EARLIER COLLECTION DATES FOR SOUTHERN PINE CONES

James P. Barrett 1/

Abstract.--Loblolly and slash pine cones can be collected 2 or 3 weeks before maturation, if they are stored 3 to 5 weeks before processing and if some reductions in yield and viability are acceptable. Longleaf cones should be collected only when mature, since storage decreases germination of seed from immature cones.

Additional keywords: Pinus, longleaf pine, slash pine, loblolly pine, germination, seed maturity.

INTRODUCTION

Collecting enough cones to meet the needs of increased forest regeneration is becoming a great problem. The main focus of the problem is the seed orchards; it is difficult to collect enough cones from standing trees within the traditional 2- to 3-week harvesting period. If collections could begin about 2 weeks earlier than usual, the amount of seed harvested could be increased appreciably.

Southern pine cones have traditionally been considered mature and ready for harvesting when their specific gravity drops below 0.89 (Wakeley 1954). An extended collection period had been reported possible if slightly immature cones were stored before kilning (Bevege 1965, MoLemore 1975, Waldrip 1970). The present study was conducted to define how early the cones could be collected and to determine the maturation times for southern **pine cones and** their seeds.

METHODS

Four trees each of loblolly (Pinus taeda L.), slash (P. elliottii Engelm.) and longleaf (P. palustris Mill.) were selected in sites outside Alexandria, Louisiana, and 24 cones were collected from each tree at intervals to test cone and seed maturity. Collections were made weekly from September 15 to October 13, 1969, for loblolly and longleaf and from July 12 to September 22, 1971, for slash pine. The earliest (September 15) collection of loblolly and longleaf seed proved mature; so collections of loblolly and longleaf were begun 5 weeks earlier the following year and were repeated biweekly from August 10 to October 17, 1970.

Each lot of 24 cones was divided into 4 groups of 6 each. One group was tested for specific gravity and moisture content immediately after collection, and each of the other three groups received one of three storage treatments to determine whether cones would ripen artificially. The cones were stored in open paper bags in an unheated building for 1, 3, or 5 weeks

---

1/ Principal Silviculturist, Southern Forest Experiment Station, Forest Service--USDA, Pineville, Louisiana.

before processing. When the time assigned to each batch had passed, the cones were opened by drying for 3 days in a gas-fired kiln at 38 C.

Cone maturity was determined by the number of seeds loose in each bag. Casehardened cones were considered immature, and their seeds were obtained by mechanical opening. Seeds from all of the storage treatments were used for germination trials. Seeds were cleaned to 100 percent soundness, and germination was tested with 100 seeds from each tree, collection date, and storage treatment. Slash and longleaf seeds were not stratified, but loblolly was, for 30 days.

RESULTS AND DISCUSSION

Loblolly pine

Loblolly pine cone collections normally begin in early October when specific gravity--the conventional maturity index--is about 0.89. Tests showed that the loblolly pine cones collected in 1969 reached maturity near October 1 (figure 1). Cone moisture contents at this time were about 110 to 115 percent (figure 2).

