 1.89	100.00 80.00 60.00 40.00 20.00	1216-68 816-40 358-99 139-94 97-74	721.68 420.40 61.99 -58.05 -1.25
11.0 BY 8.5	93.50	465.88	465.88 372.70 279.52 186.35 93.17	1.85470 1.48376 .89026 .35610 .07122	46.36 37.09 22.25 8.90 1.78	100-00 60.00 60.00 40.00 20.00	1083.21 730.76 327.91 134.82 97.49	617.33 358.06 48.38 -51.52 4.32
11.0 B¥ 9.0	99.00	440.00	440.00 352.00 264.00 176.00 88.00	1.75053 1.40043 .84025 .33610 .06722	43.76 35.01 21.00 8.40 1.68	100.00 80.00 60.00 40.00 20.00	976.42 662.23 303.02 130.71 97.29	536.42 310.23 39.02 -45.28 9.29
11.0 BY 9.5	104.50	416.84	416.84 333.47 250.10	1.66476 1.33180 .79905	41.61 33.29 19.77	100.00 80.00 60.00	893.06 608.74 283.58	476.22 275.26 33.48

PLANTIN			THEORITICAL NUMBER	PL	ANTED SEEDLIN	G ESTIMAT		ATURAL SEEDL	ING ESTIMA
IN FEET			OF	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUADS	QUADS	STOCK	COMPUTED TREES/ACRE	DIFFERENCI TREES/ACRI
11.0 BY	9.5	104.50	416.84	166.73 83.36	.31963 .06392	7.99 1.59	40.00 20.00	127.49 97.14	-39.23 13.77
II.O B¥ I	1 <b>0.</b> 0	110.00	396.00	316.80 237.60 158.40 79.20	.30669	31.94 19.16 7.66 1.53	80.00 60.00 40.00 20.00		251.77
11.5 8¥	7.5	86.25	505.04	505.04 404.03 303.02	2.02012 1.61610 .96966 .38786 .07757	50.50 40.40 24.24	100.00	97.83	
11.5 B¥	8.0	92.00		378.78 284.08 189.39 94.69	.90542 .36217	37.72 22.63 9.05 1.81	80.00 60.00 40.00 20.00	1116.82 752.33 335.73 136.11 97.56	643.34 373.54 51.65 -53.27 2.86
11.5 B¥	8.5	97.75	445.62	445.62 356.50	1.77259		100.00	998.52 676.42	

				FORE	ST PLANTAT	ION STOCKIN	G TABLE			
PLANTING DIMENSIONS		NUMBER	THEORITICAL NUMBER		ANTED SEEDLIN		NATURAL SEEDLING ESTIMAT			
	IN FEET		SQUARE FEET	OF TREES/ACRE	COMPUTED TREES/ACRE	AV. COUNT PER 4 QUADS				DIFFERENCE TREES/ACRE
11.5	B¥	8.5	97.75	445.62	178.25 89.12	.34033	8.50 1.70	40.00 20.00		-46.68 8.21
11.5	8 <b>Y</b>	9.0	103.50	420.86	420.86 336.69 252.52 168.34 84.17	1.67898 1.34319 .80591 .32236 .06447	41.97 33.57 20.14 8.05 1.61	100.00 80.00 60.00 40.00 20.00	617.43	485.73 280.73 34.22 -40.32 12.99
11.5	BY	9.5	109.25	398.71	398.71 318.97 239.23 159.48 79.74	1.60548 1.28438 .77063 .30825 .06165	40.13 32.10 19.26 7.70 1.54	100.00 80.00 60.00 40.00 20.00	573.32 270.71 125.36	439.16 254.34 31.48 34.12 17.29
12.0	BY	7.5	90.00	484.00	484.00 387.20 290.40 193.60 96.80	1.93057 1.54446 .92667 .37067 .07413	48.26 38.61 23.16 9.26 1.85	100.00 80.00 60.00 40.00 20.00	1164.83 783.13 346.92 137.96 97.64	680.83 395.93 56.52 -55.63 .84
12.0	в¥	8.0	96.00	453.75	453.75 363.00 272.25 181.50 90.75	1.80507 1.44406 .86643 .34657 .06931	45.12 36.10 21.66 8.66 1.73	100.00 80.00 60.00 40.00 20.00	697.63 315.87 132.83	577.82 334.63 43.62 ~48.66 6.65
12.0	B¥	8.5	102.00	427.05	427.05 341.64 256.23 170.82 85.41	1.70147 1.36117 .81670 .32668 .06533	42.53 34.02 20.41 8.16 1.63	100.00 80.00 60.00 40.00 20.00	631.31 291.78	501.17 289.66 35.55 -41.96 11.79

