

The Indiana Coal Industry Surface Mining Reclamation Program

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Abstract

There had been 101,178 acres disturbed in Indiana in the process of surface mining for coal as of June, 1970. Over 3,000 acres are currently being disturbed annually.

The Indiana coal mining industry operates the oldest continuous surface mining revegetation program in the country. Beginning in 1926, sixteen conifer and 28 broadleaf tree species and other perennials have been planted. The future trend of vegetation type is shown to be an increase of forage production and a decrease of forest plantation. Some surface mined lands have been successfully reclaimed for tillable crop production. Some implications of the current (1967) reclamation law remain unresolved.

Introduction

Discussions following previous papers (presented before Indiana Academy of Science meetings) on reclamation of surface mined lands indicate that increased information exchange between coal companies, conservationists, and the scientific community would be desirable. If an exchange of information is desirable, then it is incumbent upon the coal industry to make known what it has done, what it is doing, and what it plans in the future.

The coal industry, through the Coal Association's Conservation Department, does keep abreast of the latest known reclamation techniques and strives to apply these measures. There are indications that some inconsistencies exist concerning the extent of surface mining and reclamation efforts in Indiana.

Extent of Surface Mining in Indiana

Data concerning the extent of surface mining and reclamation in Indiana is available from a special report of the Indiana Geological Survey entitled *Coal Strip-Mined Land in Indiana* (4), or from the Indiana Department of Natural Resources Reclamation Supervisor's office at Shakamak State Park. All mining companies are required to file certified maps and acreage figures for disturbed and revegetated acres annually with the latter office.

Coal Association's records show that 101,178 acres had been disturbed in Indiana by surface mining for coal as of June, 1970. For the past 5 years, surface coal mining has disturbed slightly over 3,000 acres annually. The first year in which as much as 3,000 acres were disturbed was 1966. There have been 32,700 acres disturbed since 1959. This last figure is significant because an earlier report indicated that 93,836 acres had been disturbed prior to 1959 (2). If the previous report (2) was accurate, then the present total disturbed acreage would be 126,536, some 25,358 acres greater than the 101,178 acre total reported in this study.

Similar variation in acreage is noted for individual Indiana counties. An earlier report (2) indicated that Clay and Greene Counties had 18,295 and 18,200 acres disturbed, respectively, by 1959 (2). My data reveal only 14,298 and 12,476 disturbed acres, respectively, for the two counties in 1969.

All companies licensed to surface mine coal in Indiana are required to file maps and acreage records annually with the State Reclamation Supervisor. When such is done, the Indiana Coal Association always obtains duplicate copies of such reports and maps. This makes it possible for this office to always have a current tally of acreage disturbed. Individual county figures are obtained by planimetry U. S. Government Agricultural Stabilization and Conservation Service aerial photographs and updating with the aforementioned measured map data.

Scope and Longevity of Surface Mining Reclamation in Indiana

The Indiana coal mining industry has the oldest continuous surface mining revegetation program in the country (3). Two general aspects of this revegetation program are subsequently discussed.

The first aspect is the changes in plant species used during the past 40 years. The second aspect involves a discussion of land treatment measures showing the pattern leading to present practices.

Although some planting of fruit trees was done as early as 1918 and some forest trees were planted in 1926, the organized continuous program of revegetating surface mined acres did not begin until 1928. Tree planting stock used in 1928 was either brought in from out of state or "wildlings" were used, because Indiana did not yet have an established tree nursery program (Ralph Wilcox, personal communication). Since no other state had yet engaged in revegetating disturbed coal lands, it was not possible to look elsewhere for guidance. Ralph Wilcox and Joseph Kaylor, then in the State Forester's office, made the original selection of tree species.

Table 1 is a chronological listing of the 16 conifer and 28 broad-leaf species planted from 1926 to the present time. Of the conifer species originally used, only white pine and jack pine are still planted. On the other hand, five original hardwood species (black locust, red oak, white oak, tulip poplar and black walnut) are still in use. Red oak, white oak, tulip poplar, and black walnut were discontinued for a period of years before establishing themselves as permanently accepted species. Probably the best guide available today in selecting tree species to plant on surface mined areas is familiarity with failures of the past. Upon reviewing the chronological species composition in Table 1, it can be presumed that those species which have been discontinued either did not perform satisfactorily or are not sufficiently desirable to justify continued use. Of 20 non-arborescent perennial species tried, only 1 (autumn olive) has found a place in our regular revegetation program. Bristly locust may prove useful if seed supply and nursery problems are solved.

TABLE 1. Summary of tree species planted by chronological time period.