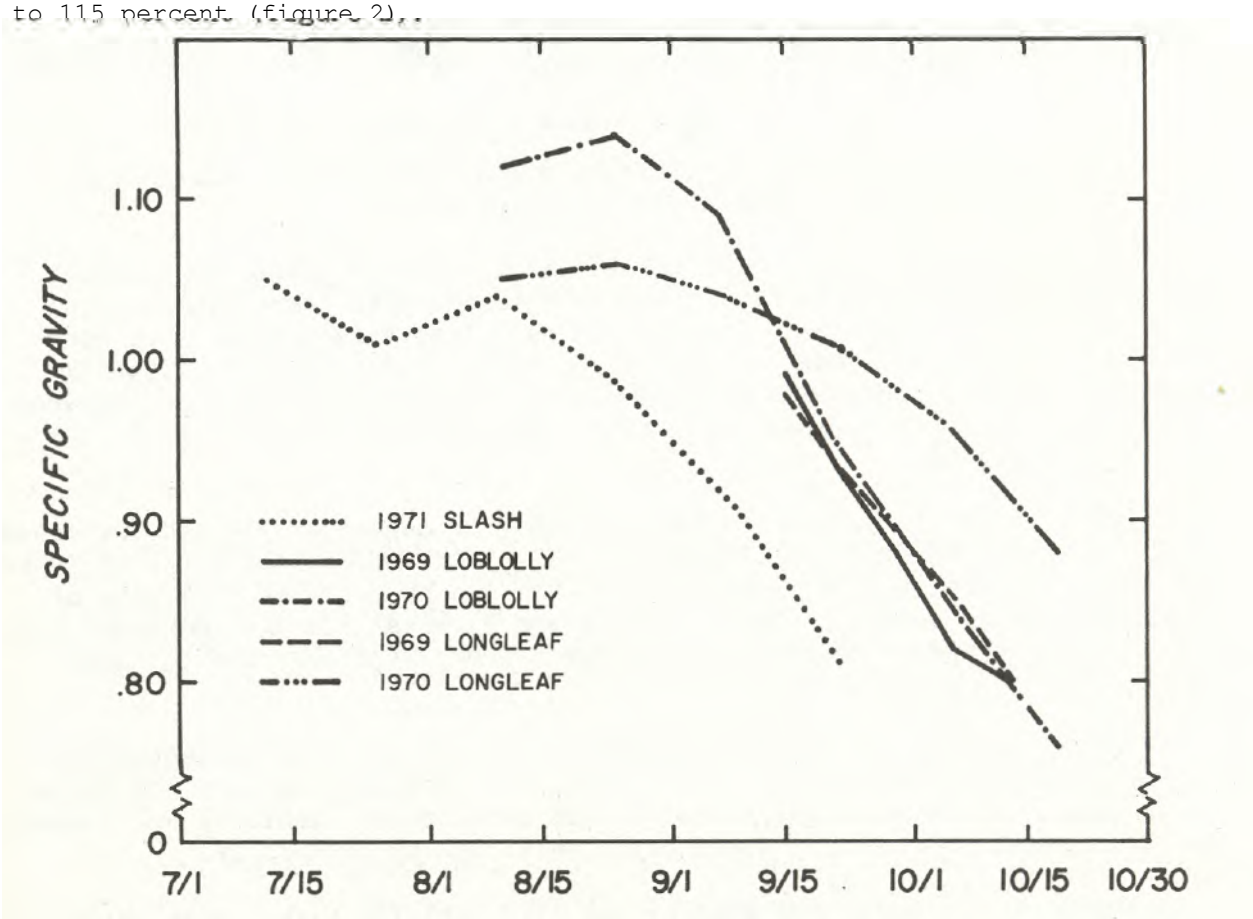

Figure 1.--Specific gravities of loblolly, slash, and longleaf pine cones at different dates.

