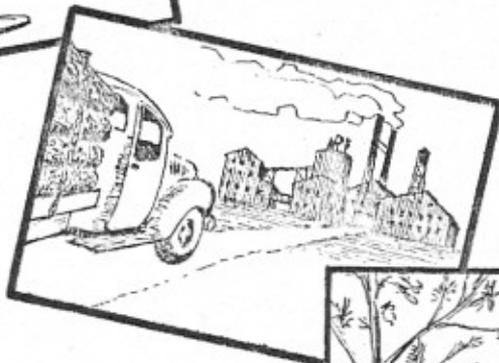
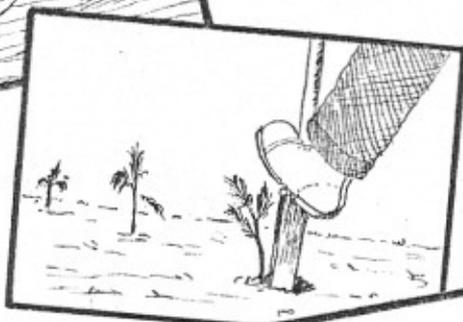
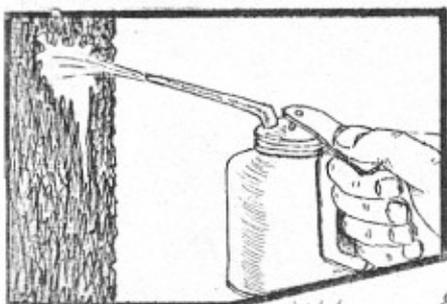


SAVE

14,4437

# VIRGINIA'S 1958 PINE SEED TREE

## REPRODUCTION SURVEY



Virginia Division of Forestry  
Department of Conservation & Economic Development  
Charlottesville, Virginia

### Acknowledgments

The Virginia Division of Forestry wishes to thank members of the Southeastern Forest Experiment Station, United States Forest Service for their valuable assistance in helping formulate the sampling methods used in the survey and in the interpretation of the data.

Special thanks are due to T. C. Evans, P. C. Guilkey, G. F. Gruschow, and G. P. Haney of the United States Forest Service, Southeastern Forest Experiment Station, for their contributions and help in the survey.

## VIRGINIA'S 1958 PINE SEED TREE REPRODUCTION SURVEY

### Foreword

Virginia's first pine seed tree act was passed in 1940. The 1940 Pine Seed Tree Act required that three 10-inch seed trees be left per acre, or lacking these, that four nine-inch trees be left instead. The 1940 Act also provided that pines left for seed purposes had to be left uncut for at least ten years.

In more recent years, Virginia's Pine Seed Tree Act has undergone some revisions but the substance of the Act has remained unchanged. The present day Seed Tree Act still requires that a specified minimum number of seed trees of a certain size be left for seeding purposes and that these seed trees must be left uncut for at least ten years.

To date, in Virginia, no one has published information regarding the kind and number of tree reproduction which has resulted on cut-over tracts where seed trees have been left as required by the Pine Seed Tree Act. The report, which follows, furnishes information regarding the relative effectiveness of the Pine Seed Tree Act over a span of years and also to describe the method used to obtain this information.

### Purpose of the Survey

The main purpose of the Pine Seed Tree Reproduction Survey was to provide information, based on unbiased sampling methods, concerning the kind and amount of tree reproduction which has resulted on: 1. tracts cut-over leaving seed trees as required by the Pine Seed Tree Act, and 2. tracts cut-over leaving an insufficient number of seed trees to satisfy the requirements of the Pine Seed Tree Act.

### Participants in the Survey

The Virginia Division of Forestry sponsored and provided the personnel necessary for the field work.

In formulating the sampling method used in the Survey and in interpreting the results of the Survey the Southeastern Forest Experiment Station, United States Forest Service, cooperated and furnished valuable assistance.

### Counties Included in the Survey

A total of twelve counties were included in the Survey. Of the twelve counties, five are Piedmont and seven are Coastal Plain

counties. The twelve counties included in the Survey were:

Piedmont

Amelia  
Fluvanna  
Halifax  
Louisa  
Lunenburg

Coastal Plain

Accomack  
Dinwiddie  
Gloucester  
Greensville  
Hanover  
Isle of Wight  
Westmoreland

Two Types of Cuttings Recognized

Two different types of cut-over tracts (cuttings) were recognized for survey purposes: 1. "Compliance" cuttings--those tracts cut leaving seed trees in accordance with minimum requirements as required by the Seed Tree Act, and 2. "Violation" cuttings--those tracts cut-over in violation of the Pine Seed Tree Act and on which an insufficient number of seed trees were left to satisfy the requirements of the Seed Tree Act.