# APPENDIX III

# DERIVATION $\frac{1}{}$ of probability equations

1. The integrals of the area equations (Table III) are as follows:

$$A_{1} = 4bx - 2\left[x\sqrt{r^{2} - x^{2}} + r^{2} \sin \left(\frac{x}{r}\right)\right] \begin{vmatrix} xa \\ \frac{x}{r} \end{vmatrix} = -2\left[x\sqrt{r^{2} - x^{2}} + r^{2} \sin \left(\frac{x}{r}\right)\right]_{xc}^{-1}$$

$$A_{3} = 4\left[x\sqrt{r^{2} - x^{2}} + r^{2} \sin \left(\frac{x}{r}\right)\right]_{0}^{xj} - 8yj x \begin{vmatrix} xj \\ 0 \end{vmatrix}$$

$$A_{4} = 2\left[x\sqrt{r^{2} - x^{2}} + r^{2} \sin \left(\frac{x}{r}\right)\right] - 4yh x \begin{vmatrix} xh \\ xe \end{vmatrix}$$

2. The two curve equations for A1 (figure 3) are:

$$x^{2}a + y^{2}a = r^{2}$$
  
(xa - a)² + (ya - b)² = r²

After substituting  $y_a = \sqrt{r^2 - xa^2}$  into the second expression and substituting S for  $a^2 + b$ , xa can be expressed as:

$$\frac{aS \pm \sqrt{a^2S^2 + S (4b^2r^2 - S^2)}}{2S}$$

Points xa and xc can now be stated as:

$$xa = \frac{a}{2} - \frac{1}{2}\sqrt{a^2 + \frac{4b^2r^2}{s}} - s$$
$$xc = \frac{a}{2} + \frac{1}{2}\sqrt{a^2 + \frac{4b}{s}r^2} - s$$

Assign the following:

$$Q = \frac{1}{2}\sqrt{a^2 + \frac{4b^2r^2}{S}} - S$$

Then by substitution

$$xa = xe - Q$$
$$xc = xe + Q$$
where xe = a/2

1/Source, 6.

The following points are noted:

$$xh = \frac{1}{2}\sqrt{4r^2 - b^2}$$
$$xj = \frac{1}{2}\sqrt{4r^2 - S}$$
$$yh = b/2$$
$$yj = S/2$$

3. Assign the following:

$$F = x\sqrt{r^2 - x^2} + r^2 \sin^{-1}\left(\frac{x}{r}\right)$$

Area equation can now be stated as follows:

$$A_{1} = 4bx \begin{vmatrix} xa \\ 0 \end{vmatrix} - 2F \begin{vmatrix} xa \\ -2F \end{vmatrix} \Big|_{xe}^{xa}$$

$$A_{2} = 1/2 (\uparrow\uparrow\uparrow r^{2} - A_{1} - 3A_{3} - 4A_{4})$$

$$A_{3} = 4F \begin{vmatrix} xj \\ 0 \end{vmatrix} - 4yj x \begin{vmatrix} xj \\ 0 \end{vmatrix} - 2A_{4}$$

$$A_{4} = 2F \begin{vmatrix} xh \\ xe \end{vmatrix} - 4yh x \begin{vmatrix} xh \\ xe \end{vmatrix}$$