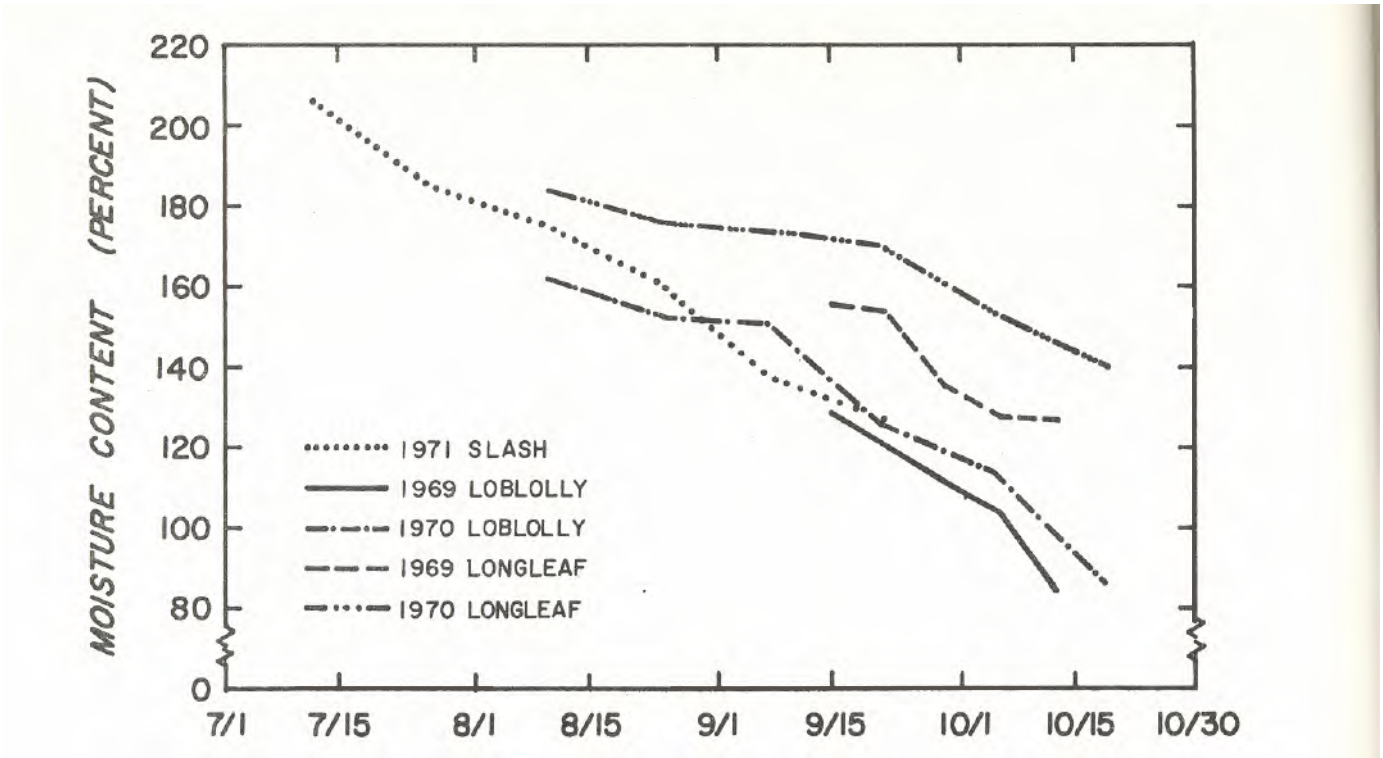

Figure 2.--Moisture contents (dry weight basis) of loblolly, slash, and longleaf pine cones at different dates.

The average number of seeds collected per cone in September tended to increase with each subsequent collection date and with increasing lengths of cone storage (figure 3). Storage had much less effect when cones were collected in October. Cones collected as early as September 15 (specific gravity 0.99) and stored for 5 weeks yielded 38 seeds per cone, as compared to 47 per cone for the final collection (specific gravity 0.80) which was stored for 3 weeks.

One week of storage for collections made in September yielded few seeds, with the exception of the September 22 collection. Cones collected on September 29 (specific gravity 0.88) yielded only one seed per cone after 1 week of storage. During October, yields after 1 and 3 weeks' storage increased appreciability, but yields of seeds stored for 3 weeks were superior to those of seeds stored for 5 weeks.

Germination was 95 percent or greater for all dates of collection and for all storage periods (figure 3). Obviously, collections were not begun early enough to allow observations of seed development: loblolly seeds apparently mature several weeks before cones are ripe enough to open fully.

These results were confirmed by the 1970 loblolly tests, when collections began 5 weeks earlier and storage was omitted. Seed yields were nil through September 21 but satisfactory thereafter. No viable seeds were found in

the August collection; the germination rate was 58 percent for the seeds collected on September 7, 79 percent for those collected on September 21, and 96 percent for those of October 5.

