



Slash pine seeding sites require different seedbed preparation. Open areas with high water tables such as this require elevated seedbeds

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How To Direct-Seed Slash Pine

Guides similar to those issued for longleaf and loblolly several years ago are now ready. Here is a preview

By W. F. MANN, JR., and H. J. DERR

Southern Forest Experiment Station, U.S. Forest Service

A new publication, "Guides for Direct-Seeding Slash Pine," has been released by the Southern Forest Experiment Station. It is the third in a series for this new regeneration technique, similar guides for longleaf and loblolly having been issued a few years ago.

The new booklet, like the others, covers all phases of seeding from planning to appraisal of results. This article summarizes the major recommendations.

conditions, two situations should be avoided. First, broadcast sowing is a poor risk on soils with coarse, sandy surface layers that dry out fast. On these

soils, seeds must be buried from a half to one inch deep if they are to germinate normally.

The other situation to avoid is where

Disk seeders prepare a narrow seedbed and sow seed in a single pass. This model plants two rows at a time — can seed up to 30 acres a day.



Landowners contemplating direct-seeding of slash pine should make their plans at least eight months before the seeding season, so as to allow time for seedbed preparation, seed procurement, drainage, hardwood control, and special protection. Of great importance, they will have previously made sure that slash pine is the best species for the proposed site. The most reliable basis for a decision is the satisfactory growth of natural or planted slash stands on similar, nearby sites. It is also necessary to assess the hazards from fusiform rust and glaze ice, especially where slash pine is not a native species.

Even though slash pine seeding is practical on a wide variety of soil and cover

seed is apt to be submerged in water, including slowly draining surface water on uplands. Brief submergence weakens the repellents; extended soaking (several weeks or more) reduces viability. Sowing should be delayed until danger of flooding is past, or seedbeds should be mechanically elevated.

Early planning should include careful appraisal of hazards from livestock, rabbits, salamanders, and a few insects like the town ant and the short-tailed cricket. Grazing animals, often attracted from several miles by site preparation and hardwood control, are a serious threat to seedlings. Diversionary burns or temporary fencing may be necessary to prevent heavy concentrations. Town ants should be fumigated and salamanders baited before sowing begins. Local game officials may help cope with unusually high numbers of squirrels and rabbits. Strict adherence to recommended sowing rates is necessary where predatory insects are numerous.

Seedbed Preparation

Sites can be divided into three categories—classified by the seedbed preparation required.

First are sites with a fairly dense stand of cull hardwoods. Ground litter that is heavy enough to prevent seeds from reaching mineral soil should be burned. The best time to burn is in the autumn when newly fallen leaves help carry the fire. If the litter is wet at this season, it can be burned during the winter. Land-owners who lack the equipment to burn safely or are unwilling to risk fire spread-

Spot-seeding on small areas. After litter is removed seed are dropped onto soil by hand



Site preparation before seeding pays off. Six-year-old pines above were sown on disked strips — those below, same age, in a grass rough



ing to adjacent land may sow on small, raked spots, as described later.

In any case, hardwoods must be deadened soon after pines are started. On areas with brush and dense thickets of small hardwoods, however, it may be more economical to apply control treatments in advance of sowing. Disking, chopping, cutting, or chemical sprays are effective. They are sometimes followed by a prescribed burn.

In the second site category are open areas with a high water table. Such sites normally have dense stands of grass, often inter-mixed with gallberry, titi, or palmetto. Elevated seedbeds are necessary to keep seed from being killed by submergence; they also increase growth. A bedding disk-harrow pulled by a D-6 crawler tractor is often used; it makes a bed about eight inches high. Seedbeds should be prepared three to four months in advance of sowing to allow loose,

cloddy soil to settle. Dense growth of gallberry or other woody plants should be chopped and burned prior to disking.

Bedding may also be done with a fire-plow. High ridges are formed by two adjacent passes with a middlebuster plow. In a variation of the bedding technique, one company uses a bulldozer to create small mounds of soil above the level of the water that stands on the area much of the year.

Elevated, disked strips are also recommended for heavier flatwoods soils of the West Gulf region, where shallow claypans make sites wet in the winter and dry in the summer. Disking reduces competition from the heavy grass sod that abounds on such sites, reduces hazards to seed from flooding, and increases growth.

