Improved Reforestation With Seedbed Scarification Device

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Reforestation problems with Ocala sand pine on the Ocala National Forest are discussed. A seedbed scarifier developed by a private seeding contractor resulted in much improved seed germination and seedling establishment. Seeding failures have been reduced substantially, even at reduced seeding rates.

The Ocala National Forest in central Florida contains the largest concentration of Ocala sand pine (*Pinus Clausa* var. *clausa* (Chapm. ex Engelm.) Vasey ex Sarg.) in the world. The Forest Service manages approximately 200,000 acres of this species under the even-aged management system with a 50-year rotation. Sandy, extremely droughty soils; dry winters; and hot summers combine to present difficult problems in sand pine regeneration on the Ocala.

Seed tree or shelterwood cutting is not applicable in Ocala sand pine management because the species has serotinous cones. Sand pine cones will not open unless subjected to extreme heat such as a hot wildfire. Regeneration is best accomplished by clearcutting, preparing the seedbed with rolling drum choppers in the spring or summer, and broadcast seeding in the fall.

In some areas, heavy brush remains on the ground after chopping. Brush is burned after it dries partially, but before it sheds the leaves from its twigs. Burning allows pine seeds to reach mineral soil and also destroys protective cover for seed predators. White-footed deer mice (*Peromyscus* spp.) are the principal predators of sand pine seeds and probably cause more seeding failures than any other environmental factor.

Regeneration by planting seedlings has not been done extensively because of the extremely droughty, sandy soils. Also, the Ocala sand pine variety characteristically has had poor survival when planted (*1, 2*). Although broadcast seeding has been the best reforestation method used to date, this method has had erratic results for several reasons. Weather and, to some extent, local economic conditions within the timber industry affect the rate of clearcutting and, thus, site preparation and regeneration. Site preparation acreage often fluctuates from 3,000 to as much as 6,000 acres per year. In years when larger acreages are to be regenerated, site preparation must begin 6 to 8 months before seeding. The long interval allows sprout vegetation to become established on some areas to the detriment of pine seedling establishment. Another disadvantage of chopping several months before seeding is the favorable environment that it provides for seed predators. Seed predators inhabit early successional stages and have ample time to increase their population from early spring to late fall. There is also time for the soil to form a surface crust. Direct seeding on such seedbeds is more expensive because of both the extra seed needed to compensate for high losses from predation and an unfavorable microsite for seed germination.

Foresters involved with managing the timber resource on the Ocala National Forest throught the problem of erratic seed catches could be alleviated by freshening the seedbed and covering seeds lightly with soil at the time of seeding to provide more seed- to-soil contact and more protection from seed predators. Several studies have shown marked improvement in seed germination and seedling establishment when seeds are covered (*3, 4, 5*). The Forest Service tried several techniques involving seed distribution, soil scarification, and seed coverage. A farm tractor and disk harrow were used in some areas to cover the seeds; others were chopped with a light double-drum offset chopper; and others were dragged with a "homemade" arrangement of discarded truck and car tires bolted and chained together. All

of these methods were used simultaneously with ground seeding or, in a few cases, directly after aerial seeding. All methods proved quite effective in improving seed germination and seedling establishment. However, problems such as cost, mobility, and maintenance caused these methods to be less than satisfactory when large acreages had to be covered in a relatively short time period.

To date, the most efficient and effective soil scarification and seed-covering technique was developed by a private seeding contractor, Mr. Gerald Sherrer of Fort McCoy, Fla. Mr. Sherrer, in an attempt to meet a Forest Service contract, which specified that seed be sown and covered lightly, made a sturdy, dependable scarification implement (fig. 1) that requires little or no maintenance and is relatively inexpensive. It consists of a 30-foot steel pipe, 4 inches in diameter, to which three-point hitch connections are attached. Forty-eight 1-3/8-inch diameter steel cables, cut to 28-inch lengths, are welded to the tool bar at 6-inch intervals (fig. 2). About 6 inches of the cable ends that contact and scarify the ground are frayed by separating the strands to form a fan-shaped "broom." Individual cables are sufficiently flexible to allow enough lateral and backward bending to move around stumps and other obstacles, but

