A Bibliography Of Reclamation On Strip Mined Land

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Abstract
This bibliography is the result of an intensive search for yield response data on reclaimed strip mines. The primary objective of this search was to locate experiments from field research which could be used to estimate response functions expressing output (crop yield) as a function of inputs (spoil characteristics, fertilizer levels, plant types, and moisture levels). The search also included studies on the characteristics of the overburden, soil types, slope, and methods of reclamation...

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A BIBLIOGRAPHY OF RECLAMATION
ON STRIP MINED LAND

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Foreward

This bibliography is the result of an intensive search for yield response data on reclaimed strip mines. The primary objective of this search was to locate experiments from field research which could be used to estimate response functions expressing output (crop yield) as a function of inputs (spoil characteristics, fertilizer levels, plant types, and moisture levels). The search also included studies on the characteristics of the overburden, soil types, slope, and methods of reclamation.

Section I includes a listing of annotated references that contain the most useful data on yield responses, overburden characteristics, and soil types. Section II contains useful references without added annotation. Additional references that contain yield characteristics are included in Section III. Section IV is an inventory of other bibliographies about reclamation on strip mined land.
SECTION I


A comparison of a young soil profile with a Steinaur loam profile. The results point out that the loss of CO$_3$ is relatively rapid.


A report on studies conducted at mines near Gallup, New Mexico; Farmington, New Mexico and Raton, New Mexico. Different seeding methods were tried and the number surviving after two years has reported. Different irrigation methods and devices for catching ground water were tested and results reported.


Articles on fly ash, fertilizer applications, levels of fertilizer, and different species. Qualitative results reported but no quantitative results included.


Reports results of lime and phosphorous upon yield of various forages. Both yield tests and soil tests were conducted.

Grass species and loblolly pine were tested under various fertilizer applications. Dry matter forage production was estimated; also, the number of trees and height was recorded.


Spoil samples were collected and characterized. Several treatments were analyzed involving fertilizer and plant types.


Reports commonly used tests for determining soil nutrients. General background information rather than experimental data.

Berg, W. A. and E. M. Barrau, "Composition and Production of Seedings on Strip Mine Spoils in NW Colorado." National Coal Association/Bitum


Various sites seeded with different species of plants and the percent dry matter production recorded. Sites included spoils, soils over spoils, and normal soils.


Experiment reported the results of spoil pH. as a useful measure of predicting manganese and aluminum toxicity to legumes. Mulching tests for spoil pH. were also reported.

Test data showing levels of toxicity of manganese on plant growth on spoils.


Three year test period using various seeding methods, species, and soil types. Germination, mortality, stocking rate, and survival rate was recorded.


A review of mining and reclamation problems, policies, and practices in the Midwest. Environmental problems, reclamation technology and costs, and surface mines were listed.


Experimental results of soil development on mine spoils. Results show possibility of A-horizon topsoil developing in 20-30 years.


Reports that soil classification for spoils should be analyzed using different techniques than for normal soils.

Describes site conditions, treatments, trials, pre and past pH recordings, species of plants, and dry weight results.


Results on tree plantings along the Kansas-Missouri line in Illinois. Height, diameter, and survival percent recorded for various species after 19 and 20 growing seasons.


Focus on soil moisture conditions and soil compaction as affected by surface modifications via different methods of grading and soil movement.


Spoil material was collected from several Kentucky mining sites and the physical and chemical properties of each sample were analyzed for possible plant growth mediums.


Different types of spoils (10-15 years old) both graded and ungraded variables and several species of trees were analyzed. Height and survival data recorded after five years. No fertilizer treatments were recorded.

Several different mulch, lime, and fertilizer levels were used. Records of past treatment pH levels, survival, and height were kept.


This study was on deep mine spoil reclamation. Various levels of lime, fertilizer, and mulch were used with percent survival and groundcover recorded.


Various spoil materials, grading conditions, and seed mixtures, and lime were used. Also, different fertilizer and mulch treatments were used. The number of plants per acre was recorded as the response factor.