In the third site category are areas of rolling uplands where surface water and

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forest industries and landowners were marshaling forces against two outbreaks involving 16,000 acres of woodland in Calcasieu Parish. The worst area of infestation, described as "a severe outbreak of major proportions," lies in the vicinity of Sulphur. The other "potentially epidemic" area is reported to be in the Niblett's Bluff community, six miles south of Starke, on the Sabine River.

Control operations are in progress.

Direct-Seed

(Continued from page 7)

internal drainage are not problems. All that is needed in these situations is a flat, disked seedbed to reduce competition from grasses. A heavy-duty offset disk pulled by a light crawler tractor does a satisfactory job with a single pass. Strips, about 7-1/2 feet wide, are spaced 6 to 8 feet apart. Summer disking is recommended because grasses are most readily killed in hot, dry months.

Plowed furrows have not proved satisfactory on rolling uplands, except on sandy soils with good internal drainage. In furrows, seed is washed away on sloping ground, or killed by flooding on flat poorly drained sites. Furthermore, fur-

rows often start erosion unless they follow contours.

Obtaining Seed

Most landowners buy seed from commercial dealers who have facilities for processing cones and for stratifying and coating seed with repellents. Purchased seed should meet minimum standards for viability (80 percent or more), soundness (95 percent or more), moisture content (10 percent or less), and purity (98 percent or more). Seed quality should be tested in the U.S. Forest Service's Eastern Tree Seed Laboratory at Macon, Georgia. Stored seed is acceptable if viability is high. It is best to negotiate the charges for stratifying and coating seed separately from the price of seed.

Some landowners collect their own cones to obtain seed from local sources or from trees of above-average form and vigor, and specialized equipment is available for drying these small lots of cones. Also, custom processing is offered by commercial dealers for around \$0.75 to \$1.00 per bushel. Improvised facilities should not be used, because seed can be easily damaged.

Seed Treatment

Fast germination reduces the time seed

is exposed to predators and minimizes exposure to adverse weather. Consequently, it is necessary to cold-stratify lots that are slow to germinate. Stratification requirements differ from lot to lot. It is advisable to stratify samples for varying periods so as to determine the best time. If testing in advance is infeasible, a rule of thumb is to leave fresh seed unstratified and to stratify for 15 to 30 days lots that have been stored for a year or more. Stratification can be done in polyethylene bags, or in large drums in which layers of wet peat moss are alternated with layers of seed.

Several bird repellents have been recommended in the past—now there is only one. The complete repellent coating consists of Arasan 42-S to protect seeds from birds, Endrin 50-W to reduce losses to rodents and insects, Dow Latex 512-R to bind chemicals to the seed, and aluminum powder to lubricate seeds so they will flow freely through hoppers.

Five pounds of endrin, 5 gallons of Arasan, and 1-1/2 pints of latex are mixed together to form a thick liquid. About 2.2 gallons of the mixture treat 100 pounds of seed. The repellent coating can be applied to the seed in a cement mixer with no irritating or hazardous dust. The aluminum is added in the mixer as an



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overcoating after the repellents have been applied.

Endrin is highly poisonous. Personnel treating or handling coated seed should take strict safety precautions to prevent skin contact or inhalation of the dust.

Season of Sowing

The most difficult question in direct-seeding slash pine is the optimum time for sowing. Fall is the best season in some areas; winter is best in others.

General recommendations are: (1) sow in October and November on sites within 50 miles of the Gulf Coast, and in interior Florida; (2) sow in mid-February in the Upper Gulf Coastal Plain; and (3) if in doubt sow in mid-February, provided that early spring droughts are not common.

Methods of Sowing

Sowing is done by hand, or with seeding guns, hand-operated "cyclone" seeders, airplanes, helicopters, or tractor-drawn machines.

Hand seeding is good for small areas of disked strips or plowed furrows. One man can cover 15 to 20 acres per day, conserving seed by sowing only on prepared ground.

The "cyclone" hand-operated seeder is useful for broadcast sowing on tracts up to 200 acres in size. One man can sow about 20 acres a day. Its greatest utility is on scattered openings and on areas that are irregular in shape.

Spotting is a good way to seed areas smaller than 200 acres. With this method,

a man rakes or kicks away the leaves or grass from a spot about one foot square, drops five or six seeds onto the mineral soil, and lightly presses them into the soil with his foot. With 1,000 spots per acre, one man can sow two to four acres daily. Special tools have been developed for this purpose, but a fire rake and apron for carrying seed are probably adequate for most operations.