Only Recent Cuttings Surveyed

In order to be eligible for survey purposes the cut-over tracts had to be cut-over during the period beginning July 1, 1950 and ending December 31, 1955. A total of six different cutting or "seed" years are included in this period.

Cuttings made since December 31, 1955 were not included in the survey because it was felt that at least three years time should elapse following cutting activities on a tract to allow ample time for pine reproduction to appear and become established.

Size Cuttings Included in Survey

To qualify, a "compliance" cutting had to contain at least twelve acres in a single block. This twelve acre acreage minimum was placed so that a specified minimum number of regularly spaced reproduction plots could be taken on the tract.

A "violation" cutting had to contain at least four acres in a single block in order to be considered for survey purposes. A lower minimum acreage size restriction proved necessary with respect to "violation" cuttings so that a larger number of these "violation" cuttings could be surveyed.

### Isolation Zone Provided

In order to prevent a pine seed source from outside the cutting area surveyed influencing the results obtained in the reproduction count an isolation zone, where needed, was provided.

This isolation zone was at least 132 feet in width and was used, when necessary, with both "compliance" and "violation" cuttings.

### Cutting Year Defined

For purposes of definition the cutting years were placed on a fiscal year basis beginning July 1 on one year and ending June 30 the following year. The only exception to this was the cutting year 1955-5 which began July 1, 1955 and ended December 31, 1955.

### Number of Cuttings Surveyed

Within the twelve survey counties a total of 72 cut-over tracts were surveyed in the "compliance" group and a total of 30 cut-over tracts surveyed in the "violation" group. The 30 cuttings surveyed in the "violation" group represents the entire listing of qualified "violations" which could be found.

Listings of the number of tracts surveyed in the "compliance" and "violation" groups by cutting year and county follow.

"Compliance"

(Cutting Year)

County	1950-1	1951-2	1952-3	1953-4	1954-5	1955-5	Totals
<u>Piedmont</u>							
Amelia	4		1				5
Fluvanna	1			2	1		4
Halifax		1	1	1			3
Louisa	4	3	1	3	1	1	13
Lunenburg			1				1
Totals	9	4	4	6	2	1	26
<u>Coastal Plain</u>							
Accomack		1			1		2
Dinwiddie	1	1	2	1	1	1	7
Gloucester	1	1	1	2	1	1	7
Greensville		1		2	1		4
Hanover	1	3	3		5	1	13
Isle of Wight	2	2	2	2	1	1	10
Westmoreland	1		1	1			3
Totals	6	9	9	8	10	4	46
Grand Totals	15	13	13	14	12	5	72

"Violations"

(Cutting Year)

County	1950-1	1951-2	1952-3	1953-4	1954-5	1955-5	Totals
<u>Piedmont</u>							
Amelia	1	1	1		1		4
Fluvanna							
Halifax	5	1	1		2		9
Louisa				2	1	1	4
Lunenburg			2				2
Totals	6	2	4	2	4	1	19

<u>Coastal Plain</u>							
Accomack		3		1			4
Dinwiddie							
Gloucester			3	1			4
Greensville							
Hanover	1						1
Isle of Wight					1		1
Westmoreland					1		1
Totals	1	3	3	2	2		11
Grand Totals	7	5	7	4	6	1	30

### How Cuttings Selected

Those "compliance" tracts selected for survey purposes were selected entirely in a random manner. A list of all eligible "compliance" tracts was compiled within the twelve survey counties by cutting year. This list included a total of 626 cuttings involving more than 46,000 acres of cut-over land upon which the minimum legal requirements of the Pine Seed Tree Act had been satisfied.

From this list of 626 cuttings, 72 tracts were randomly selected for survey purposes. A proportional sampling method was used to determine the number of random selections made within each county by cutting year.

Due to the fact that there were not many tracts available in the "violation" group, a different means of selection had to be used. It was necessary to use all the "violation" cuttings which qualified for survey purposes. Therefore, it might be called a "random" selection with respect to "violation" cuttings since each cutting had an equal chance of being selected and because all the cuttings were selected.

### Plot Layout and Design

The tracts selected for survey purposes were not surveyed in their entirety, only a portion of the tract was surveyed. The portion of the tract surveyed was chosen at random and the point on the tract where the survey would begin was left entirely to chance.

