

SUMMER PLANTING ON STRIP MINES SUCCESSFUL

**Frank W. Woods, Ronald L. Hay,
and Gary H. Irwin**

Department of Forestry, Wildlife,
and Fisheries, Institute of Agriculture,
Univ. of Tennessee,
Knoxville, Tenn.

Strip mining for coal need not become a problem if appropriate action is taken to rehabilitate the site before, during, and immediately following the mining operation. One kind of action may be soil preparation at the immediate site where trees are to be planted. Further benefit would accrue by being able to extend the planting season into the summer. This study was designed to investigate minisite preparation for establishing tree seedlings with summer plantings on sites that may otherwise be unfavorable for plant growth.

Methods

Virginia pine (*P. virginiana* Mill.) and pitch pine (*P. rigida* Mill.) were used. Virginia pine has proven to be useful for strip-mine revegetation previously. Pitch pine performance on mine spoil is relatively unknown but it was chosen because of its tolerance of low-quality sites.

All seedlings were grown under the direction of personnel at the Institute of Mycorrhizal Research and Development, USDA Forest Service, in Athens, Ga. Roottrainers (Hilson size) were filled with a mixture consisting of 4 parts milled pine bark, 1 part vermiculite, and 1 part sewage sludge. All seeds were germinated in seed flats and seedlings were placed, one to a roottrainer, with radicles appropriately

positioned. They were then inoculated with a spore infusion of *Pisolithus tinctorius*. Seedlings were grown for 3 months in roottrainers prior to transplanting on the mines.

Two planting sites were established, one site had been mulched and seeded with grass (grassed) and one had not received any treatment (bare). Eight plots were established on each site, each with two replications of both planting treatment. Forty-nine seedlings were planted on each plot at a spacing of 1 by 2 meters.

Minisite preparation was made by removing about 50 cubic decimeters of spoil with auger where each tree was to be planted. Spoil was placed in a cement mixer and combined with amendments at the rate of 12 parts spoil to 4 parts pine bark and 1 part vermiculite. Lime and mineral fertilizers were added to raise the level of fertility to approximately that of a good agricultural soil. After returning the amended spoil to the hole, seedlings were planted. Soil analyses were made at laboratories of the Georgia Extension Service.

Control seedlings were planted in dibble holes without the benefit of site preparation.

Seedling examinations and survival counts were made in March, 9 months after planting.

Results and Discussion

Pitch pine survival was better on minisite areas than for controls on both bare and grassed sites (table 1). For both sites, minisite survival was at least 50 percent greater than for controls. Results for Virginia pine were similar and only slightly less dramatic. When average values for both species on both sites are compared, it is evident that seedlings planted on minisite areas had far better survival than seedlings planted without minisite treatment.

Frost heaving was a severe problem for controls of both pitch pine (69 percent) and Virginia pine (53 percent) planted on the bare area, while values for minisite plantings were less than 9 percent for both species (table 2). The value of prepared minisites in preventing the formation of a "water pocket" around seedling roots on bare sites, which provides conditions for frost heaving, can hardly be overestimated. Seedlings planted in grassed sites had few frost heaving problems.

Relatively few dead seedlings were found, the highest percentages being 18 percent for pitch pine controls planted in the grassed area and 9 percent for Virginia pine controls planted in the grassed area. This is probably a reflection of the severe competition from the abundant grass cover. Fewer than 4 percent dead

seedlings were found in all other treatments on both sites.

It is significant that summer plantings of pines on strip-mined sites can be successfully established if the site is mini-prepared and if tubelings are used. Seedlings were irrigated one time, immediately after they were planted. However, a heavy rain during the first night negated any beneficial effects the irrigation may have had. The usual August dry period occurred to provide moisture stress for all seedlings.

When containerized seedlings were first produced it was thought that the planting season could be extended beyond the 2 or 3 months normally used. We now believe tree planting on strip mines is feasible during summer months, but it should be preceded by a heavy straw mulch bound with a "sticker," such as an asphalt emulsion. The mulch would protect spoil from the erosive effects of precipitation and would form countless small dams to further prevent erosion. Mulching in this manner should be heavier than would be considered normal for grass seeding, because it must remain intact long enough for tree seedlings to become well established. If it is necessary to plant on grassed sites, it would be desirable to kill the grasses and other vegetation with a biodegradable herbicide several

weeks prior to planting in a circle 18 to 24 inches in diameter.

From a practical standpoint, it would be desirable to use pre-manufactured slow-release fertilizer pellets with a complete soil amendment.

Table 1.—Pitch pine and Virginia pine survival on strip mine spoils 9 months after planting

Site conditions	Treatment	
	Minisite	Control
	----- (percent)-----	
Pitch pine		
Bare	84	26
Grassed	84	40
Average	84	33
Virginia pine		
Bare	86	39
Grassed	81	50
Average	83	44
Average	83	39

Table 2.—Frost heaving of pitch pine and Virginia pine during the first winter following planting

Site conditions	Treatment	
	Minisite	Control
	----- (percent)-----	
Pitch pine		
Bare	8	69
Grassed	0	1
Virginia pine		
Bare	6	53
Grassed	0	4