# FOREST PLANTATION PROBABILITY GENERATOR PROGRAM

ORTRAN IV G I	EVEL	1, MOD 1	MAIN	DATE = 6	P149	15/42/05		PAGE ON
		VARTABLE	NALTS PLANTATIO	IN SURVEY PLOT PR	OBABILITY	GENERATOR		
		PRAD FACT1	ADIUS OF ROUND 4 X PLOT RADIUS					
		FACTZ	PLOT RADIUS SQU					
		PIAG	DIAGONAL + 15 S	RT. DF FACTI				
		FACT3	MAXEMUM DEAGONAL	DE PLANTING SPA	CING			
		*-******						
001		COMMON PRAD						
0002		JOUNT=0 KOUNT=0						
		READ PARAMETE						
	909			INC.JLT1.JLT2.JLT	17			
	i	FORMATI6(151)						
006		1F(J1A112000.	2000,9999					
	C	OTAT IS FIRST	PLANTING DIMENS					
	<u> </u>	DIA2 15 SECON	D PLANTING DIMEN	S10N				
		DIAC IS PLAN	TING OTMENSION 1	NCREMENT			· *	
		PLT1 15 STAR PLT2 15 STOP	TING PLOT SIZE PING PLOT SIZE		a and a			
			RADEUS INCREMEN	•				
	9999	WRITFIG. LOORI						
008		WRITE16.10101						
009		KOUNT=2						
			******************					
1010 1011		00 1200 L1M=J PR&0+L1M	LT1.JLT2.JLT1C					
012		PRACE PPAC/100						
	č		******************		······································			
013	•	00 1200 LL1M=	JIA1.JTA2.JINC					
014		KK≖LL <b>I</b> M						
015		KKK=JIA2						
	C .							
016		00 1200 LLLIM						
017	,	1F I JOUNT-950 JOUNT-JOUNT+1						
019	·	A=LLIM						
020		B=LLLIM						
071		A=4/100.						
022		B=8/100.	ur finan da Tairir	TINCORPECT OT IEN	7120			
0 2 3	6	IFIA-PRADI6.5		I INCOMPTCE OF TH	- 5 Min 1			
	5	1F(R-PRA016.8						
	6	WR1TE16,10001						
026		WR1TE(6,7)A.B	. PRAD					
027	7	FORMAT(*0*+2H	A= . F7.7.2X.2HB= .	F7.2.31HA AND -	UST RF FOL	110 CTP 1P		
ORTRAN IV G	LEVFL	1, MOD 1	MAIN	OATE =	58149	15/42/05		PAGE 00
		1AN. 28. F7.23						2
0028		KOUNT=KOUNT+	3					
0029		IFIKOUNT-50)	1200.71.71					
06.00	71	WRITELS.LOOB	}					
0031		WRITE16.1010	1					
0032		KOUNT=2						
0033	A	GO TO 1203 5=4+4 + 8+8						
		SRT=SQRT(S)						
			AO+PRAO1					
0035								
nn 15 nn 16 nn 17		FACT2*PRAC+P	K AO					
0035 0036 0037 0038		FACT2+PRAC+P FACT3=2+PRAC						
0035 0036 0037 0038 0039		FACT2+PRA0+P FACT3+2+PRA0 1FLSRT-FACT3	111.11.9					
0035 0036 0037 0038 0039 0040	9	FACT2*PRA0*P FACT3=2*PRA0 1FLSRT~FACT3 WRITE16,1000	111.11.9 )					
0035 0036 0037 0038 0039 0040 0041		FACT2*PRA0*P FACT3=2*PRA0 1FUSRT~FACT3 WRITE(6,1000 WRITE(6,911A	111.11.9 ) .B.PRAD	.FR.6.2X.17HP1 0	r radius=•F	R.41		
0035 0036 0037 0038 0039 0040 0041 0042	9 91	FACT2=PRA0+P JACT3=2+PRA0 1FUSRT-FACT3 WRITF16,1000 WRITF16,911A FCRMAT1**3 WRITF16,1015	111.11.9 3 .8.PRAO HA= .F8.4.2x.3HD: R1.FAET3	• .F.R. 4 . 2X . 1 2HP1 ()				
0035 0036 0037 0038 0039 0040 0041 0042 0043		FACT2+PRA0+P JACT3+24PRA0 JFUSRT-FACT3 WRITF16.1000 WRITF16.91JA FORMAT(1 * .3 WRITF16.101S FORMAT(1 * .1	111.11.9 .B.PRAO HA= .F8.4.2x.3HD RT.FAET3 OHD1AGONAL =.F8.4	• .F.A.4.2X.17HP10				
0035 0036 0037 0038 0039 0040 0041 0041 0042 0043 0045	91	FACT2*PRAG*P JACT3*2*PRAG 1ELSRT-FACT3 WRITF(6,1000 WRITE(6,911A F(RMAT(**,3 WRITF(6,101S F(RMAT(**,1 KOUNT*KOUNT*	111.11.9 ) +P+PRAO HA= .F8.4.2X.3H0+ RT.FACT3 OHO1AGONAL =.F8.4 4					
0035 0036 0037 0038 0039 0040 0041 0042 0043 0044 0045 0046	91 10	FACT2=PRAG=P JACT3=2#PRAG IF(SRT=FACT3 WRITE[6,91]A F(IRMAT[**,3 WRITE[6,01]S F(IRMAT[**,1 R)UNT=KOUNT= IF(KOUNT=50]	111,11,9 } ,B,PRAO HA= ,F8,4,2X,3HD RT,FACT3 OHD1AGONAL =.F8,4 4 1200,101,101					
0035 0036 0037 0039 0040 0041 0042 0043 0044 0045 0045 0045	91	FACT2*PRAG*P JACT3*2*PRAG 1F(SRT-FACT3 WRITE(6,1000 WRITE(6,91)A F(RMAT(**,3 WRITE(6,1015 F(RMAT(**,1 KOUNT*KOUNT* IF(KOUNT*SG) WRITF(6,1008	111.11,9 3 «B.PRAO HA* «F8.4.2%,3HB HAT.FACT3 OHDIAGONAL =«F8.4 4 1200,101,101 3					
0035 0037 0037 0038 0040 0040 0042 0043 0045 0045 0045 0047 0047	91 10	FACT2= DRAOPP JACT3=2+PRAO IFISRT-FACT3 WRITE16,1000 WRITE16,911A FORMAT1**3 WRITE16,1015 FORMAT1**3 WRITE16,1015 WRITE16,1010	111.11,9 3 «B.PRAO HA* «F8.4.2%,3HB HAT.FACT3 OHDIAGONAL =«F8.4 4 1200,101,101 3					
0035 0037 0037 0038 0049 0041 0042 0042 0043 0044 0045 0045 0045 0047 0047 0048	91 10	FACT2+ DRAO+P JACT3+2+PRAO JFISRT-FACT3 WRITEF6,1000 WRITEF6,911A FORMATI**,3 WRITF16,101S FORMATI**,1 KOUNT-KOUNT+ JFIKOUNT-S0 WRITF16,1010 WRITF16,1010 KOUNT-2	111.11,9 3 «B.PRAO HA* «F8.4.2%,3HB HAT.FACT3 OHDIAGONAL =«F8.4 4 1200,101,101 3					
0035 0037 0037 0039 0040 0040 0041 0042 0043 0044 0045 0047 0047 0047	91 10 101	FACT2-PPRAO=P IACT3-20PRAO IF(SRT-FACT3 WEITF(A.1000 WRITF(A.6)1A FORMATI**. KOUNT*KOIWT+ IF(KOUWT*0 KOUNT*C6.1010 KOUNT*2 GO TO 1200	111.11,9 3 «B.PRAO HA* «F8.4.2%,3HB HAT.FACT3 OHDIAGONAL =«F8.4 4 1200,101,101 3				•	
0035 0036 0037 0038 0039 0040 0041 0042 0043 0043 0045	91 10	FACT2-2PRA0EP 14CT3-2PPRA0 1FISRT-FACT3 WRITFI6.100 WRITFI6.1015 FORMATI''' KOUNT+KOINT- 1FIKOUNT-9 WRITFI6.1010 WRITFI6.1010 KOUNT-2 GO TO 1200 XF-,54A Q-,54SORTIA*	111.11,9 3 «B.PRAO HA* «F8.4.2%,3HB HAT.FACT3 OHDIAGONAL =«F8.4 4 1200,101,101 3	.15HMUST NOT FXC			· .	
0035 0037 0037 0037 0047 0040 0041 0042 0043 0044 0044 0044 0044 0046 0047 0047 0047	91 10 101	FACT2=DRA0=P JACT3=2+PRA0 IFISRT-FACT3 WRITE(6,1010 WRITE(6,911A F(RMAT1' *,1 K0UNT-K0UNT+ IFIK0UNT-S0 WRITF(6,1010 WRITF(6,1010 K0UNT+2 GO TO 1200 XF=,54A	111.11.9 ) .B.PRAO HA* .F8.4.2x.3HD RT.FACT3 OHNIAGONAL =.F8.4 4 1200.101.101 ]	.15HMUST NOT FXC				