A regular plot pattern or layout was used on the tracts surveyed. On this plot pattern reproduction plots were regularly spaced sixty-six feet apart. Tree species composition and seed tree information plots were spaced further apart and were usually taken at the beginning and very end of the plot pattern. For more information concerning plot patterns, the reader is referred to the Appendix, pages IV and V.

### Size Plots Used

Three different sized plots were used on which to record field data; all plots used were circular plots.

Plots used to record reproduction data were mil-acre plots (1/1000-acre plots, plot radius 3.72 feet). Plots used to record tree species composition information, were 1/10-acre plots (plot radius 37.24 feet). Plots used to record various information concerning seed trees were one-acre plots (plot radius 117.75 feet).

### Stocking Discussed

Since the section immediately following this one will deal with tree stocking percents, etc. tree stocking is now briefly discussed.

Reduced to simplest terms, stocking refers to the number of trees per acre. For purposes of this survey, reproduction stocking included those trees or reproduction which appeared on the tracts surveyed between the time of last cutting (cutting year) and the time of survey.

To one not familiar with the usual distribution pattern of natural reproduction, the number of trees required for full stocking on a mil-acre basis may be surprising. This is because of the very uneven and patchy distribution of natural tree reproduction which may result and may be due to a variety of causes. It may be due to an uneven distribution of the seed source itself. It may be due to prevailing winds or the reproduction may be confined to particular portions of the tract such as moist spots, exposed mineral soil, etc. Whatever the cause, the distribution pattern of natural reproduction is usually very uneven.

It is also important to recognize that satisfactory stocking does not mean that every mil-acre plot must contain at least one tree of a desired species. Each tract cut-over has portions on which it is difficult, if not impossible, to obtain reproduction.

Stocking percent, used in this report, refers to the percentage of mil-acre plots containing one or more established loblolly and/or shortleaf pine seedlings. Stocking percent also reflects the number and distribution of seedlings present. Stocking percent, therefore, is the most meaningful expression of reproduction on a given area and the timber potentialities of this area.

Stocking percent in this report is expressed in terms of "free to grow" and "all" seedlings. A "free to grow" seedling must be free from overtopping competing vegetation or be judged capable of satisfactorily outgrowing competing vegetation. A "free to grow" seedling is a potential crop tree. "All" seedlings stocking percent includes those seedlings judged not "free to grow" as well as those judged "free to grow".

Therefore, for illustrative purposes, a "free to grow" stocking percent of 35 indicates that, on the average, the acre contains at least 350 potential crop trees. Whereas, also for illustrative purposes, an "all" seedling stocking percent of 35 indicates that, on the average, the acre contains at least 350 trees per acre all, some, or none of which are considered "free to grow".

Survey Stocking Percent Data Summarized

	<u>"Compliance"</u>	<u>"Violations"</u>
(Mean Stocking Percent - "Free to Grow" Seedlings <sup>1/</sup> )		
Coastal Plain	35.5 ± 3.5	25.6 ± 8.3
Piedmont	11.7 ± 2.2	9.9 ± 3.6
(Mean Stocking Percent - "All" Seedlings <sup>1/</sup> )		
Coastal Plain	55.9 ± 19.0	39.4 ± 27.1
Piedmont	25.9 ± 15.2	21.5 ± 18.5

The above tabular data expresses the mean or average stocking percents and their variances with a probability of 2 to 1. Expressed differently, a mean stocking percent of 35.5 ± 3.5 (Coastal Plain - "Compliance") indicates that the chances are two times out of three that the true mean stocking percent will fall within 32.0 and 39.0.

Using the above stocking percents, the data may also be expressed in terms of numbers of trees per acre (loblolly and/or shortleaf pine):

	<u>"Compliance"</u>	<u>"Violations"</u>
(Average Number of "Free to Grow" Seedlings <sup>1/</sup> per Acre)		
Coastal Plain	355 ± 35	256 ± 83
Piedmont	117 ± 22	99 ± 36
(Average Number of "All" Seedlings <sup>1/</sup> per Acre)		
Coastal Plain	559 ± 190	394 ± 271
Piedmont	259 ± 152	215 ± 185

Statistically, there is no real or significant difference between "Compliance" mean stocking percent and "Violation" mean stocking percent ("free to grow" or "All" seedlings) in either the Coastal Plain or Piedmont. Furthermore, there is no assurance that a significant difference could be found if the sample size used in the 1958 Survey were increased four times or quadrupled.

