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COMPARISON OF FIVE WOODY SPECIES FOR RECLAMATION OF AN UPPER COASTAL PLAIN SPOIL BANK

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ABSTRACT.—Third-year survival and height are compared for autumn olive. European black alder, flowering crab apple, sawtooth oak, and Virginia pine on a sandy clay loam spoil bank in South Carolina. Flowering crab apple and sawtooth oak exhibited the best survival, while autumn olive and European black alder had greater height growth. Only European black alder failed to become adequately established. Autumn olive and sawtooth oak were judged most successful under the conditions of the study. Fruit was set by autumn olive saplings during the second growing season.

Keywords: *Alnus glutinosa, Elaeagnus umbellata, Malus floribunda, Pinus virginiana, Quercus accutissima.*

The National Environmental Policy Act (NEPA) requires reclamation of drastically disturbed sites. Road and dam construction, surface mining, and landfill operations have resulted in the creation of large disturbed sites throughout the Southeast. Site characteristics and reclamation requirements vary with soil, time between disturbance and reclamation, and type, degree, and depth of disturbance. While current policy is generally to reclaim sites immediately after disturbance, a backlog of pre-NEPA sites exists. The objective of this research was to evaluate and compare the performance of five woody species planted on a 20-year-old spoil bank in the Upper Coastal Plain of South Carolina.

METHODS

The study area is located at the Savannah River Plant in Bamwell County, South Carolina, on land administered by the U.S. Department of Energy. Vaucluse and Blaney soil series predominate. The spoil bank was formed during excavation of a large, 25-foot-deep water-retention basin. The spoil material was inverted as it was removed and placed on the surface of the original groundline. The resulting bank ranged in height from approximately 4 to 12 feet and was approximately 120 feet wide. The upper stratum (including the root zone) is sandy clay loam with no organic matter and a surface slope of 10 percent. After 20 years the bank was devoid of vegetation except for two or three small, naturally seeded loblolly pines (*Pinus taeda* L.) per acre.

The study was installed in May 1977. The bank was first terraced on contours at 50-foot intervals, and disked to a depth of about 8 inches. Fertilizer (S-8-8) and agricultural lime were broadcast at rates of 500 and 1,000 pounds per acre, respectively, then disked into the spoil.

Seedlings (I-O) of autumn olive (*Elaeagnus umbellata* Thumb.), flowering crab apple (*Malus floribunda* Sieb.), European black alder (*Alnus glutinosa* (L.) Gaertn.), sawtooth oak (*Quercus accutissima* Carruthers), and Virginia pine (*P. virginiana* Mill.) were hand planted immediately after site preparation in a completely randomized experimental design with six replications. Each experimental unit was a square plot of 49 seedlings planted at 7-foot spacings in both directions. Seedlings were watered at planting and I week afterward. No other cultural treatments were applied. Survival and height data were collected in September 1979—three growing seasons after planting.

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RESULTS AND DISCUSSION

Analysis of variance showed significant differences (P = 0.01) in both survival and height of the five species. Duncan's multiple range test[3] showed significant differences (P = 0.05) in survival among three distinct groupings (table 1), with highest survival for fiowering crab apple and sawtooth oak and lowest for European black alder.

Differences in height growth were less marked than for survival (table 1). Differences among flowering crab apple, sawtooth oak, and Virginia pine were not statistically significant, but autumn olive was significantly taller than all three of these species and European black alder was significantly taller than flowering crab apple. On the average, autumn olive was twice as tall as flowering crab apple.

Of the five species, only European black alder failed because of poor survival despite its good growth rate. Survival of all other species averaged at least 70 percent. Although flowering crab had the least height growth, it attained a marginally acceptable average size after 3 years in the field. Some of the variation in survival among species may have resulted from the late planting when hot, dry conditions prevailed. The recommended time for planting is winter, before dormancy is broken. For all species except European black alder, results indicate a tolerance for adverse conditions frequently encountered on reclamation sites. However, additional trials with European black alder, planted during the winter months, are warranted before this species is considered unsuitable for reclamation purposes.

Considering both survival and height, autumn olive and sawtooth oak show promise as species for reclamation under conditions similar to those of this study. Although autumn olive had only 70 percent survival, it outgrew all other species. This species also produces fruit for wildlife, beginning in the second growing season after planting. Sawtooth oak exhibited midrange growth and very good survival: it too would eventually produce fruit and cover for a variety of wildlife.

[3]Steel, Robert G. D., and James H. Torrie. 1960. Principles and procedures of statistics. 481 p. McGraw-Hill, New York.

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Table 1.—Survival and height of five species after three growing seasons on a sandy clay loam spoil bank

Species	Survival		Height (mean)
	Range	Mean	
	..... *Percent*		*Inches*
Autumn olive	59–82	[1]70b	83a
European black alder	8–55	29c	68ab
Flowering crab apple	84–92	90a	42c
Sawtooth oak	71–100	92a	59bc
Virginia pine	43–92	71b	48bc

[1]Means followed by the same letter are not significantly different at the 0.05 level.