USING TREES ON RECLAIMED MINED LANDS
IN SOUTHERN ILLINOIS

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Abstract.--In southern Illinois Peabody Coal Company included reforestation as a part of its ten year plan for the reclamation of acid mine spoil. Hand planted trees had highest survival rates. The species that proved most successful were black locust, autumn olive, sweetgum, black alder, loblolly pine, and river birch.

Tree planting on surfaced mined land in Illinois began in the spring of 1920. Approximately 9,000 mixed pines and hardwoods were planted on a mine site near Danville, Illinois. However, it wasn't until the 1930's that mined lands were planted to trees on a large scale. In 1937 a cooperative program was initiated between six coal companies and the Illinois Division of Forestry. This initial agreement resulted in over a quarter of million trees in the spring of 1938.

In 1939 the Illinois Coal Strippers Association made an arrangement with the Illinois Forestry Division to plant an equal amount of acreage that was stripped annually by the coal companies. This resulted in the planting of over seven million trees from 1941 to 1945.

Plants of trees on Peabody Coal Company's Will Scarlet Mine began in 1956. This was five years prior to Illinois' first reclamation law effective January 1962. At first, large blocks of pines were planted, chiefly loblolly pine (Pinus taeda) and Virginia pine (Pinus virginiana). These plantings were chiefly for esthetics and for covering the un-reclaimed mine spoil.

After 1961 a larger variety of species was used. The species included black locust (Robinia pseudoacacia), sweet gum (Liquidambar styraciflua), sycamore (Platanus occidentalis), river birch (Betula nigra), red oak (Quercus rubra), silver maple (Acer saccharinum) and white pine (Pinus strobus). Introduced species included such trees as autumn olive (Elaeagnus umbellata), and European black alder (Ulmus glutinosa). At this time the Open Cut Land Reclamation Act (OCLR) of 1962 came into affect.

This law made no requirements on grading other than firelanes be constructed to a minimum width of ten feet and be located every 440 yards. A minimum number of 680 trees per acre was required to be planted. No sampling procedure was required and, after ten years the reclamation bond was released even if no tree survival was evident.

In 1968 the Surface-Mined Land Reclamation Act (SMLR) was passed. This act was more stringent than the first (OCLR) in regulating survival rates of 450 trees after the second growing season. A sampling procedure was also implemented. Fire lanes of 25' width had to be constructed at 440' intervals.

The Surface-Mined Land Conservation and Reclamation Act (SML) was implemented in 1971. With the passing of this act (SML) the pendulum swung from forestry practices to the establishment of permanent pastures on the reclaimed mined lands. The reason for this change away from trees was the new grading requirements. The grading requirements passed in this act stated that all exterior slopes must be graded to 30% and interior slopes graded to 15%. With the elimination of the spoil ridges, farm machinery could traverse the entire area, making it much easier to establish permanent pasture as a vegetative cover. This method was much more favorable, especially to the larger area surface mines which where affecting 50 to 400 acres annually.

In 1974 Peabody Coal Company's Will Scarlet Mine began a ten year plan which would reclaim 2600 acres of acid mine spoils. This included a large watershed which was located adjacent to the South Fork of the Saline River. A multiple land use for this area was designed with four categories. These were forestry, wildlife, livestock management and recreation. This land use plan had two purposes: to rid the area of an environmental hazard of acid mine drainage and to create a higher and better land use.

Tree species used for this project were selected for the following criteria: 1) commercial forest; 2) acid tolerance; 3) wildlife, and 4) esthetics.

Those trees selected for their commercial desirability were black walnut (Juglans nigra), red oak, yellow poplar (Liriodendron tulipifera), sycamore, sweet gum, cottonwood (Populus
deltoides), and southern yellow pines (Pinus spp). Site selection for these species was determined from those spoils that had the highest soil pH. These species were planted on 6 x 7 spacing giving a planted seedling population of 1037 trees per acre. All species were mixed during planting giving a heterogenous stand.

Both mechanical and manual planting was employed the first three years. The fourth year all trees were planted manually. Those areas planted by hand tended to have the highest rate of survival. The loose shaley material of spoil along with the tendency to get J-rooting of seedlings necessitated the elimination of the mechanical tree planters.

Since over 90% of the pre-law mined lands in the Will Scarlet Mine area was created from strip spoils of the Davis and Dekovan seams, high acidity problems developed. These two coal seams are very high in sulfur and the overburden covering them is also very acidic. Soil test on some spoils showed a pH from 2.8 to 3.4 with total sulfur exceeding 8%. Therefore, in grading of these pre-law spoils new unleached toxic materials were brought to the surface. To counteract this acidity, 12 to 30 tons per acre of agriculture limestone were broadcast spread. After the areas had been limed they were disced. Acid tolerant tree species were then selected for planting. These tree species included black locust, European black alder, river birch, autumn olive and bristly locust (Robinia hispida).