---

<sup>1/</sup>Includes loblolly and/or shortleaf pine.

### Volume in Seed Trees

Of the 46 "Compliance" tracts surveyed in the Coastal Plain, the plot data taken on 92 one-acre plots indicates that the average volume<sup>1/</sup> per acre was nearly 595 board feet (International  $\frac{1}{4}$ " Log Rule). Of this total, 492 board feet was contained in pines 14 inches or more in diameter<sup>2/</sup>. The remaining 103 board feet was contained in pines less than 14 inches in diameter.

The 26 "Compliance" tracts surveyed in the Piedmont represented by 52 one-acre plots revealed an average volume per acre of 379 board feet. Of this total 262 board feet was found in pines having a diameter of 14 inches or more and 117 board feet found in pines having a diameter less than 14 inches.

### Seed Tree Mortality

Volume loss due to seed tree mortality proved insignificant. According to plot data, within the legal seed tree size category (trees 14 inches in diameter outside bark, measured at a point on the tree 10 inches from the ground) less than an average of three board feet per acre was lost between time of cutting and date of survey within the Coastal Plain Compliance tracts while Piedmont Compliance tracts indicated no seed tree mortality whatsoever in legal sized seed trees.

For more complete seed tree mortality figures refer to the Appendix page VI.

### Summary

In 1958 the Virginia Division of Forestry undertook a reproduction survey, based on unbiased sampling methods, of cut-over tracts upon which seed trees had been left as required by the Virginia Seed Tree Act in order to determine the kind and amount of tree reproduction which resulted. Also surveyed, in a like manner, were tracts cut-over in violation with the Virginia Seed Tree Act. The Southeastern Forest Experiment Station, United States Forest Service, cooperated in planning survey procedures and in evaluating survey results.

Both Coastal Plain and Piedmont counties were included in the survey. A total of 72 cut-over tracts in the "Compliance" group were surveyed, and a total of 30 cut-over tracts in the "Violation" group surveyed.

---

<sup>1/</sup> Includes loblolly and/or shortleaf pine.

<sup>2/</sup> Diameter outside bark measured at a point on the tree 10 inches from ground.

The survey results indicate with a probability of 2 to 1 that the following mean stocking percents will be found:

	<u>"Compliance"</u>	<u>"Violations"</u>
	(Mean Stocking Percent - "Free to Grow" Seedlings <sup>1/</sup> )	
Coastal Plain	35.5 ± 3.5	25.6 ± 8.3
Piedmont	11.7 ± 2.2	9.9 ± 3.6
	(Mean Stocking Percent - "All" Seedlings <sup>1/</sup> )	
Coastal Plain	55.9 ± 19.0	39.4 ± 27.1
Piedmont	25.9 ± 15.2	21.5 ± 18.5

Statistically, there was no real or significant difference in percent stocking ("free to grow" or "all" pine seedlings) either in the Coastal Plain or Piedmont between "compliance" cuttings and "violation" cuttings. Furthermore, nor is there any assurance that if the survey sample used were quadrupled that a significant difference would occur.

Within the Coastal Plain, on the "compliance" tracts surveyed, the average volume contained in seed trees 14 inches or more in diameter<sup>2/</sup> was 492 board feet and within the Piedmont, on the "compliance" tracts surveyed, the average volume contained in seed trees 14 inches or more in diameter was 262 board feet.

Seed tree mortality between time of cutting and time of survey was insignificant. Plots taken on "compliance" tracts in the Piedmont failed to indicate any seed tree mortality on seed trees 14 inches or more in diameter. Within the Coastal Plain, the average seed tree mortality loss per acre, on trees 14 inches or more in diameter, was three board feet per acre.

---

<sup>1/</sup>Includes loblolly and/or shortleaf pine

<sup>2/</sup>Outside bark diameter, measured on the tree at a point 10 inches from the ground.

