LONGLEAF PINE
CONE COLLECTION AND
SEED CONDITIONING GUIDELINES

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INTRODUCTION

These guidelines are designed to provide specific criteria that are necessary to insure good germination of longleaf pine seed. The guidelines are divided into 5 topics:

I. Longleaf Pine Cone Collection Criteria
II. Seed Extraction Criteria
III. Seed Dewinging Criteria
IV. Seed Conditioning Criteria
V. Seed Testing Criteria

The National Tree Seed Laboratory personnel have developed these guidelines to assist the Southern region’s forestry professionals in maximizing their effort to collect and clean longleaf pine seed. The guidelines were chosen by seedlab personnel through experience working with longleaf pine seed, the valued opinion of their customers, and published research.

If any additional information or assistance is needed, please contact the National Tree Seed Laboratory, Rt1, Box 182B, Dry Branch, GA 31020-9696; phone (912-751-3551) or FAX (912-751-3554).

References:
I. Longleaf Pine Cone Collection Criteria

1. Collecting cones at the right stage of maturity is absolutely critical in producing high quality longleaf pine seed. Dr. Barnett (1993) reports that cones with a specific gravity higher than 0.89 have lower germinating seed. In a bumper crop year there is the tendency to start early so you have time to collect all the cones. This will only reduce your overall germination.

2. Cone collection ranges from October 1st until the end of October. A good rule of thumb is to start collection around October 15th.

3. Mike Young, tree improvement forester for the Georgia Forestry Commission, recommends waiting until cones from early ripening clones begin to open before collecting to insure that the majority of the cones are ripe. For good seed germination you may be willing to lose some seed from the early ripening clones.

4. Seed orchard clones do not ripen all at the same time. It is a good practice to check each clone's cone maturity before harvesting. The specific gravity can be determined by floating cones in a large, water filled, graduated cylinder. By measuring the cone's water displacement in the cylinder, you can calculate the cone's specific gravity. This procedure explained by Dr. Barnett (1979) is illustrated on the last page of the guidelines.

5. Cones left on the ground overnight are subject to attack by fungi. Unripened cones have a higher moisture content and are more susceptible to fungi than ripened cones.

6. A bushel contains about 50 cones with a range between 25 to 75 cones. Bumper crop yields range between 0.75 to 1.0 lbs. of seed per bushel.
II. Seed Extraction Criteria

1. Fungal growth, seed deterioration, and premature germination are encouraged when cones are left outside. The best temporary storage is to place cones on screens under a shelter where cones can air dry. The ideal condition is to spread out cones to a depth of 2 cones for free expansion.

2. Dr. Barnett’s research (1993) shows that seed extraction needs to be completed within 30 days of harvest. Dr. Bonner (1987) has found that cone-specific gravity should be below 0.80 before kiln drying begins, and drying temperatures should be about 35°C (95°F). Dr. Barnett (1993) reported that temperatures of 46°F (115°F) reduced longleaf pine seed viability.

3. Longleaf pine seed (Barnett 1993) is shed from the cones at high moisture (15 to 25%) even after kiln drying. The seed needs to be dried below 10% moisture content after the cones have been tumbled. The thin seed coat does not prevent moisture absorption during processing, so monitor the moisture content with moisture meters.

4. This additional seed drying creates a bottleneck in the processing operation. Usually the kiln capacity is not big enough to dry cones and seed simultaneously. Seed can be placed in cold storage -6.7°C to 4.4°C (20°F to 40°F) until all the seed has been extracted from the cones. Dr. Barnett (1993) has found that seed stored too long at a high moisture content (above 12%) in cold storage will begin to deteriorate and germination will begin to drop.

5. A seed dryer that forces air through the seed is needed to free up the cone kiln for drying cones. Commercial seed dryers can be purchased or one can be made with lumber, screens, and fans. Turning the seed aids in uniform drying.

6. A hygrometer or psychrometer, used with a psychrometric chart, aids in determining the potential to dry the crop and the temperature required to achieve the desirable relative humidity for drying. A relative humidity of 30%, usually dries the cones at an acceptable rate. Charts are available from the National Tree Seed Laboratory.

7. Dr. Barnett (1993) reported that dried seed could be stored in moisture proof containers at -8°C (18°F) without significant seed deterioration. Anytime after drying,
the seed can be dewinged and cleaned.

III. Seed Dewinging Criteria

1. Longleaf pine seed is easily damaged in the dewinging process! This is a critical element in the processing of longleaf pine seed. The dewinger can easily crack the seed by removing too much of the wing or removing the wing too harshly. Someone needs to monitor the dewinging process continually.

2. Personnel need to be trained on the proper operation of the dewinger and shown what kind of seed damage to avoid. Training can be obtained from attending tree seed processing workshops or individual instruction.

3. Dr. Barnett (1993) recommends only dewinging longleaf pine seed that has been dried to a moisture content below 10%. If available, take X-rays during dewinging to check for seed damage.

4. Damaged seed will not store well and germination will be reduced. Once the seed is mechanically damaged, the only way to correct the problem is to separate the damaged seed from the good seed. This requires more time and labor in seed processing and drives up the cost of the seed.
IV. Seed Conditioning Criteria

1. Basic seed cleaning after dewinging is performed with air cleaners. Cone bracts or trash can be removed with large round hole screens and the gravity table.

2. Size seed so gravity table can be used to remove damaged seed. Seed sizing creates homogenous seedlots which make the gravity table more efficient. The seed can be sized by width with round hole screens and by thickness with oblong hole screens. The round hole screens needed for longleaf pine seed range from 22/64th inch to 16/64th inch in half size increments. The oblong hole screens range from 12/64th inch to 8/64th inch in half size increments. Using the screens in half size increments gives the best size separation for the gravity table. (Information on sizing longleaf pine seed can be obtained from the National Tree Seed Laboratory)

3. If your organization does not have a gravity table, make arrangements now to have your seed run over a gravity table. The seed needs to be sized because the gravity table cannot separate seed by size and weight simultaneously. Once the seed is dimensionally homogenous, the gravity table can remove lighter weight seed which can significantly raise your seed germination.

4. If your organization has a gravity table and any other equipment that its personnel
do no know how to operate correctly, call the National Tree Seed Laboratory and make arrangements to get free training.

5. Properly processed longleaf pine seed can be easily sown with a precision seeder.

V. Seed Testing Criteria

1. Germination tests of seed are needed for calculating nursery sowing rates. The seed is planted in the best germinating conditions to measure its maximum potential of producing a plant.

2. A number of nursery managers have found that stratified germination tests more accurately reflect nursery germination; therefore, they use stratified test data and stratify seed for nursery sowing. Nursery trials should be conducted on small samples of longleaf pine seed before switching the whole longleaf pine crop to stratification.

3. The commonly used stratification period for longleaf pine seed is moist, cold treatment for 10 to 14 days @ 3.3°C (38°F).

4. The National Tree Seed Laboratory's longleaf pine germination data (Karrfalt 1988 and data on file) demonstrates that stratified seed has on average a 15% greater
germination than unstratified seed. Dr. Barnett (1993) reported a 10% decrease in
laboratory germination, but a 2 to 21% increase in nursery germination with stratified
longleaf pine seed. In the laboratory an unstratified and stratified test is performed on
each seedlot to look at the effect stratification has on the seedlot.

5. Bob Karrfalt (personal communication) planted a longleaf pine seed soak study in a
bareroot nursery and found no detriment in nursery germination from soaking seed
before planting. The soaked or stratified seed germinated more rapidly than dry seed.