Species	Time Period Planted 19 — (years inclusive)								
	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-69
Conifers									
¹ Arborvitae, American			X						
¹ Cedar, white		X							
Cypress, bald				X	X	X	X	X	X
Pine, corsican	X								
Pine, jack	X	X	X	X	X	X	X	X	X
Pine, loblolly				X	X				
Pine, pitch				X	X	X	X	X	X
Pine, red	X	X	X	X	X	X	X	X	
Pine, Scotch	X	X	X	X					
Pine, shortleaf				X	X	X	X		
Pine, Virginia				X	X	X	X	X	X
Pine, white	X	X		X	X	X	X	X	X
Larch, European	X								
Larch, Japanese	X								
Spruce, Norway	X	X	X						
¹ Spruce, white	X		X						
Hardwoods									
Alder, black							X	X	X
<i>Ailanthus</i>					X				
Ash, green					X		X		
Ash, white				X		X	X	X	X
Birch, river								X	X
Birch, yellow									X
Chestnut, Chinese					X	X	X	X	X
Cottonwood, eastern				X	X	X	X	X	X
¹ Cottonwood, plains	X								
¹ Dogwood, flowering			X						X
¹ Elm, American				X					
Gum, sweet				X	X	X	X	X	X
Locust, black	X	X	X	X	X	X	X		X
² Maple, red & silver				X	X	X	X		X
Maple, sugar				X	X		X		
Oak, chestnut	X				X				
¹ Oak, cork					X				
¹ Oak, cow	X								
Oak, red	X			X	X	X	X	X	X
Oak, white	X				X	X	X	X	X
¹ Osage-orange					X				
¹ Pecan, commercial					X				
¹ Poplar, hybrid								X	X
Poplar, tulip	X			X	X	X	X	X	X
¹ Redbud			X						X
Sycamore					X	X	X	X	X
Walnut, black (nuts)		X	X		X				
(seedlings)	X			X	X	X	X	X	X
¹ Willow						X			

¹Species planted only in token quantity. (Also, a few Douglas-fir trees (not listed) have survived on one site and some catalpa exist which apparently were planted but were not recorded.)

²Some years, red or silver maple were identified. Some years, the record only listed soft maple.

Revegetation of surface mined lands for forage production for cattle grazing was initiated about 25 years ago (5). However, large scale production became a major aspect of our revegetation program only within the last 5 years. We seed from 1,000 to 2,200 acres to forage crops annually.

Major seeding work is done in February and March by broadcast seeding using fixed wing aircraft. The following two seeding mixtures are commonly used:

1) For Sites With Highly Favorable Nutrients And Acidity

Species	Pounds Per Acre
Alfalfa	10
Tall fescue	5
Orchard grass	5
	—
Total	20

2) For Sites With Less Than Optimum Nutrients And Alkalinity

Species	Pounds Per Acre
Alfalfa	7
Korean lespezeza	3
Tall fescue	10
Yellow sweet clover	2
	—
Total	22

When hay production is planned, only alfalfa is sown. We have experienced continuous alfalfa hay production for as much as 8 to 10 years with no liming or fertilization needed, after which time, stand renovation or conversion became necessary.

Reclamation of mined lands for tillable crops has been only on a small scale to date, with varying degrees of success. Commercial crops produced to date include corn, sorghum, soybeans, and wheat. Wheat has consistently performed the best thus far. Experience to date indicates that a period of several years of forage production is desirable on this new land before beginning tillable crop production. Several desirable edaphic improvements result from deep-rooted plants such as alfalfa. Production or incorporation of organic matter improves porosity, water infiltration, and water holding capacity. One farm manager reports that a particular site, after initially experiencing considerable erosion, had apparently ceased to be an erosion problem during wheat production after undergoing 10 years of hay production. The benefits of nitrification from leguminous alfalfa and sweet clover are obvious. It should be emphasized here that the edaphic matter we are discussing is not actually soil, if soil scientists' definition of soil is to be respected.

Implications of the Current Reclamation Law

The amount of grading required under the current reclamation law probably will bring about more intensive uses and more intensive

management of reclaimed areas. Where site capability permits agronomic uses, whatever management refinements and land use versatility are needed, no doubt, will come about. However, where excessive stoniness, excessive sandiness or high acidity dictates less intensive land use such as afforestation, then we still have a problem which justifies some concern. Inferior tree survival and growth due to site compaction created by tractors in the grading process is to be expected; and, hopefully, in some way resolved (1). Pines may again replace hardwoods as the most commonly planted species on these areas because pines appear to tolerate site compaction better than hardwoods.

Upon reading the current (1967) reclamation law and the administration guidelines, one readily concludes that demands for aesthetics supercede productivity and economics by far. To the extent that scenically attractive reclamation can be achieved within tolerable cost limits and post reclamation land use not infringed upon intolerably, one is hard pressed to oppose present Indiana legal reclamation requirements. However, adversities due to site compaction brought about by required grading work are numerous and ought not to be overlooked.

Literature Cited

1. CHAPMAN, A. G. 1967. How strip-land grading affects tree survival and growth. School of Agriculture Publication No. 29. Southern Illinois University, Carbondale, Ill. 34 p.
2. GUERNSEY, LEE, 1960. Settlement changes caused by strip coal mining in Indiana. Proc. Indiana Acad. Sci. 70:158-164.
3. MEDVICK, CHARLES, 1969. Selecting plant species for revegetating surface coal mined lands in Indiana—A forty year record. Proc. Int. Symp. on Ecology and Revegetation of Drastically Disturbed Areas, The Pennsylvania State University, University Park, Pa. 13 p.
4. POWELL, RICHARD L. 1968. Coal strip mined land in Indiana. Unpublished Special Report. Indiana Geological Survey. 26 p.
5. STIVER, EDWARD N. 1949. Revegetation of strip coal spoil banks of Indiana. Unpublished Ph.D. thesis. Purdue University, Lafayette, Indiana. 94 p.