Appendix

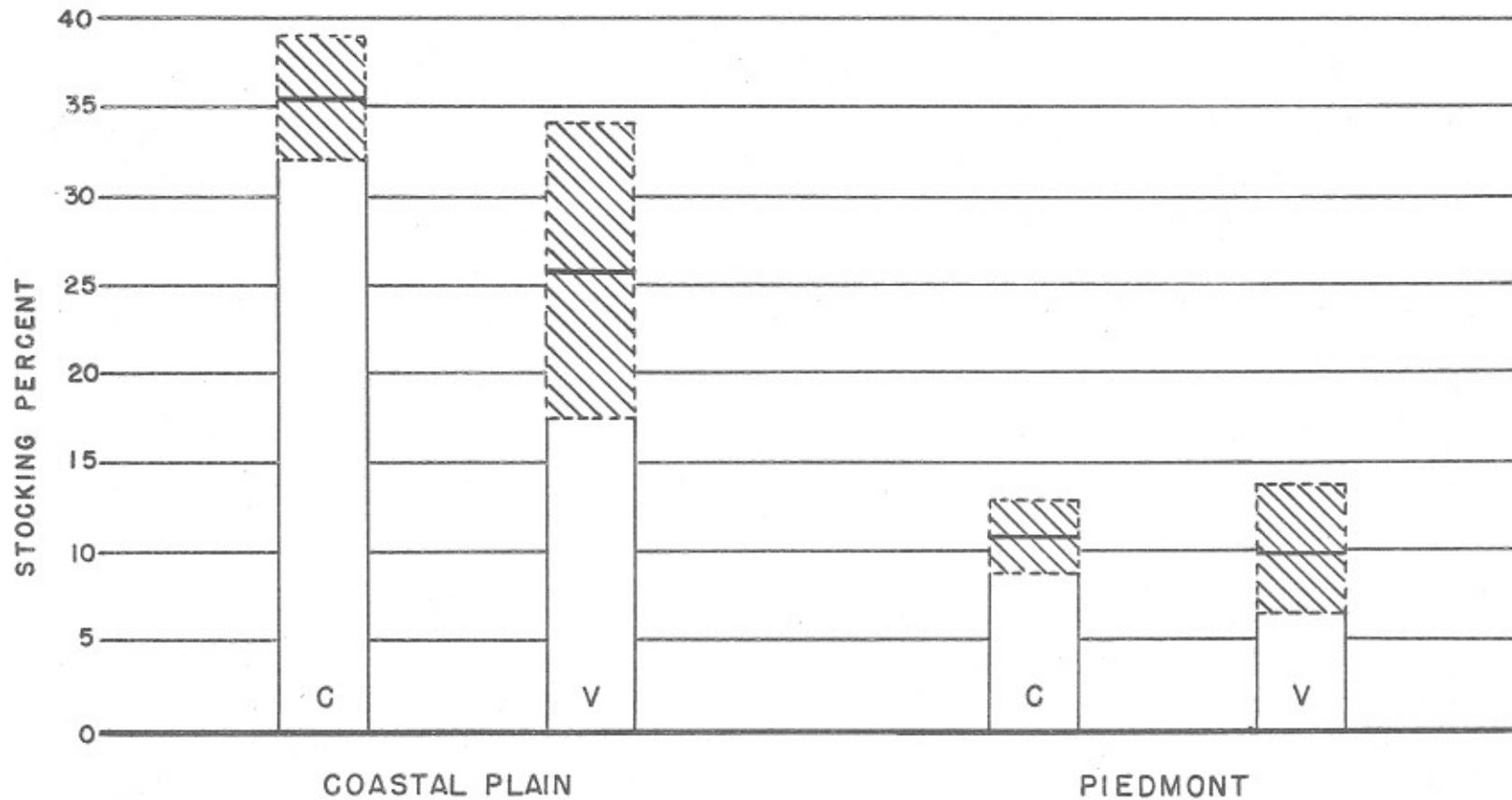
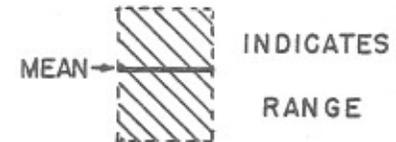


# MEAN STOCKING PERCENT "FREE TO GROW" SEEDLINGS

(INCLUDES LOBLOLLY AND/OR SHORLEAF PINE)