0001 11 01-01-01 0072 12 0-,5%50RT(A*A + FACT1+R*R/S - S1 0031 XA*K--0 0055 13 XH-,5%50RT(FACT1-R*R] 0056 14 XJ-,5%50RT(FACT1-S) 0057 15 A1-4,0%1%XA - 2,0%(AFFA(X,A))-AFFA(X,A)] 2-2,0%(AFFA(PRA),A,1-AFFA(X,A)] - 2,0%R*(Y+XF) 0058 16 A4+2,0%(AFFA(Y,A),A)-AFFA(X,A)] 0058 16 A4+2,0%(AFFA(Y,A),A)-AFFA(X,A)] 0059 17 A3-4,0%(AFFA(Y,A),A)-AFFA(X,A)] 0059 17 A3-4,0%(AFFA(Y,A),A)-AFFA(X,A)] 0050 17 A3-4,0%(AFFA(Y,A),A)-AFFA(Y,A)] 0050 17 A3-4,0%(AFFA(Y,A),A)-AFFA(Y,A)] 0051 18 A4+2,0%(AFFA(Y,A),A)-AFFA(Y,A) 0061 19 T07+A]+A7+A3+A4 0062 20 AF-A4 0063 FR=(AB-T07)*(00,0/AF C R1+4,AFFA(T)A 0064 R1+A1/T0T 0065 R2+A7/T0T 0066 R3+A37/T0T 0067 R4+A4/T0T 0067 C P0(NTS X PR0BANLLITIFS 0064 0 PXP1+R1 0070 PXP2+2,4%2 0071 PXP3+3,4%3