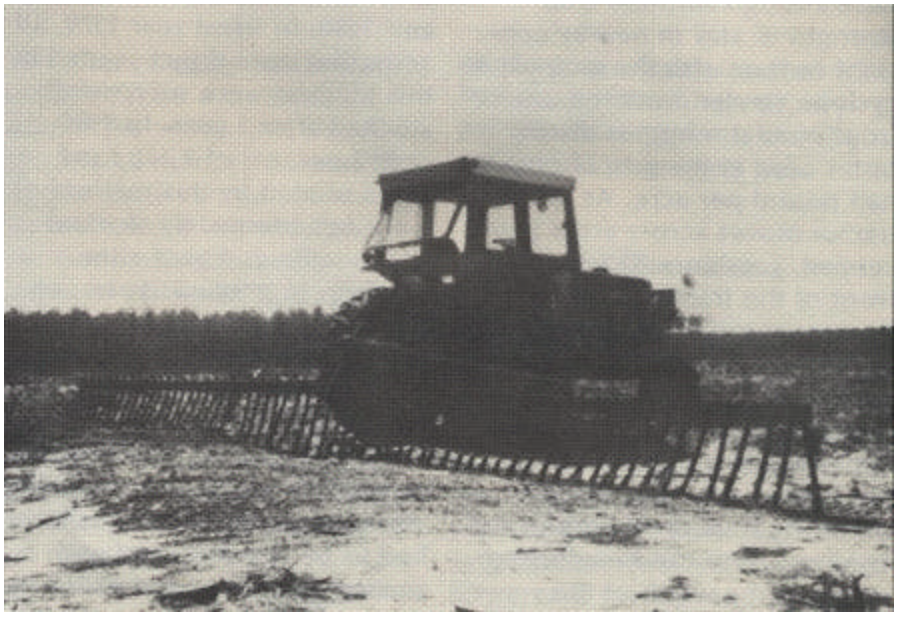

Figure 1.—*Scarification implement attached to tractor.*

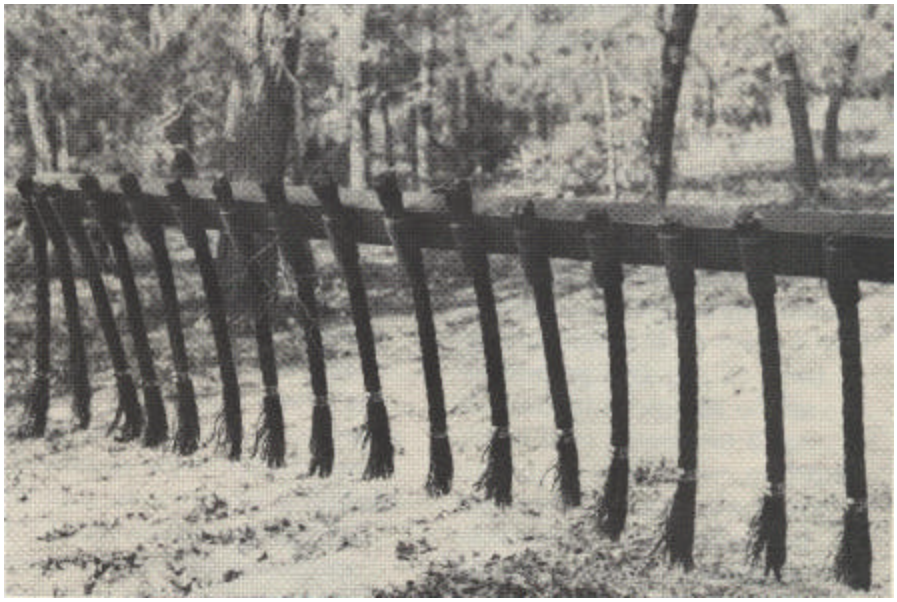

Figure 2.—*Steel cable segments on scarifier.*

have enough stiffness and strength to stay in nearby constant contact with the ground. A cyclone seeder mounted on the front of a farm tractor distributes seed at the rate of one-half pound per acre. As the tractor moves across areas being seeded, seeds are distributed in front of the tractor; and the brooms scarify the ground surface behind it, lightly covering most seeds with soil. The speed (r/min) of the seed Slinger or impeller can be controlled by the tractor operator with a rheostat. Thus, the width of the seeding swath can be adjusted to match the width of the scarifier.

This seeding and scarification method has proven to be economical, practical, and effective in obtaining satisfactory stocking of sand pine seedlings over a variety of seedbed conditions. Seeding rates were cut almost in half resulting in a savings of $10 to $12 per acre. The contract rates for this type of seeding and scarification varied from $5.50 to $7.50 per acre in 1979 and 1980. In fiscal year 1979, all acres that were direct seeded by this method were successfully stocked after 1 year. In 1980, only 2 percent of 2,149 total acres seeded by this method were not adequately stocked with seedlings 1 year after seeding. In previous years, an average of 25 percent of all acres seeded had inadequate stocking after one growing season. Year-to-year losses fluctuated greatly. These losses were costly and time consuming since areas with seeding failures had to be site prepared and seeded again at a cost of $60 or more per acre. As a result of using the improved seeding technique explained above, an estimated $50,000 was saved over a 2-year period in site preparation and seed costs alone. This does not include the value of growth loss that would normally have occurred.

Mr. Sherrer is in the process of applying for a patent on his scarifier. The device may prove to be adaptable for direct seeding of other species in other geographic areas. There is little doubt the device can improve the chances of success from broadcast seeding.

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