- If the seed is abundant and a dense stand results, a pre-commercial thinning may be necessary to decrease the number of trees per acre. For example, if there are more than 2000 slash pine seedlings at age three, growth may be inhibited and the site will require pre-commercial thinning 700-1000 trees per acre. This thinning may be accomplished by hand-cutting or plowing up rows of seedlings and leaving the remaining rows about 10-12 feet apart.
- Because the site is planted with seed versus 1-year-old seedlings, the rotation length (time until harvest) may be increased by one or more years.
- The seed coming from the seed trees is not genetically improved as when the seed comes from a seed orchard.
- Natural regeneration may be less expensive initially but more costly in the long run if it is necessary to prepare the site or precommercially thin.
- Open sites without trees such as clearcuts, abandoned fields, and stands after a wildfire or windstorm cannot be naturally regenerated.
- The landowner does not have any control over spacing between trees or stocking levels and so often these can be very uneven.
- A successfully regenerated site may take longer to reach harvest than with direct seeding or planting.

Direct Seeding

Definition

Direct seeding means that the landowner applies seeds directly to the land; these seeds then germinate and a forest stand results. A lot of the principles for site conditions and site preparation are the same as with natural regeneration but, in addition, a known amount of seed is used. Direct seeding is often employed on poor or inaccessible sites or where little initial involvement is possible or desirable. Sites which are droughty or have high erosion potential should be avoided. Three reviews give detailed information on direct seeding (Lohrey and Jones 1983, Williston and Balmer 1983, Beaufait and others 1984).

Steps

1. **Harvesting and preparing the site.** First, the present stand must be harvested and the site prepared to create a mineral soil seedbed. Again, as in natural regeneration, the options for site preparation are burning, mechanically scarifying, and/or spraying with herbicides (Jack et al. 1984).
2. **Obtaining seed.** Seed with greater than 85% viability and with a minimum of 95% sound seed should be used. After receiving seed, it should be stored immediately in a refrigerator at 34-36°F (Williston and Balmer 1983).
3. **Sowing rates.** The amount of seed required will vary according to species, method of sowing, degree of site preparation, and general ease of regeneration of the site. For instance, in an area where summer showers are frequent and survival is good, 0.6 lb/acre is adequate for slash pine. However, in drier areas 1 lb/acre for broadcast sowing, 0.75 lb/acre for row seeding on a disked bed, and 0.5 lb/acre for spot seeding may be required for adequate regeneration (Lohrey and Jones 1983). In general for each species there is an average amount of seed which is needed (Table 3).

Table 3. Amount of seed needed to direct seed an acre of land and the approximate number of seeds per pound.

Pine Species	Lbs of seed needed per acre*	Approximate number of seeds per lb**
Loblolly	0.5	18,200
Slash	0.6	13,500
Longleaf	2.5	4,900
Sand	0.6	75,000

*(Williston and Balmer 1983)
**(Schopmeyer 1974)

4. **Treating seed.** Seed is often treated with a repellent for seed-eating insects, birds, and mammals which will otherwise consume the entire seed crop. The most common repellent for birds is Thiram. Endrin, which has been used to repel rodents is no longer available as a repellent. If a substitute cannot be found, predation will be an even bigger problem for direct seeding.

   Loblolly and sand pine seed also needs to be stratified, a process which subjects water-soaked seed to cold temperatures for 20-60 days according to species and improves its chance of germinating.

   Stratified and repellent-treated seed can be purchased from most commercial seed companies. The repellent and stratification treatments each increase the weight of seed by about 10% and 25% (Williston and Balmer 1983).
5. **Date of sowing.** Longleaf and sand pine seed should be sown in the fall when soil moisture is high from rains. Longleaf pine appears to naturally regenerate better in the panhandle than the peninsula of Florida, perhaps due to the wetter climate in the fall and winter.