FORTPAN	IV G	LFVFL	1, 400 1	MAIN	DATE = 68149	15/42/05	PAGE 000
0012		· •	PXP4=4.+R4	• ••• • • •			
0.013			SUMP=PXP1+PXP2	• P X P 3 + P X P 4			
0014			AVPCT+SUMP/4.				
		C	PRINT OUT SECTI	INN			
0015			WRITE(6.1000)				
0016		1000	FORMATLY				
1100			WRITF(6,1001)PR				
0018		1001			LX.F6.2.2X.74HPLANTING	DIMENSIONS AR	
			1F .7¥.F6.2.1X.2				
0019			KOUNT=KOUNT+2				
0050			WRITF16,10021				
ODAL		1002		TS TOTAL ANEA	PROBABILITY PTS X PR	OBARTITY PO	
			IOBABILITY PCT.I		PRODADILITY PIS & PR	UNANILITY PR	
0087			J#1	,			
0081			WRITE(6,1004)J				
0084		1004					
0085		1004		3X;F11,5;2X;F9;6	, HX, FLO, 61		
0085			J=2				
0046			WRITE(6,1004)J	AZ+KZ+PXP7			,
0088			J=1				
			WR1TF16,1004)J	A3,83, PXP3			
0089			J=4				
0090			WR1TF16,1004)J,				•
0091				TT+TOTR+SUMP+AVPO			
0092		1006		)TAL,F11,5,2X,F9.	6.8X,F10.6.8X,F11.61		
0093			WRITE(6,1000)				
0094			KOUNT=KOUNT+EO				
		C,					
0095			IFEKOUNT-501120	00,1007,1007			
0096		1001	WRITE(6,1008)				
0097		1008	FORMATI'1',9X,4	AHREPRODUCTION	SURVEY PLOT PROBABILITY	GENERATORI	
0098			WRITE16,1010)				
0099		1010	FORMATE! !.9X.4	6H**********	*********************	*********	
0100			KOUNT # 7				
0101		1200	CONTINUE		· -		
0102		3000	P66 01 00				
0103			WRITEL6.2002)	1. A.M. A.			
0104				***END OF JOA***	r		
0105			STOP		•		
0106			END				

0001 0002 0003 0004 0005 0006 0001	100	COMMON PRAD RSQ=PRAD*PRAD IF(X)2+1,2 AREA=0,0	FÜNCTION A	RFA [X,A]	 	19 C. <b>6 6</b> (1997) - <b>199</b> 7) - 1997)	 
0009 0010	2 3	RFTIIRN Z=X/PPAO ARFA=X*SQRT[R] RFTIIRN END	50-X+X   +RSO+		2)+2.		

# APPENDIX V

# EXAMPLE COMPUTER OUTPUT - FOREST PLANTATION PROBABILITY GENERATOR PROGRAM

Г

PLOT	RADIUS IS	7.45 PLANTI	ING DIMENSIONS ARE	9.00 BY	8.50
PTS	TOTAL AREA	PROBABILITY	PTS X PROBABILITY	PROBABILITY	PCT.
1	2.43579	0.035820	0.035820		
2	34.53426	0.507857	1.015713		
3	21.25786	0.317616	0.937847		
4	9.77208	0.143707	0.574828		
TOTAL	67.9999R	1.000000	2.564207	0.641	052
 PĹ O T	RADIUS IS	7.45 PLANT 1	NG DIMENSIONS ARE	8.00 PY	
				-	
PTS	TOTAL AREA	PROPABILITY	PTS X PROBABILITY	PROBABILITY	PC1.
t	3.77838	0.052478	0.052478		
2	41.81964	0.580829	1.161656		
3	18.65927	0.259157	0.777470		
4	7.74268	0.107537	0.430149		
TOTAL	71.99997	1.000000	2.421751	0.605	438
PLOT	RADIUS IS	7.45 PLANT!	NG DIMENSIONS ARE	8.00 BY	9.50
PTS	TOTAL ARFA	PROBABILITY	PTS X PROBABILITY		
t	5.34380	0.070313	0.070313	1 KOMOLETTY	FC1.
ż	48.94898	0.642750	1.285500		
3	15.90428	0.209767	0.627801		
i.	5.90289	0.077670	0.310679		
	3.70201	0.011810	0.310074	· · · · · · · ·	
TOTAL	75.99995	1.000000	2.294291	0.573	573
PLOT	RADIUS IS	7.45 PLANTI	NG DIMENSIONS APE	8.00 BY	10.00
PTS	TOTAL APPA	PROBABILITY	PTS X PROBABILITY	PROBABILITY	PCT
1	7.21431	0.090179	0.090179		
ż	55.47549	0.693443	1.386886		
3	13.04015	0.163002	0.489005		
4	4.27011	0.053376	0.213505		• -
τηταί	80.00006	1.000000	2.179573	0.544	993
					1

