A LOOK AT TREES AND RECLAMATION IN GEORGIA

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Abstract.--The author briefly reviews Georgia's land reclamation requirements when rehabilitating mined lands with trees as one's reclamation objective. Techniques used to establish two plantations are used to raise several important issues which, if resolved, can result in increased tree planting and lower land reclamation cost.

INTRODUCTION

Tree planting was recognized as a valuable land reclamation practice early in the development of Georgia's program for rehabilitation of mined lands. Original Land Reclamation Rules, promulgated January 19, 1969, established forestry as one of several objectives which a mining operator could choose when reclaiming lands affected by surface mining.

Georgia's original rules involving forestry specified: "An approved cover of trees must be established on affected areas. The character and nature of the overburden (soil fertility, pH, drainage, etc.) must indicate that same will properly support growth of the species selected for planting. On lands where tree crops are planted, a minimum of 500 uniformly distributed trees per acre must be established. No fail spots larger than one-fourth acre in size will be permitted."

In 1971, Georgia's Land Reclamation Rules were amended. Forestry was still an allowable reclamation objective and similar requirements prevailed as to the selection of species for planting, number of trees per acre to establish, size of fail spots, etc. An important addition to the Land Reclamation Rules concerning forestry was: "When affected lands are being developed for forestry the operator will, in addition to trees, establish a protective vegetative cover of some other type plant, such as grass, to assist in preventing excessive erosion pending the development of forest tree seedlings into trees."

This paper raises certain issues which are important to the reclamation of mined lands, using forestry as one's major reclamation objective. To accomplish this, a brief case review of two loblolly pine *(Pinus taeda)* plantations established by mining companies to fulfill their legal reclamation obligation is presented. Planting techniques used to establish the plantations were similar, as each site was machine planted. Cultural practices used varied and are shown in Table 1.

Table 1.--A comparison of cultural practices used by two mining companies when reclaiming mined lands using trees

Practice	Plantation A	Plantation B
Site preparation	Backfilled and graded to rolling topography.	Backfilled and graded to rolling topography
Type growing media	Low grade, kaolin-type clay and white sand. Heterogenous in nature.	Best available spoil - yellow sandy mixture.
Site preparation:		
Subsoiling	None.	18 inches.
Fertilization	None at seedling planting.	500 lbs. 6-12-12, 500 lbs. superphosphate, 1 ton dolomitic lime and 100 lbs. N. prior to seeding ground cover.
Vegetative cover	No type ground cover established prior to tree planting.	A ground cover consisting of common Bermuda, lovegrass and sericea lespedeza 1/ seeded prior to planting tree seedlings.
Post-planting treatment	6 ozs. 10-10-10 per seedling. 400 lbs./acre 10-10-10 in 1972, 200 lbs./acre of 20-20-20 in 1974, 1977 and 1979.	500 lbs. 10-10-10 one year after seeding.
Fertilization frequency	Five varied applications.	Once following planting.

1/ common Bermuda grass *(Cynodon dactylon)*, lovegrass *(Eragrostis beauv)* and sericea lespedeza *(Lespedeza cuneata)*.

PLANTATION A

Company A, in their initial reclamation work in Georgia, chose to develop mined lands for forestry purposes. This company established loblolly tree seedlings on a previously mined area during the fall of 1969. Prior to planting, lands were backfilled and graded to a gentle, rolling topography but with long, uninterrupted slopes. No protective ground cover was established. The planting media consisted primarily of white sands and kaolin-type clays and was primarily void of plant nutrients (see Photo 1). To obtain growth of seedlings, it was necessary that each individual tree be fertilized. This was initially accomplished using crews of laborers to place 6 ozs. of 10-10-10 about 6 inches from the stem of each seedling. Ground operated fertilizer spreaders applied 400 lbs./acre of 10-10-10 in 1972. Aerial applications of fertilizer were made at 200 lbs./acre of 20-20-20 in 1974, 1977 and 1979.

Photo 1.--Plantation A - Loblolly pine plantation established on kaolin mined lands to fulfill forestry reclamation objective. Note lack of protective vegetative cover, growing media and presence of erosion. Photo taken 10/73.

Statistical data on development of Plantation A is shown in Table 2. Diameter growth averaged approximately .5 inch per year. Average height growth was 2.8 feet annually. Forest floor litter, after 11 years and where present, averaged approximately one-half inch in depth (see Photo 2). Gullying by erosion from improperly managed surface runoff was present and is illustrated in Photo 3.

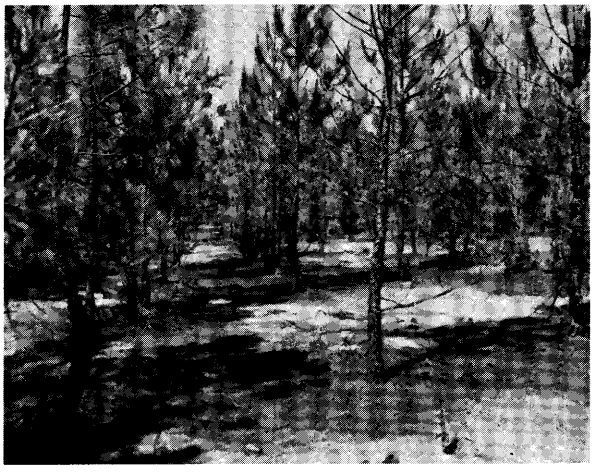

Photo 2.--Plantation A - showing growth and development of planted loblolly pine during July, 1980. Note ground cover resulting from pine straw.

