

DEVELOPING A SAMPLING METHOD TO DETERMINE EFFECTS OF
INSECTS ON YIELDS IN SOUTHERN PINE SEED ORCHARDS

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Abstract.--Describes objectives and current activities of a Seed Orchard Sampling Committee. Cooperating members of the committee are conducting sampling studies on five pine species in seven southern states. Duration of the studies is three years and results will be used to estimate impact of various destructive agents on orchard seed yields. Life tables for the pine cones of each pine species will be constructed for use in developing seed yield prediction models. Current partial results of the studies are presented.

During a Seed Orchard Sampling Workshop held at Olustee, Florida, on November 1 - 2, 1972, representatives of State and Federal Forest Services, universities, and private industry agreed that a suitable sampling method for determining the impact of insects on southern pine seed orchards was lacking. The Seed Orchard Sampling Committee was formed to develop such a method; members were from the Southeastern Forest Experiment Station, State and Private Forestry, the Texas Forest Service, the Louisiana Forestry Commission, and Mississippi State University. The purpose of the sampling will be to estimate the impact of various destructive agents, including insects, on seed orchard yields. Monthly observations taken during cone development will be used to construct life tables for use in developing seed yield prediction models. The results of the study will also be used to develop sampling methods for evaluating the effectiveness of different insect control measures.

To fulfill these objectives in a reasonably short time, a sampling method was arbitrarily selected for obtaining initial observations. The same basic method is being used for collecting these initial observations in the study orchards, and the results will be compiled and analyzed by similar methods at one location.

The study will take 3 years and will include two successive crops of cones from each of the study orchards. A total of 11 studies in 8 seed orchards are underway. Orchards of slash pine, loblolly pine, shortleaf pine, longleaf pine, and Virginia pine, in Florida, Mississippi, Louisiana, Texas, Arkansas, Tennessee, and North Carolina are represented.

A population of clones was selected within each of the study orchards. Initially, each investigator determined the number of clones he could sample in his orchard. Inferences, therefore, can only be made for those clones selected and may not apply to the entire orchard unless all clones within the orchard were included in the sample. Two or more ramets from each clone

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were selected at random, and a random sample of 10 percent of the conelet clusters on each ramet was tagged. Each bud within the cluster was also tagged to identify the individual structures throughout the study. Cones were observed monthly, and the causes of damage and mortality were recorded. At cone maturity, seeds will be extracted by techniques that maintain the individual records of each cone.

Seeds will be radiographed to determine losses caused by seedbugs, seedworms, and other factors. They will then be germinated to determine the number of viable seeds per cone. Results will enable us to relate seed yields to the developmental history of each cone.

The initial phase of this study will be completed in the fall of 1976. Results of the different samples will be analyzed and compared to determine the possibilities of devising practical sampling methods for the different species of pines represented in the study.

We recently completed the analysis for one crop of slash pine cones sampled in the McColskey Still Seed Orchard near Lake City, Florida. This study was initiated 1 year prior to the other sampling studies to try out the observation methods. The results indicated that 53.2 percent of the buds in the orchard did not mature into cones for collection in the fall. Insect attacks accounted for about 35 percent of this loss, but causes for the other 18 percent loss are unknown. In addition, only 53 percent of all seeds germinated. Forty-seven percent of the seeds were insect attacked, empty or malformed, not extracted, or not viable. The total loss of potential seed for the McColskey Seed Orchard was about 72 percent when measured from the flower bud stage throughout the procurement of viable seeds. Thus, in the absence of insect control, only about 28 percent of the potential seed yield was harvested from this orchard.

Analyses for the first crop of cones in the other study orchards will not be made until this winter. Loss estimates during the first 5 to 6 months of these studies, however, have ranged from 15 to 84 percent of initial buds.