	RADIUS IS	7.45 PLANT	ING DIMENSIONS ARE	8.50 BY	9.5
PTS	TOTAL AREA	PROBABILITY	PTS X PROBABILITY		PCT
1	4.64363		0.064272	The second se	••••
2	40.91525	0.566302	1.132603		
3		0.261207	0.783620		
4	7.91889	0.108220	0.4328P0		
TOTAL	77.24994	1.00000	2.413372	0.603	343
PLOT	RADIUS IS	7.45 PLANTI	ING DIMENSIONS ARE	8.50 BY	9.0
PTS	TOTAL AREA				•
1	7.01027		PTS X PROBABILITY	PROBABILITY	PUT
2	47.15295		0.091637		
ĩ	16.29735		1.232756		
	6.03949		0.639111		
•	0.03444	0.013741	0.315790		
TOTAL	76.50006	1.000000	2.279292	0.56 7	823
PLOT	RADIUS IS	7.45 PLANTI	NG DIMENSIONS ARE	8.50 BY	9.5
PTS		PROBABILITY	PTS X PROBABILITY	PROBABILITY	PCT.
1		0.119062	0.119062		
2	53.10518		1.315297		
3		0.168185	0.504554		
4	4.44971	0.055105	0.220419		
TOTAL	80.75006	1.000000	2.159379	0.5398	332
PLOT	RADIUS IS	7.45 PLANTI	NG DIMENSIONS ARE	8.50 BY 1	0.00
PTS	TOTAL AREA	PROBABILITY	PTS X PROBABILITY	PROBABLE FTY	PCT
1	12.54379	0.147574	0.147574		
-	58.61328	0.689568	1 379135		
2	10.77605	0.126777	0.380331		
2. 3	3.06693	0.036081	0.144326		
-	3+00043				

	R *	EPROD *****	UCTION	SURVFY *****	PL 01	PRJBA	8]L ***	Ι T Y ****	GFNER *****	ATC?	
<u> </u>	7.00	8=	7.00A	AND B		AE E 0				·	
						BE EUL	<u></u>		THAN	7.4	4 <u>5</u> 
A=	7.00	<u>R=</u>	7.504	AND B	UST	RE FOL	0 P	GTR	THAN	7.4	•5
A=	7.00	B=	3.00A	AND B	UST	BE EQL	OR	GTR	THAN	-ī.	5
A =	7.00	<u>B=</u>	8.50A	ANO B	UST	BE EOL	DR	GTR	THAN	7.4	5
A =	7.00	B=	9.074	ANO B	UST.	BEEOL	ŌP	GT₽	THAN	7.4	•5
A=	7.00	<u>8=</u>	9.50A	AND B	UST	BE EOL	DR	GTR	THAN	7.4	.5
A= .	7.00	<del>8</del> = 1	10.00Å	AND B .	UST	 BF EQL	08	GTR	THAN	7.4	
PĒOT	RADIUS	5 15	7.45	PLANT	ING	DIMENSI	ONS	ARE	·	7.50 BY	7.50
PTS	TOTAL	ARF	PROB	ABILITY	DT	C V OP			v	00 4 8 8 4 7	TY PCT.
1		0071		00128			0001		1	UBABILI	IT PUL.
- <u>1</u>		31554		01171			023				
3	27.	97595	5 0.4	97362			920				
4	16.	95000	0.3	01340		1.2	2053	60			
TOT AL	56.	24870	1.0	02000		3.0	)999	14		0.7	74978
PLOT	RADIUS	15	7.45	PLANT	ING	OIMENSI	ONS	ARE		7.50 BY	8.00
PTS	TOTAL			ABILITY	PT	S X PRO	BAB	ILIT	Y PP	OBABILI	TY PCT.
1		12364		02061			020				· · · · · · ·
2		72252		28712			574				
3		81566		30265			907				
4 -	. 14.	33763	0.2	38963	-	. 0.9	2559	151			
OTAL	59.	99944	1.0	0000		2.9	061	29		n.7	25532
PL 0T	RÁDIUS	15	7.45	PLANT	ING	OTMENSI		ARF		7.50 BY	8.50
PTS	T DT AL	ARFA	PPOB	ABILITY	PT	S X PRE	BAR	1111	Y PP	OBABILI	TY PCT.
1		31359		04919			049				
2		14061	0.4	41 422		0.8	828	45			
3		41124		57236			017				
4	11.	88441	0.1	36423		0.7	455	90			
INTAL	63.	74985	1.0	00000			351			· .	83790