Describes site conditions, treatments, amount of plant matter for various grasses and herbs after one growing season. Spoils have problem of too much marcasite FeS₂.


Study shows only the survival rate and plant heights (trees) after five years.

Report covers importance of temperature, especially on dark spoils, and on the survival of vegetation in reclamation projects.


Many experiments involving various species, specific soil types for buffers, gypsum trials, and many others reported on Montana lands.


Describes location and properties of spoils and develops fundamentals for establishing vegetative cover. Also, detailed review of successful and unsuccessful revegetation experiments.


Cost estimates for twenty mines are developed using these categories: premining, planning, backfilling, and revegetation.


Report concentrates on the type of alder seed planted on old mine spoils.

Report covers a twenty-two year period and gives results of stand density, timber production, and tree survival. The characteristics of the planting area and experimental design are discussed.


The study basically concerns tree growths, observations of pH, percent of soil-size particles, and phosphorus content after twenty years of weathering are reported.


Large number of spoil samples classified by acidity are analyzed along with various species of grasses and legumes. Several levels of fertilizer are used, and soil conditions are also described.


Report reviews active and inactive surface mining operations, and reclamation techniques. Reclamation costs are reported for certain projects.


The study evaluates the relationship between the spoil bank material and coal seams mined, vegetation density, age of spoil, pH and chemical parameters.

Report covers different seeding methods with a comparison of plant success by species.


Spring and fall plantings of grains are compared and the performance of various species reported. Various fertilizer levels and different seeding methods were used.


Treatments of snowfences, jute netting, and straw mulch were analyzed for stand establishment of various grasses. Three different spoil ages were considered. Seedling density was reported after one year.


The article deals with reforestation and reports the number of acres in agriculture, forest, and reclaimed work done on twenty year old spoils.


Several phosphorus treatments on seed ledges were reported for various sites with excess slopes. Dry matter yield reported for the several grass varieties.

Average forage yield recorded for various species and soil types. Extensive data on changes in soil characteristics.


Reports growth of trees as related to several soil characteristics. Data analyzed by multiple regression.


Several fertilizer, lime, and pH levels were used to test numerous grass and legume mixtures. Average ground cover reported on several spoils. Second year survival rates for trees were examined.


Discusses varieties of trees, shrubs, and herbaceous plants suitable for planting on various types of soil. Also categorizes soil by acidity, slope, and stoniness. The report briefly discusses the effects of mechanical treatment of spoil on plant growth.

Small area (approximately 25 square miles) studied and specific overburden characteristics reported.


Extensive data on percent survival and percent ground cover after seeding over a ten year period for various species.


A project with information on procedures, costs, and results from reclamation projects. Cost references, type and depth of soil, climate, preparation, and soil conditioning are reported.


Inventory of restored land into categories of forestry, agriculture, and lakes with reclamation costs. Various treatments and results from a variety of crops are reported.


Analyzes the amounts and distribution of precipitation, soil productivity, stability, and availability of native vegetation for reclamation work. Revegetation and reclamation costs are discussed.


Several tree species were planted on covered and uncovered spoils and the percent survival rate as well as average height was recorded.

A greenhouse study involving different levels of lime and several species of pine trees. Height, root length, and green weight were recorded after one year.


Different fertilizer levels were analyzed and the survival and height recorded for three growing seasons.


General agronomic factors of germination, emergence, and survival reported for several species of pine trees on various spoils.


A greenhouse experiment involving numerous spoil types and fertilizer levels on two grass types. Oven-dry yields recorded for two different time spans.


The report contains detailed data on how soil characteristics change due to grading. A descriptive record of plant survival is also reported.


The experiment's primary emphasis is on changes in soil characteristics as a result of furrow grading with some results on plant growth.

A survey of suitable plants for mine spoils and possible use of spoils. Categories for spoil use include woodlands, wildlife habitat, farm and forest recreation, pasture, and cultivation.


The report includes a classification system for spoils. Spoils broken down by four factors -- acidity, stoniness, texture, and slope as related to suitable uses.