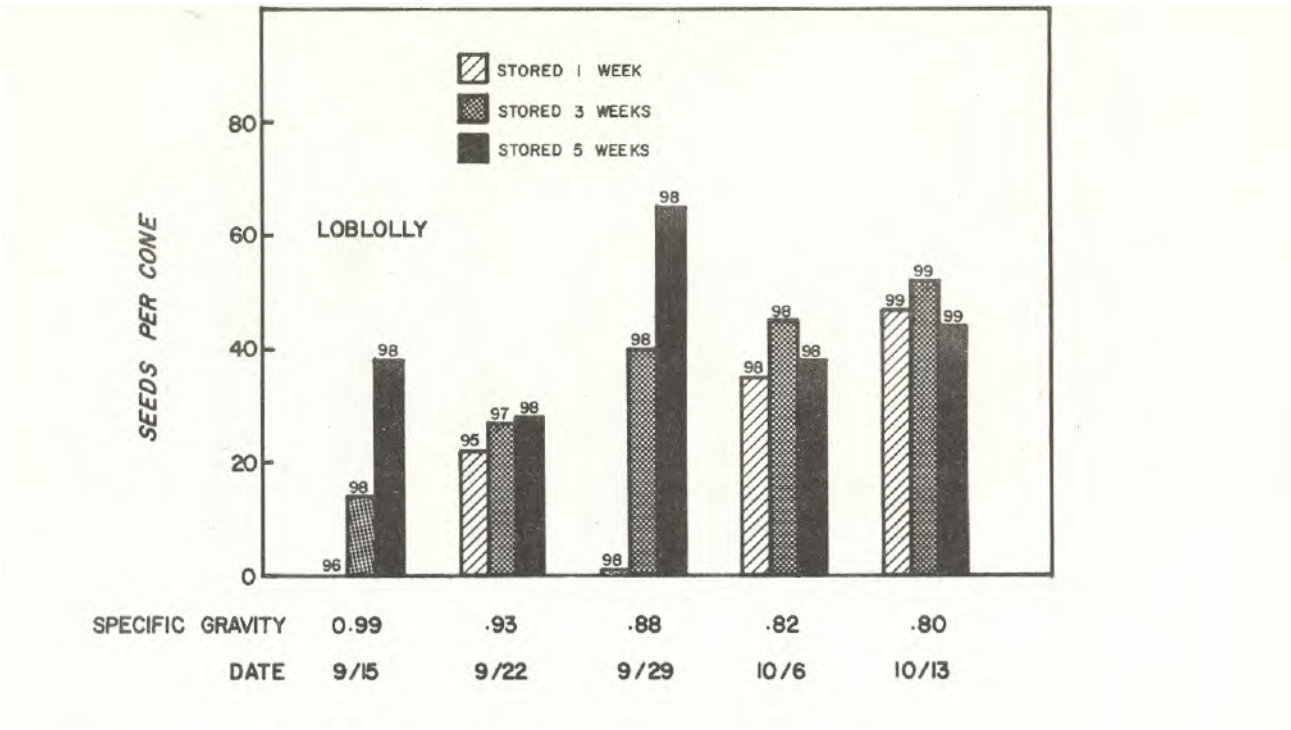

Figure 3.--Seed yields and germination (shown above bars) of loblolly pine as affected by date of collection and cone storage (1969).

Results in this study indicated that collections can begin 2 or 3 weeks earlier than the traditional date, if some reductions in yield and viability are acceptable and if the cones are stored 3 to 5 weeks before processing.

Slash pine

Slash pine collections usually begin in early September. The present tests confirm that maturity occurs before September 15 (figure 1). Our collection began 8 weeks before maturity. Seed yields generally increased with each subsequent collection date and with longer cone storage periods. Cones collected in late August gave acceptable yields provided the cones were held 5 weeks before processing (figure 4). When cones were held for 5 weeks, seed yields from the August 23 collection (specific gravity 0.99) were 70 per cone compared to 85 for cones that were picked on September 22 (specific gravity 0.81).

Germination levels were never high. The best germination rate (83 percent) was for seeds from cones collected on September 22 and held 5 weeks. No seeds from cones picked in July germinated, even after 5 weeks of storage, and few collected in August germinated unless cones were picked in late August and held for 5 weeks.