	RADIUS IS	7.45 PLANTING DIMENSIONS ARE	7.50 BY 9.0
PTS	TOTAL AREA	PROBABILITY PTS X PROBABILITY	PROBABILITY PCT
1	0.64640	0.009576 D.009576	Condicing PCI
2	36,44640	0.539946 1.079891	
3	20.30232	0.308182 0.924546	
4	9.60501	0.142296 0.569185	
TOTAL	67.50012	1.000000 2.583197	0.645799
 PLOT	RADIUS IS	7.45 PLANTING DIMENSIONS ARE	
	-	and the state of t	7.50 BY 9.5
PTS	TOTAL AREA	PROBABILITY PTS X PROBABILITY	PROBABILITY PCT.
1	1.19330	0.016748 0.016748	
2	44.51236	0.624735 1.249470	
3	18.02908	0.253040 0.759120	
4	7.51523	0.105477 0.421908	
TOT AL	71.24997	1.000000 2.447244	0.611811
PLOT	RADIUS IS	7.45 PLANTING OIMENSIONS ARE	7.50 BY 10.00
PTS	TOTAL AREA	PROBABILITY PTS X PROBABILITY	PROBABILITY PCT.
1	2.03242	0.027099 0.027099	
2	52.20143	0.696019 1.392037	
3	15.13371	0.201783 0.605348	
4	5.63245	0.075039 0.300397	
OTAL	75.00000	1.000000 2.324881	0.581220
	RADIUS IS	7.45 PLANTING DIMENSIONS ARE	8.00 BY 9.00
LOT	RADIUS IS		
LOT	TOTAL AREA	PROBABILITY PTS & PROBABILITY	
PLOT PTS	TOTAL AREA 1.24162	PROBABILITY PTS X PROBABILITY 0.019400 0.019400	
PLOT PTS	TOTAL AREA 1.24162 27.12627	PROBABILITY         PTS         X         PROBABILITY         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.019400         0.0194000	
PLOT PLOT PTS 1 2	TOTAL AREA 1.24162	PROBABILITY PTS X PROBABILITY 0.019400 0.019400	

#### APPENDIX VI

# PROPOSED STOCKING SURVEY SYSTEM FIELD INSTRUCTIONS

In order to maintain a more accurate plantation inventory, a survey system was developed utilizing a data analysis based on a sequential sampling. The field survey employs a four-milacre (7.45-foot radius) circular plot that is divided into milacre quadrants. The plots are spaced at one chain intervals along a paced line and the normal survey intensity is two lines per forty-acre subdivision; however, provisions were made in the computer program to process as many as eight lines.

This survey system is designed to enable the field data to be readily analyzed by an I.B.M. Computer System. The field cards are designed to be easily read by the key punch operator and to facilitate the transfer of data to I.B.M. punch cards. In order to eliminate punch errors, the survey personnel must carefully fill out the field forms using the rules and instructions itemized in the General Rules, Stocking Survey Card Heading Instructions and Stocking Survey Card Plot Information.

#### General Rules

- 1. All numbered spaces must be filled in with either a number or letter. Zeros should be used to fill in spaces in front of one or two-digit numbers used in a multiple space blank. An example of this would be the number 1 should be written as 01 to fill in two spaces or 001 to fill in three spaces.
- In each 40-acre subdivision the north south survey lines will be numbered from 1 to 4 starting at the northwest corner and moving to the east. The east - west lines are numbered from 5 to 8 starting at the northwest corner and numbering to the south. See Diagram B (Figure 8).

OCT. 1964         F-3-6           STATE OF OREGON         PAGE           DEPARTMENT OF FORESTRY         PAGES           STOCKING SURVEY CARD           PROJ. (1-3)	INI-20 OREGON STATE BOARD OF FORESTRY REFORESTATION SURVEY PLAT TWP	
LINE NO. (23-24)	MERIDIAN BY PLOT LINE	13 14 15 16
PHOTO NO. TYPE AGE DATE CREW CHIEF		
PLOT NATL PLANT SPECIES PLOT NATL PLANT SPECIES		
NO. STOCK STOCK. O H NO. STOCK STOCK. O H		DIAGRAM "I" - 0. Linna per 40
122-3:22 III		() - 40 Bunker (HSigBit)
29-31 III III		16 J - Live Huder
	│	
49-50 5354 5758	╴┃ _╴ ┣ <del>╸╪┈┧┈┧╶┨╶╋╌┫╸┥╸┥╺┥╸┥╸┥╸┥╸┥╸┥╸┥╸┥╸┥</del>	
·····································		Line - Line
四777 所777 69 - 70 37 77 7778 69 - 70 778 69 - 70 778 60 - 70 778 70 - 70 778 70 778 7		Busters
田路 第33     国語 第33		(16) (19 - 40 Rucher (MARA) X - Pice Sometim
		e nare; nare:
		PLAT # 20 3PLT#20
61 62 65 66	╵┃╘┼┼┼┼┼┼┼┼┼┼┼┼┼┼	L-1-10 X ANY 10
59-60 84 86 59-60 84 86 1	REMARKS	
69-70 73 4 77 79 69-70 73 1 77 78		
INPUT CARD CODE (80) 1		
REMARKS		
	STATE MONTHING BUTT.	