A two-part study involving both laboratory and field tests. Tests include several fertilizer levels, trace element treatments, and various species of grasses and barley. Dry matter growth was measured and reported.


A report listing the important variables in spoil characteristics (acidity, texture, structure of developing soil, rates of weathering, and erodability).

A comparison of old soils concerning bulk densities, porosities, structure development, pH, and chemical structures.


A data source for amounts of rain, leachable salts, available nutrients, and toxicity in strip mine spoils.


The study discusses the effect of covering toxic spoils with soil, limestone, and sewage sludge. Also, varying fertilizer levels were included in the experiments.


An analysis of several spoil types, fertilizer rates, nutrients, leaching, sulfur, and pH on the standability of different forages.


A greenhouse experiment involving several mixtures of soil from four spoils with fertilizer added. Oven-dry top weight and root weight of the fescue grass was recorded after three months.


A study of the effect of various treatments of spoils on tree survival. Treatments included various levels of fertilizer, grasses, and legumes as ground cover for young trees. The percent ground cover, tree survival, and tree height were recorded for a three-five year growing season.

An experiment covering various planting times, temporary ground cover, and permanent ground cover. The percent ground cover was recorded at various intervals.


A report of various combinations of lime, fertilizer, mulch, and tillage depths and their effects on percent ground cover at various times during the growing season.


A study of the effect of competition between herbaceous cover and young seedlings. Also, several fertilizer levels were used and the survival and growth recorded.


A report covering soil characteristics of spoils with the characteristics of natural unmined soils for the purpose of assessing the spoil as a growth medium.

The effects of various fertilizer levels on pine growth was reported. A treatment involving constant ratios of fertilizers but at different strengths was analyzed.


A combination of pine seed, grasses and legumes with various levels of fertilizer and seeding dates was analyzed. The amount of seedlings per acre was reported.
SECTION II


Anon, "Restoring Land to Productive Use," 84th Annual Report, Ohio Agricultural Research and Development Center, Wooster, Ohio, 1966.


Anon, "Strip Mining in Kentucky," Department of Natural Resources, Kentucky State University, Frankfort, Kentucky, 1965, pp. 24-55.


Anon, "Reclamation of Toxic Spoil Stack for Various Selected Soil Conditions -- with the Turow Lignite Mine as Example, Potegor," Main Research Design Institute Opencast Mining, Wruclaw, Poland, First Interim Report to US EPA, Special Foreign Currency Program Project No. 05-532-11, November 1973, 58 pp.


Berg, William A., "Plant Toxic Chemicals in Acid Spoils," Coal Mine Spoil Reclamation, School of Forest Resources Symposium, University Park, Pa., School of Forest Resources, College of Agriculture, Pennsylvania State University, October 12-13, 1965, pp. 91-96.


Struthers, Paul H., "Rapid Spoil Weathering and Soil Genesis," Coal Mines Spoil Reclamation, School of Forest Resources Symposium, University Park, Pa., School of Forest Resources, College of Agriculture, Pennsylvania State University, 1965, pp. 86-90.


Struthers, Paul H., "Forage Seedings Help Reclaim Acres of Spoil Banks," Ohio Farm Home Research 45 (1), 1960


SECTION III


Flowers, A. E., "Land Reclamation, Methods and Results," Coal Age, 73 (10), 1968, pp. 140-145.


Mellinger, R. H., R. W. Glover, Jr., and J. D. Hall, "Results of Revegetation of Strip-Mined Spoil by Soil Conservation Districts in West Virginia," West Virginia University Agriculture Experiment Station, Bulletin 540, 1966.


Stevens, David R., "Reclamation is Still an Infant. Can Strip-Mined Areas be Remade as Good as New?" Mountain Life and Work, V. 45, No. 10, October 1969, 3-5, pp. 21-22.


Tryon, E. H., "Pasture Cover for Spoil Banks," *West Virginia Agriculture Experiment Station, Bulletin No. 357, 1957.*