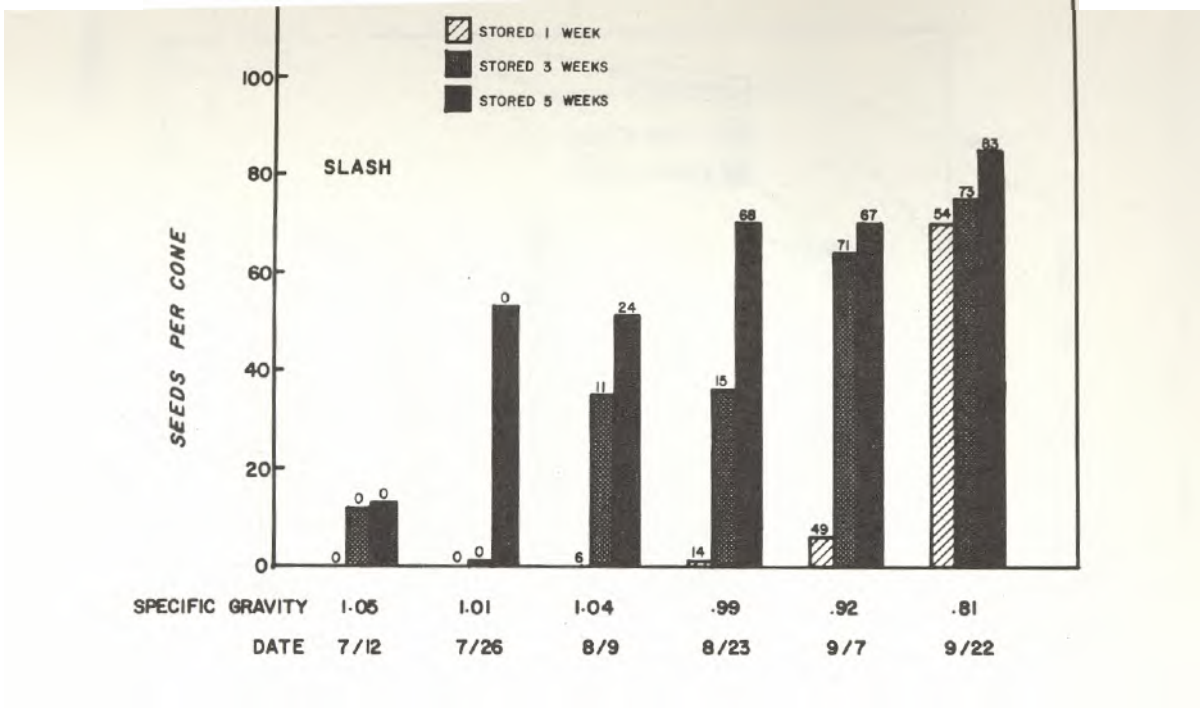

Figure 4.--Seed yields and germination (shown above bars) of slash pine as affected by date of collection and cone storage.

Although yields are usually adequate by late August for cones with a specific gravity of 0.95, viability is somewhat lower than for seed from cones about to open. To obtain maximum germination, cones must register 3.89 specific gravity when collected and stored.

Longleaf pine

Differences between cones collected in 1969 and 1970 showed that some longleaf cones ripen considerably later than loblolly cones, although differences in individual trees may explain some of the variation. Longleaf cones reached maturity on September 29 in 1969 but not until October 17 in 1970. Cone moisture contents of longleaf cones averaged 140 percent, somewhat higher than that of loblolly.

Yields of longleaf seed generally increased as the date of collection advanced, *if* cones *were* held for 3 to 5 weeks before kilning (figure 5). Storage of cones for 5 weeks improved yields appreciably from all collections, except the one of October 6, for which 3-week storage was superior. The highest yields were obtained with cones stored 3 to 5 weeks if the cones' specific gravity was 0.89 or below at the time of collection. Yields for those collected earliest (September 15) and held for 5 weeks were only about half those of the later collections.