# Figure 8. Field survey cards.

- 3. The normal survey of two lines per 40-acre subdivision will use numbers 1 and 2 for the north - south lines or 5 and 6 for east - west lines. See Diagram C (Figure 8).
- 4. Forties will be numbered consecutively starting at the NE½NE½ as number 1 then across the section to number 4 (NW½NW½) continuing down and across the section through all forties to number 16 (SE½SE½). See Diagram A (Figure 8).
- 5. All lines will originate at the north or west edge of the area to be surveyed; therefore, plot number 1 for each line will also be at the north or west edge of the survey area or 40-acre subdivision. See Diagram C (Figure 8).
- 6. A map sheet (Form F-6-7) will be used for each 40-acre subdivision surveyed. In addition a stocking survey card Form F-5-6 (Figure 8) will be used for each line in the 40-acre subdivision. A normal survey (two lines per 40) would consist of one Form 629-F-6-7 and two F-5-6 forms.
- When surveying irregular areas, be sure to record all known information about the area location such as township, range, section and the true bearing of the plot line. Use the numbers 17 - 99 for the forty number (21-22).

#### Stocking Survey Card Heading Instructions

- 1. Page: To be filled out in the office after completion of each project.
- 2. Proj. (1-3): The forester in charge of surveys will assign a project number to each project. The field personnel must fill in the spaces (1 to 3) with the proper number. Example: number 15 would be written as 015 in order to fill all spaces.
- 3. Co. (4-5): Leave blank.
- 4. Twp. (6-8): Township examples are: T1N would be O1N; T21S would be 21S. Complete in the field.
- 5. Rge. (9-11): Range blank would be completed in the same manner as Twp.
- 6. Pl. Sp. (13-18): Planting spacing. Spacing will be determined and written in by office personnel. Spacing dimensions are obtained by using the actual trees per acre planted and matching the spacing measurements to fit the trees per acre actually planted. All measurements are written to the nearest tenth of a foot. Examples: 681 trees per acre would be 08.0 by 08.0 ft. 363 trees per acre could be written as 10.0 by 12.0 ft.

- Sec. No. (19-20): Section number to be completed by field personnel. Example: Sections 1 to 9 would be written 01 or 09; all other section numbers utilize both spaces in the blank.
- 8. Forty No. (21-22): To be completed by field personnel. Numbers are assigned to each forty as per Diagram A. Example: 40-acre subdivision number 4 is the NW4NW4 and would be written as 04 to fill both spaces in the blank.
- 9. Line No. (23-24): Line number is predetermined by the system described in General Rules Diagram B and C. Both spaces in the blank must be filled in by field personnel. Example: line 2 would be written as 02.
- Bearing (25-28): Bearing is the true bearing of the line recorded in the usual form except that with single digit bearings a zero will precede the digit. Example: N8E would be N08E. To be filled in by field personnel.
- 11. Photo No.: This space can be filled in either by office or field personnel whenever photos are available.
- 12. Type: Use inventory type designation such as D1, S1 or NF1. Example: D1 would be Douglas fir reproduction 0" to 5" D.B.H. This space to be completed in the office.
- 13. Age: The date the plantation was established is to be recorded in this space. Example: a plantation that was established in the 1961-62 season would be 1962. This space to be completed in the office.
- 14. Date: Date the survey line is run. Field personnel.
- 15. Crew Chief: Name of the person who is actually running the survey line.

#### Stocking Survey Card Plot Information

- Plot numbers will be recorded using both blank spaces provided; single digit numbers will be preceded by a zero. Example: plot number 6 will be recorded as 06.
- 2. Pencil marks for stocking must remain inside the quadrant boxes. Use an "X" mark to indicate a stocked quadrant. Record natural or planted stocking and species. If there is both natural and planted trees in the same quadrant, mark both on the card.
- 3. Plots that are located in roads, rock outcrops or other nonplanted areas should not be recorded. A number should be assigned but not written in; therefore, only marks should be a dash in the species column and be used to keep count of the plots and distance paced along the line.

- 4. Non-stocked plots should be numbered and a line drawn through the species column to indicate no stocking present and that the plot has been completed.
- 5. Forty Summary (79)

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To be marked (x) if a forty summary is to be included in the I.B.M. report.

6. Input Card Code (80)

Machine code information.

7. Remarks: Space for comments about survey or area such as animal damage, brush encroachment, etc.