Fixed-wing airplanes and small helicopters have been used extensively in the past five years. Both give excellent distribution and precise sowing rates. They are best adapted for large operations. A light plane can cover up to 1,500 acres per day and a helicopter 3,000 acres.

Tractor-drawn machines have also come into wide use in recent years. There are now at least 10 models. All have one feature in common: they prepare a seedbed and sow in rows at a single pass. They can be broadly grouped as furrow seeders and disk seeders.

Furrow seeders have either a middle-buster plow pulled behind a tractor or a V-plow mounted at the front of a tractor. Most of the pulled models have an arrangement to bury the seed or press it into firm contact with the soil. They are best suited for sandy sites, where seeds broadcast on the surface fail to germinate adequately. Front-end models also work best on sandy soils, but in addition they operate well in moderately heavy brush. Either type can cover about 20 acres per day.

Some disk seeders sow two rows simultaneously with the same tractor used for

single-row furrow seeders, sowing about 30 acres per day. They have two separate offset disk units, each about a foot and a half wide and four to five feet apart. Seeds are dropped directly on the disked soil and pressed down by packing wheels. Sowing rates must be higher than with furrow seeders, because considerable seed is lost from silting.

Tractor-drawn implements should be carefully evaluated to determine their relative effectiveness in the soil and cover conditions of areas to be seeded.

Rate of Sowing

Optimum sowing rates vary by method of sowing, site, cover, seedbed preparation, climate, and local hazards such as livestock. Most landowners use a single rate for all situations, but some have initiated prescription sowing in which the rate is varied as experience and local conditions indicate.

In the West Gulf region, recommended rates per acre for initial trials are one pound for broadcast, three-quarters of a pound for disk seeding with light equipment, and one-half pound of furrow seeding. The rates can be reduced by about 35 percent on moist sites in the Southeast, where initial establishment and first-year survival are generally higher. When disk seeding is done with heavy machinery, rates should be increased to about one and one-third pounds per acre because the soil is left much rougher than with light equipment.

The above weights are for unstratified, uncoated seed. They assume a viability of at least 80 percent, and must be increased proportionately if germination is lower.

Some landowners have reduced sowing rates by 30 to 50 percent to cut costs and to avoid overdense stocking in favorable years. Such reductions increase the chances for failure. In dry years, first-summer mortality sometimes reaches 80 percent; the best insurance for consistent success is to maintain sowing rates high enough to withstand losses.

Inspections and Release

In initial trials, it is important to inspect seeded areas systematically during the germination period. It is the only way to learn of unexpected predators and to pinpoint the cause of failure when stocking is low. After several successful trials, these observations can usually be discontinued.

Observation stations are the best means of checking the progress of a seeding. A station may consist of 50 extra seeds sown within 18 inches of an identification stake, plus two seed spots screened to keep out predators. The number of stations depends on the size of the area: 10-15 for

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tracts up to 100 acres, and as many as 50 for areas of 1,000 acres or more. They should be checked weekly until most seeds have germinated. Germination, number of seeds and seed hulls, and type of damage should be noted.

Appraisal of overall success requires careful, systematic inventories in June or July of the first year and at the end of the first growing season. The summer inventory is essential on areas with a cover of hardwoods. These hardwoods must be deadened early in the first year, provided the inventory reveals that there are enough seedlings to justify the work.

First-year release is superior to delayed release because it results in higher survival in a dry year, and in greater pine

growth. Any conventional method of deadening hardwoods can be used except foliar sprays, which kill succulent yearling seedlings.

Costs

Costs of direct seeding depend mainly on the price of seed and the method of seedbed preparation. At a seed price of \$3.50 per pound, total costs will range from about \$4.50 per acre for broadcasting on a fresh burn beneath hardwoods to \$9.00 per acre for aerial sowing of open areas bedded with heavy mounding disks. Costs of hardwood control are extra.

Seeding costs are 40 to 70 percent less than those for planting comparable sites. Costs are least on hardwood-dominated

sites where planting is most difficult and expensive. Moreover, many sites that might otherwise remain idle because they are almost impossible to plant can be restocked economically by seeding. The risk of failure, which must be considered when appraising costs, is no greater with seeding than planting if recommendations are strictly followed.

U.S. Forest Service Research Paper SO-12 *Guides For Direct-Seeding Slash Pine*, contains additional information and instructions. Copies may be obtained free from the Southern Forest Experiment Station, T-10210 Federal Building, 701 Loyola Avenue, New Orleans, Louisiana 70113.