Photo 3.--Plantation A - showing typical gully resulting from surface runoff erosion. Photo taken 7/80.

Table 2.--Statistical data for Plantation A showing average D.B.H., height and number established stems per acre through July, 1980.

D.B.H.	Height	Stems/Acre
4	25	40
5	29	37
6	31	43
7	35	45
8	39	15
9	44	2
10	42	6
	Total	188

Average D.B.H. - 6"
Average Height - 31'

PLANTATION B

Company B elected to reclaim 600 acres of previously mined land. This company's site was graded to a rolling topography, blended into the existing landscape and planted to a permanent vegetative cover of common Bermuda grass, lovegrass and sericea lespedeza.[1/] Loblolly pine tree seedlings were planted during the spring of 1972, the first planting season after the establishment of the ground cover (see Photo 4). A commercial fertilizer (6-12-12) in the amount of 500 lbs. per acre and 1 ton of lime (dolomite), along with 500 lbs./acre of superphosphate and 100 lbs. of nitrogen, were applied prior to seeding of the permanent vegetative cover. A top dressing of 500 lbs./acre of 10-10-10 was applied about one year after seeding of the site. No additional fertilization was given to forest tree seedlings after application of the top dressing. The pine trees developed in a satisfactory manner, were never chloratic and have made acceptable growth. Trees involved have been windfirm and a minimum amount of erosion occurred on the site.

Photo 4.--Plantation B - loblolly pine trees established on mined lands in protective cover of sericea lespedeza. Photo taken 7/80.

Information concerning development of Plantation B is shown in Table 3. Diameter growth averaged .6 inch annually, while average hieght growth was 3.5 feet per year. The forest floor under this plantation, after 8 years, was completely covered with litter that averaged 1 inch in depth (see Photo 5).

Photo 5.--Plantation B - showing typical view under canopy during 7/80. Note density of protective vegetative cover and loss of same due to shading by canopy. Site had 100% cover of litter resulting from leaf and needle fall, with minimum erosion.

Table 3.--Statistical data for Plantation B showing D.B.H., height and number established stems per acre through July, 1980.

D.B.H.	Height		Stems/Acre
4	26		114
5	28		98
6	30		46
7	32		14
		Total	272

Average D.B.H. - 5"
Average Height - 28'

DISCUSSION

Several important land reclamation and forestry issues are suggested when one compares management techniques used to establish the two pine plantations. Silvilculturists would be interested in a comparison of the economics of the two cultural methods employed to establish trees and grow same to their present state. This paper has not attempted to examine the cost of management techniques involved. If one should attempt a cost-benefit ratio study, it must be remembered that a normal forestry site is not

present but one on which a legal land reclamation obligation exists to rehabilitate lands drastically disturbed by mining. The legal obligation regarding the reclamation of mined lands raises the question of "how far can one go 'cost wise' applying various silviculture techniques to reclaim affected acres using forestry as a reclamation objective?"

In Georgia, tree planting on mined lands has been minimized since the Land Reclamation Rule change requiring that a permanent vegetative cover be established when trees are planted. It is accepted land reclamation procedure to require the planting of a ground cover with trees. Reclamationists have observed sites being reclaimed where erosion of bare lands under young planted trees was heavy and visually rendered a site unacceptable.

Most Georgia based mining companies assumed the attitude that it was advantageous to their operations to reclaim mined lands for pasture or grasslands rather than forest land. By following this course of action in conducting reclamation work, mining operators were not legally obligated to the State to establish tree crops and were free to conduct their tree planting activities at a later date following reclamation and release of lands involved.

Ground cover requirements for State land reclamation programs and miner's attitude resulting from same spawned an important issue regarding tree planting activities on reclaimed lands. Forest managers and reclamationists should determine the long-range economics and environmental impact of requiring a ground cover on all sites when trees are planted. Study is needed, when forestry is one's reclamation objective, to determine how much erosion and gullying one can tolerate and yet produce and harvest an acceptable tree crop. When reclaiming mined lands with trees, what period of time should one's reclamation objective be confined to? Is it proper for one to consider a short term land reclamation objective or extend reclamation to include a reasonable forestry rotation?

Twelve years ago, when I officially entered reclamation work in Georgia, I was a staunch advocate of grass first, then trees. Since I have had the privilege of observing the two plantations previously discussed, my support of the "no grass-no trees" policy is failing.

I am of the opinion that reclamation cost to industry can be minimized and increased tree planting on mined land realized if we reevaluate our land reclamation specifications. I'm convinced trees "over the long term" will accomplish more reclamation than they have been given credit for.

In conclusion, research organizations are encouraged to examine the several problems mentioned. In summary, they should provide long-range guidance to issues such as:

1. Should all reclaimed sites have a vegetative cover established when planting trees?

2. Can tree plantations established on mined lands sufficiently stabilize a site so that it can be classified as reclaimed and at what age?

3. What period of time can be considered reasonable when using forestry as a reclamation objective?

4. How much erosion, including gullying, can one accept on a reclaimed site when forestry is the reclamation objective?

5. How may visual or aesthetic problems which appear early in the life of a forest tree plantation be minimized?

6. Will tree seedlings and heavy straw mulch produce an acceptable reclaimed site?

In Georgia, we do not know the answers to questions raised. We certainly hope work will be initiated to find solutions which will stimulate tree planting during mined land reclamation activities. After all, one realizes little financial gain from grasslands without livestock; but planted trees will yield future dollars.