C = COMPLIANCE

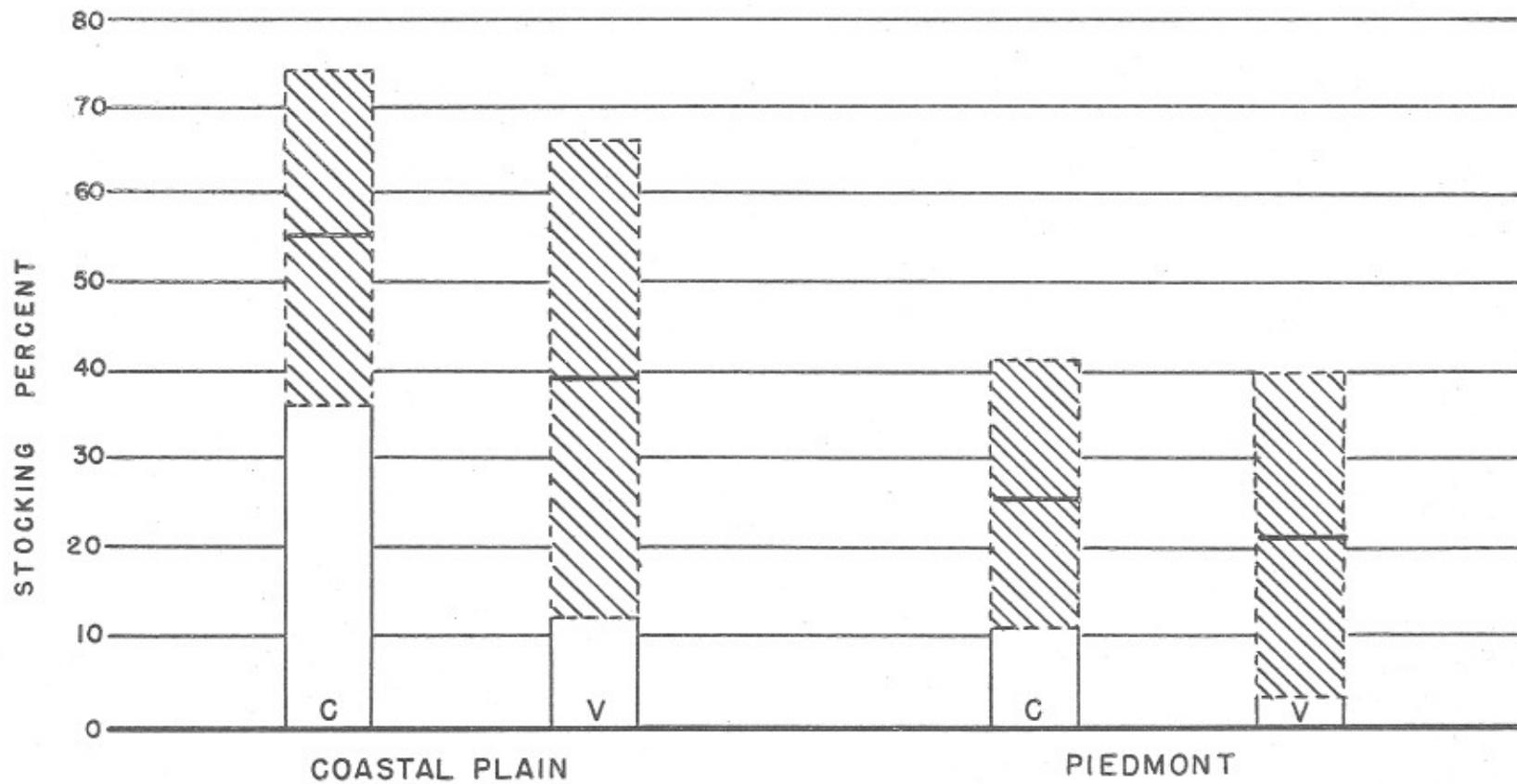
V = VIOLATION



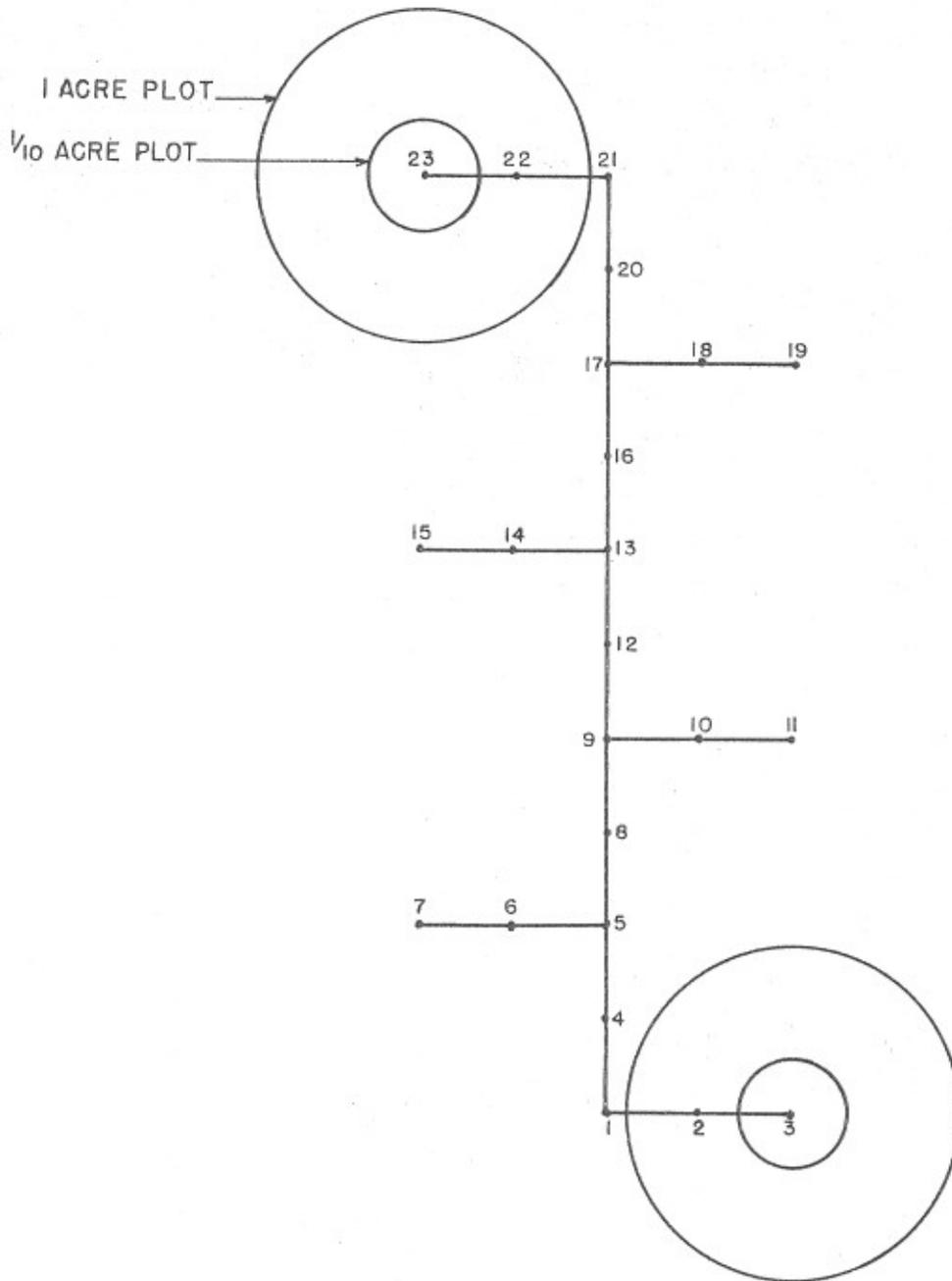
# MEAN STOCKING PERCENT "ALL SEEDLINGS"

(INCLUDES BOTH "NOT FREE TO GROW" & "FREE TO GROW" LOBLOLLY AND/OR SHORLEAF PINE)