The plant methodology of these acid tolerant species included small blocks and strips. We found that both black locust and autumn olive planted as close as 4' x 4' spacing on steep slopes created very good erosion barriers.

In the planting schematic high emphasis was made on establishing heterogenous stands of hardwoods planted in strips or bands. These bands were layed out in such a manner as to create as much wildlife "edge" as possible. The contour of the topography was followed in using these bands much in the same manner as contour farming is practiced. Open strips between the tree bands were left and were seeded to grasses and legumes.

Where possible, the outer perimeter of the hardwood strips was planted to loblolly pine, white pine, autumn olive and black locust. Cypress (Taxodium distichum) was used extensively to border the small ponds and the longer lakes.

Screenings of loblolly pine and white pine have been planted around the exterior perimeter mainly for aesthetic purposes. Volunteer cottonwoods, willow, and river birch have come in on most of the areas planted.

The species numbers and stocking rates per acre reflect the adverse conditions encountered on this one particular area.

Tree mortality during the first year is extremely high. In three of the past five years extremely dry weather has followed the spring planting season. Droughty conditions coupled with the highly acidic spoils have greatly reduced survival. Therefore, large tree populations of over 1000 trees per acre have been planted. In 1979 the most favorable spring of the past five occurred. After one year's growth, mortality was recorded at its lowest. Survival for this particular year was 63%, giving approximately 600 live trees per acre after one year. The spring of 1977 survival was as low as 13% of the total trees planted. An extremely dry spring, coupled with receiving planting stock late from the nurseries, led to this high mortality.

The success in 1979 was attributed to three factors: All areas to be planted were seeded to cover crop of Balboa rye the preceding fall. Planting stock was obtained from the nursery in February, and all planting was completed by the end of March. During the spring and summer growing season adequate precipitation fell.

Sampling procedures to determine survival were carried out by running transects of 100 tree counts and averaging the number of transect lines. No statistical averages or other computations were made.

Planting methods consisted of mechanical, manual and direct aerial seeding.

Mechanical planting was accomplished by using a double and single row tree planter pulled behind a D-4 cat tractor. This method of planting was eliminated due to the poor survival that resulted from it. The reason for this was the failure to close the trench properly, letting the tree roots dry out. Also a high degree of J rooting was caused because the shaley soils did not permit the trenching plow to penetrate deep enough.

A higher degree of survival was obtained from using manual hand planting. Forestry technology students from Southeastern Illinois Junior College were employed and paid on a per tree basis.

In the spring of 1980 an attempt was made to aerial seed black locust. Two pounds of seed to the acre were aerial broadcast using a helicopter. Inaccessible areas such as high walls and final cut spoils above water impoundments were seeded in this manner.

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The black locust seed was scarified prior to being aerial seeded. The method for scarifying was soaking the seed in weak solution of sulfuric acid for forty-five minutes and rinsing with water and baking soda. At this time no seedlings have been noticed on the areas that were aerial seeded.

In 1978 fertilizer pellets of 18-8-3 analysis were used. A pellet was placed adjacent to each tree as it was manually planted. Both black locust and loblolly showed some response to this fertilizing. No specific data was correlated on these plantings other than visual observations.

On one site of black locust, the trees on one side of an access road were fertilized while the trees on the opposite side of the road were not. The fertilized trees seemed to have a higher rate of survival and greater degree of total height. Some individual trees grew to heights of six feet the first growing season.

Loblolly pine showed also a higher degree of survival with fertilized trees. However, severe infestation of Nantucket Pine tip moth (Rhyocionia frustrana) on both fertilized and unfertilized trees greatly surpressed growth.

SUMMARY

1) The first planting of trees in Illinois began in the spring of 1920 and by 1938 a cooperative program had materialized with coal companies and the Illinois Division of Forestry.

2) Tree planting on voluntary basis began on Peabody Coal Company's Will Scarlet Mine in 1956. Loblolly and Virginia Pine were the principal species used.

3) In 1961 a larger variety of both hardwoods and pines were used.

4) Earlier reclamation laws made forestry a higher priority in the reclamation strip mined lands.

5) In 1974 a ten year program was initiated at the Will Scarlet Mine to clean up 1600 acres of pre-law spoils. Due to the high acidic nature of the regraded spoils, large amounts of agricultural limestone was applied.

6) Species in the clean up program were chosen for: commercial forest; acid tolerance; wildlife, and esthetics.

7) Trees were planted both mechanically and manually. A higher degree of survival was accomplished by manual plantings.

8) Aerial seeding and fertilizing have both been attempted. No favorable results as of yet have been attributed to either practice.