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PLANT COVER AND SOIL EROSION FOLLOWING SITE PREPARATION AND PLANTING IN EAST TEXAS

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Because disturbed soil areas contribute sediment to streams, some environmentalists have suggested that forestry operations may be important sources of water pollution. Concern centers especially on intensive site preparation where the soil may be exposed temporarily with little vegetative cover. Very little research has been reported on the rates of erosion from such short-time disturbances on Coastal Plain sites.

To provide preliminary information on trends of erosion and revegetation, 20 plots were installed in May 1974, on a loamy sand area in Nacogdoches County, Texas. Logging debris and residual trees had recently been pushed into windrows after removal of a pine stand in 1972. Windrows were roughly on contours and about 10 feet wide and 100 feet apart. Such clearing disturbs the ground surface more severely than any other method of site preparation commonly used in the Gulf Coastal Plain. Light rains had partially settled the surface, which was bare and rough with numerous minor depressions affording considerable detention storage. Plots were located to sample the range of slope positions on the area, but there was no attempt to place them proportionally with respect to erosible or depositional land area.

At each plot two iron stakes were driven 6.6 feet apart roughly along a contour, affording supports for suspending a beam from which 10 vertical distances to the soil surfaces were measured. The stakes also marked the centerline of one-half milacre quadrat (6.6 x 3.3 feet) on which vegetation was evaluated. The slope was measured at each quadrat.

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In mid-May 1974, profiles between stakes were measured on each plot, the proportion of each plot covered by vegetation was estimated to the nearest 5 percent, and the species of plants present were recorded. These determinations were repeated in mid-September 1974, and again in late January 1975. At the latter remeasurement, profile data could be obtained on only 11 of the 20 plots because stakes on nine plots had been disturbed by tractors used for tree planting.

RESULTS AND DISCUSSION

The loamy sand soil appeared bare when plots were installed, and was estimated to be 3.4 percent covered by vegetation; no evidence of erosion was then visible. By September 15, 18.77 inches of rain had fallen, leaving a more compacted surface and considerable evidence of soil movement. Profile measurements at that time showed an average soil level 0.12 inches lower than in May (Table 1). Disregarding any possible settling, this reflects the resultant of net erosion at some points and net deposition at others, depending mainly on microtopographic position. By January 31, 1975, after 21.38 more inches of rainfall, the level of the soil had recovered 0.06 inches of this loss (estimated from 11 intact profiles) and net average erosion for the two periods was only .05 inches. These data substantiate ocular observations that although erosion was moving some soil within the area, practically none was being moved off the watershed.

The 0.12 inch indicated erosion loss between May 14 and September 15, 1974, represents about 16.1 ± 4.9 cubic yards or 16.3 ± 5.4 tons per acre[2], and because it includes some settling, is probably a maximum estimate. Erosion of this extent is consistent with reported rates for cultivated land of 14 to 60 tons per acre per year (Blakely et al., 1957).

Cessation of mean net erosion prior to January 31, as indicated by the measurements of that date, appears to be related to the recovery of vegetation during the summer. By September, 58 percent of the plot area was covered with vegetation, about half of which consisted of grasses. Two groups of grasses were among the three taxa most commonly counted on the quadrats in the fall (Table 2). Panic grasses (Panicum sp.), purple crabgrass (Digitaria violascens Link.) and poorjoe (Diodea teres Walt.) were found on most plots. Of other species, only Lespedesa (Lespedesa sp.) was found on more than half of the plots. Woody sprouts occurred 25 times (1.25 stems per half milacre), but they occupied a very minor place in percent of area covered.

The January estimates reflected more than a 50 percent decline in plant cover due to cold weather but persisting roots and dead plant parts evidently continued to afford protection against erosion.

If planned follow-up examinations confirm the evidence of these first-year observations, soil loss due to intensive site preparation for regeneration on deep permeable soils in this region should not be excessive. Some erosion and deposition occur within the disturbed area, but little or none is moved off the watershed.

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[2]Estimates of weight based on 75 pounds of soil in one cubic foot.

LITERATURE

Blakely, B. D., J. J. Coyle and J. G. Steele. 1957. Erosion on cultivated land. pp. 290 - 307 In Soil, 1957 Yearbook of Agriculture. U. S. Dep. Agr., Washington, DC.

Figure 1. Plots were established and first measured within a week after the site was prepared by bulldozer equipped with root rake.

Table 1. Vegetative cover and erosion.

Plot No.	Slope	Vegetation			Mean change in soil surface level[1]	
		May 14 1974	Sept. 15 1974	Jan. 31 1975	May to Sept. 1974	Sept. 1974 to Jan. 31 1975
	Percent	Percent of area covered			inches	
1	21	2	27	4	-0.5	—
2	21	1	78	1	-0.2	—
3	12	.5	57	9	-0.2	-0.0
4	10	4	70	60	-0.2	+0.1
5	5	1	52	2	-0.2	-0.3
6	7	17	53	8	0.0	-0.1
7	14	1	74	6	0.0	+0.1
8	14	5	66	75	-0.1	-0.1
9	14	2	72	15	-0.5	-0.1
10	12	0	26	10	-0.4	—
11	5	7	75	2	-0.1	—
12	8	0	14	12	+0.5	+2.5
13	23	1	39	20	-0.2	—
14	5	5	71	—	-0.1	-0.1
15	5	2	55	10	-0.1	—
16	19	2	42	8	-0.2	—
17	13	13	54	2	+0.1	+1.1
18	7	0	90	75	-0.0	—
19	12	2	57	8	-0.1	-2.2
20	12	2	85	85	+0.1	—
$\bar{x}$	12.0	3.4	58.0	21.7	-0.12	.06
S	5.7	4.4	20.4	28.3	.16	.06
Sx	1.37	1.0	4.6	6.5	.04	.34

[1]Each value is the mean of 10 measurements equally spaced along a 6.6 foot transect. Stakes on nine transects had been disturbed by planting tractors prior to Jan. 31

Table 2. Plant occurrence on clearcut plots, September, 1974.

Common name	Scientific name	Number of plots where found
Black eyed Susan	Rudbeckia hirta L.	1
Blackgum	Nyssa sylvatica Marsh.	2
Bracken	Pteridium aquilinum Kuhn.	4
Crabgrass (purple)	Digitaria violascens Link.	19
Dewberry	Rubus trivialis Michx.	2
Dogwood	Cornus florida L.	2
Euphorbia	Euphorbia spp.	4
French mulberry	Callicarpa americana L.	1
Goatweed	Croton capitatus Michx.	3
Grape	Vitis spp.	2
Greenbriar	Smilax spp.	5
Hickory	Carya spp.	1
Horsemint	Salvia spp.	5
Indian grass	Sorgastrum nutans (L.) Nash.	3
Lespedeza	Lespedeza spp.	13
Nightshade	Solanum spp.	3
Nut grass	Cyperus rotundus L.	2
Oak	Quercus spp.	3
Oxalis	Oxalis spp.	3
Panic grass	Panicum spp.	20
Persimmon	Diospyros virginiana L.	2
Poke	Phytolacca decandra L.	4
Poorjoe	Diodea teres Walt.	18
Ragweed	Ambrosia artemisiifolia L.	3
Sassafras	Sassafras albidum (Nutt.) Nees.	5
Sensitive plant	Schrankia unicinata Willd.	1
Sumac	Rhus glabra L.	4
Sweetgum	Liquidambar styraciflua L.	5
Tephrosia	Tephrosia spp.	1
Woodbine	Psedera spp.	6