C = COMPLIANCE  
V = VIOLATION

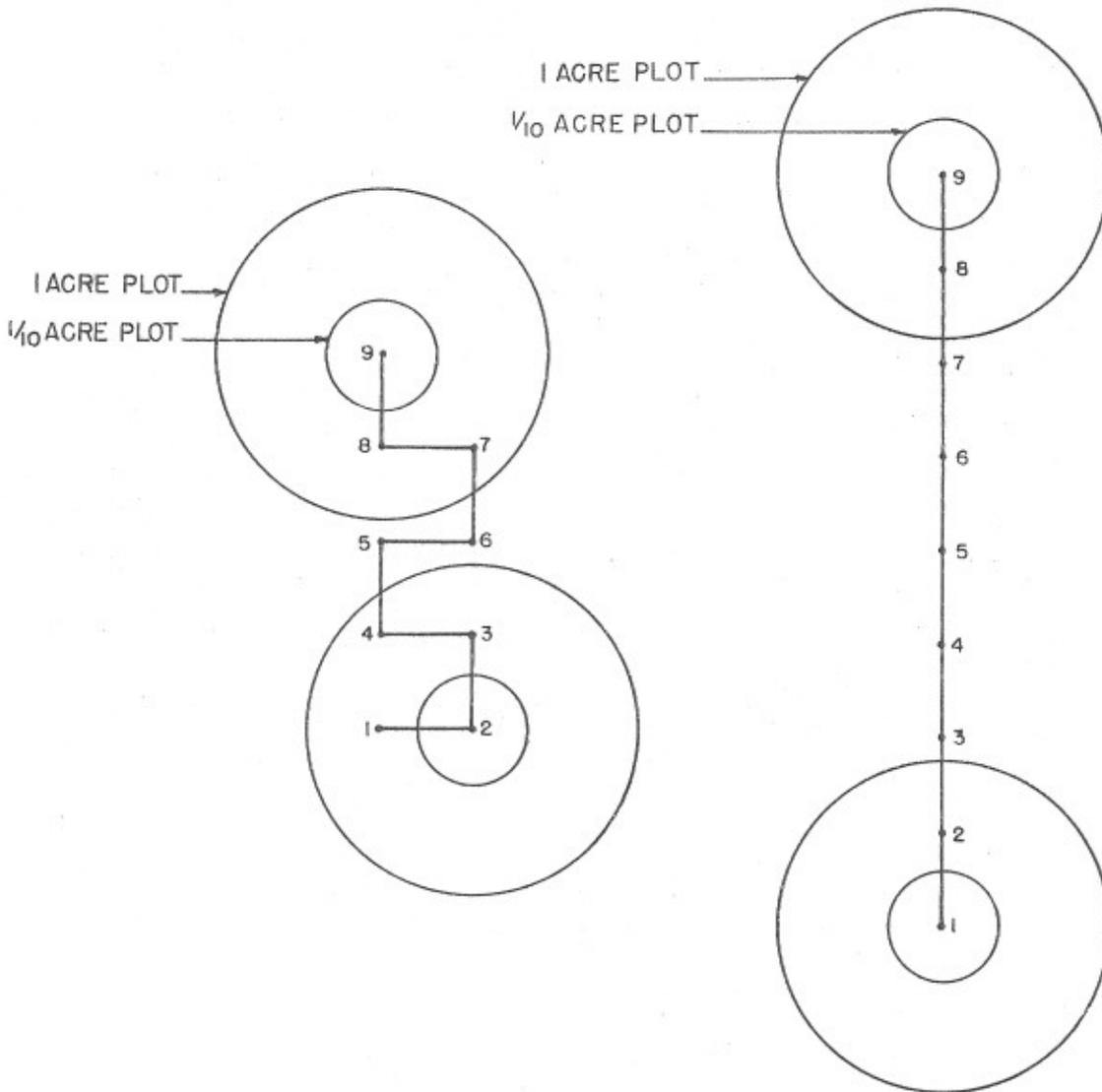


SKETCH SHOWING PLOT DESIGN  
AND LAYOUT FOR "COMPLIANCE"  
TRACTS



NUMBERS INDICATE LOCATION OF  $\frac{1}{1000}$  ACRE PLOTS  
DISTANCE BETWEEN  $\frac{1}{1000}$  ACRE PLOTS = 66 FEET

SKETCH SHOWING PLOT DESIGN  
& LAYOUT FOR SMALL SIZED  
"VIOLATION" TRACTS \*



NUMBERS INDICATE LOCATION OF  $1/1000$  ACRE PLOTS  
DISTANCE BETWEEN  $1/1000$  ACRE PLOTS = 66 FEET

\* THESE DESIGNS REPRESENT THE SMALLEST ONES USED.  
WHEREVER POSSIBLE, THE "COMPLIANCE" DESIGN WAS USED.

Seed Tree Mortality

The following table summarizes seed tree loss due to mortality between time of cutting and date of survey on "compliance" tracts included in the survey. The time interval elapsing between time of cutting and date of survey ranged from three to eight years.

<u>Coastal Plain:</u>	<u>-14"<sup>1/</sup></u>	<u>14"<sup>1/</sup></u>	<u>Totals</u>
Avg. No. trees per acre	0.17	0.01	0.18
Avg. vol. per tree (bd. ft.)	21	3	24
 <u>Piedmont:</u>	 <u>-14"</u>	 <u>14"<sup>+</sup></u>	 <u>Totals</u>
Avg. No. trees per acre	0.06	none	0.06
Avg. vol. per acre (bd. ft.)	6	none	6

Of the known reasons for seed tree mortality insects and logging damage accounted for more than fifty percent of the mortality loss. Miscellaneous causes for seed tree mortality such as lightning, wind, etc., accounted for the remaining losses.

<sup>1/</sup>Diameter, outside bark measurements, measured on the tree at a point ten inches from the ground.