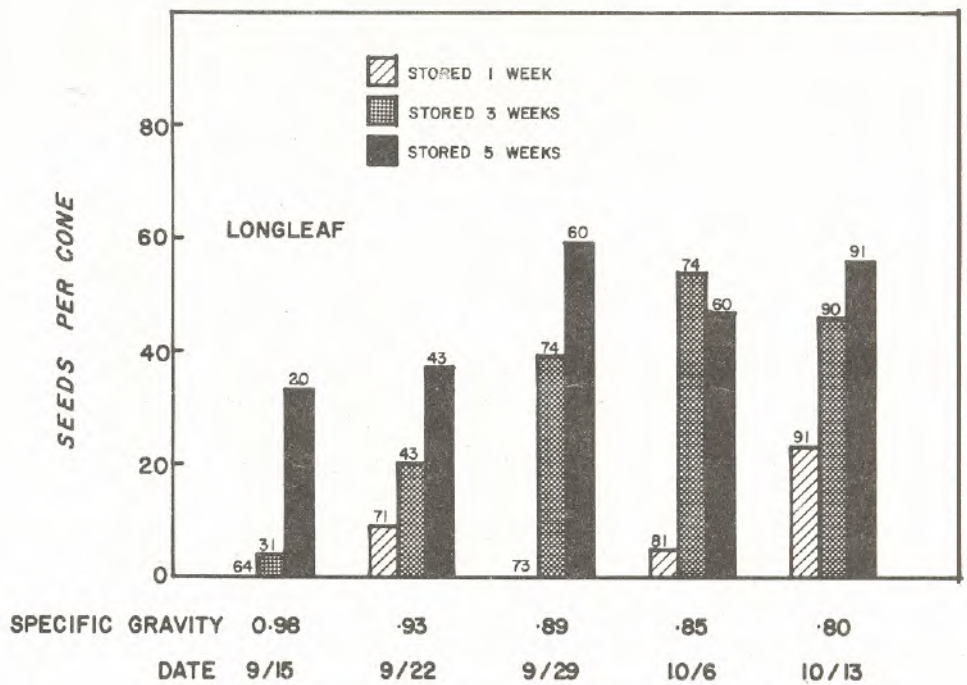

Figure 5.--Seed yields and germination (shown above bars) of longleaf pine as affected by date of collection and cone storage.

Viability increased with each successive collection date, but within each collection date, longer storage resulted in reduced germination. However, the viability of the seed collected on October 13 was unaffected by cone storage. These results indicate that longleaf cones should be collected only when mature. They should also be processed as quickly as possible because cone storage beyond 5 weeks reduces seed storability (McLemore 1961).

The 1970 tests confirmed that cones collected and processed when specific gravity is above 0.90 fail to open adequately and release seed. Seeds were obtained only from the final cone collection (October 19), for which germination was 93 percent.

CONCLUSIONS

Optimum yields and germination are possible with loblolly and slash pine only if the cones are mature when collected. Early collections are advisable only if there is a large cone crop and if large quantities of seed are needed immediately or the labor supply is limited. When the cone crop is small, collections should be delayed until the cones are fully mature. Starting collections approximately 2 weeks earlier doubles the collection period, but it increases the seed yield by only 25 percent.

Collections of loblolly can begin 2 or 3 weeks before maturity if specific gravity is 1.0 or less (about mid-September), but yields may be 30 to 40 percent of those from ripe cones. Seeds from immature loblolly cones are apparently mature when the cones are ripe for harvest. Slash can be collected up to 21 days before maturity (specific gravity 0.95) with a smaller loss in yield than loblolly. Slash pine seeds continue ripening during cone storage, even when the cones are fully mature at the time of picking.

But viability of longleaf seeds from immature cones decreases during storage. Therefore, only mature longleaf cones should be collected. Once ripe, longleaf cones can be stored from 3 to 5 weeks to increase seed yields without reducing viability, but the storage period should not exceed 5 weeks.

Moisture contents varied slightly among species but were usually near 120 to 140 percent at maturity and are a possible maturity index.

LITERATURE CITED

Bevege, D. I. 1965. An investigation of cone and seed maturity of slash pine in southern Queensland. Aust. For. 29: 135-148.

McLemore, B. F. 1961. Prolonged storage of longleaf cones weakens seed. USDA For. Serv. South. For. Notes 132, South. For. Exp. Stn., New Orleans, La.

McLemore, B. F. 1975. Collection date, cone-storage period affect southern pine seed yields, viability. USDA For. Serv. Tree Plant. Notes 26(1): 24-26.

Wakeley, P. C. 1954. Planting the southern pines. USDA For. Serv. Agric. Monog. 18, 233 p.

Waldrip, B. T., Jr. 1970. Artificial ripening of loblolly pine cones and seed. Proc. Southeast. Nurserymen's Conf. 1970: 82-91.