

FORESTRY AS A RECLAMATION PRACTICE

ON STRIP MINED LANDS IN KANSAS¹

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Abstract.--A general description of the significance of coal strip mining in Kansas and the current efforts to reclaim spoil banks to forest uses. Landowner's objectives are shown to be the most limiting factor in forestry operations.

Strip mining for coal in Kansas began in the 1860's with horse-drawn equipment and hand tools, working on seams exposed at the surface along creeks and bluffs. Drift and tunnel mines began at about the same time. By 1877, a steam-operated shovel had been introduced and stripping of surface overburden began. In 1918, the first electrically powered shovel was used and strip mining rapidly displaced tunnel mining in the region (Pierce and Courtier, 1937).

Kansas coal occurs in the eastern one-fourth of the state in what is part of the Western Interior Bituminous Coal Province (Powell, 1974). Currently, there are six commercial seams of bituminous coal in southeastern Kansas occurring in association with shales, limestones, and sandstones of the Pennsylvanian Era sediments. Some commercial grades of fire clay are also found at some sites.

The occurrence of large amounts of iron pyrites in Kansas coal causes three significant problems:

- 1) The sulfur fraction of the pyrite gives an average yield of over 3% sulphur to our coal, which in turn causes problems in combustion from the air pollution point of view.

- 2) The weathering of these exposed pyrites left on old mine dumps and tipples sites is a source of sulfuric acid pollution in pit waters and local streams.
- 3) The oxidation of pyritic materials creates "hot spots" of toxic wastes which occur randomly throughout the spoil banks and inhibit reclamation efforts.

The reclamation problem in Kansas is not large in scope. Since 1969, we have had the Mined Land Reclamation and Conservation Act (Kansas, 1968), which requires new mines to be leveled to a substantially flat surface. The visible results of this "reclaim as you go" requirement, are readily apparent. Re-vegetation is predominantly to fescue pasture or wheat, both of which are common local products of farming practices on un-mined lands. Other common perennial forages used include alfalfa, clover, vetch, and warm season native grasses.

Prior to the 1969 law, some 46,000 acres of strip mined lands were unreclaimed and not subject to the provisions of the new law. This represents only .08% of the land in Kansas and is thus not a massive problem from the State perspective.

However, most of this abandoned land is in a two-county area which has been impacted by the ups and downs of the coal-mining economy for over a century. In these two counties unreclaimed strip mined lands cover approximately 6% of the area--still not a massive problem. But, there are some townships which are nearly 50% strip mined due to the concentration of the commercial coal seams. As in all problems, the perspective is important.

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As early as 1935, the U.S. Forest Service established tree plantation research plots in Kansas strip mines (Roger, 1949). In 1967, the Forestry Department at Kansas State University initiated research in the strip mines based upon the work of the USFS and designed to evaluate tree species selection and management practices which would be feasible and practical for the reclamation of strip mines as productive forests, (Geyer, 1971).

Hardwood forests occur naturally on about 10% of the land in the region of Kansas where strip mining has been concentrated. Our work with private landowners and public officials has been based upon the concept that, ideally, 10% of land reclaimed would return to forest uses so that the agricultural economy of the area would approach normalcy.

The Forestry Department began a detailed study of the spoil bank lands in May of 1980 for the purposes of determining the feasibility of establishing energy forest plantations on these lands as a reclamation technique. The study is designed to assimilate all the past research data from spoil bank experimentation plus the inputs from a recently completed study on short rotation energy forests, (Naughton, 1980).

Two possible outcomes are anticipated:

- 1) production of cordwood fuels for direct consumption as home heating fuel.
- 2) production of woodchips for combustion in mixture with high sulfur coal for industrial use.

In the first case, our study is showing that reclamation is relatively low cost, reliable, but also low in total economic productivity because of the time required to produce a crop and the low stumpage value per cord.

In the second case, reclamation costs will be higher because spoil banks will need to be leveled sufficiently prior to planting to allow for mechanized planting and harvesting of trees. The returns per acre will also be higher because of the shorter rotation and the higher yield per acre.

In both cases, the concept of reclamation to forestry uses takes into consideration the value of the head-wall pits for fishing and water based recreation and intends to develop and enhance these values by:

- 1) improving the accessibility to pit waters.
- 2) controlling on-site erosion which pollutes these waters.
- 3) planting shoreline vegetation for aesthetic purposes which would not be included in the normal harvesting cycle.
- 4) excluding use by domestic livestock so that wild game habitat will be enhanced.

PAST RECLAMATION EFFORTS

Over the years, the Kansas Fish and Game Commission has acquired control of approximately 6,500 acres of these spoil banks for management as public hunting and fishing reserves. The preponderance of this acreage is wooded, some of it having been planted by the Civilian Conservation Corps in the mid-1930's under the direction of the U.S. Forest Service. A larger portion of this public land is naturally re-forested as the result of management policies which favored trees by excluding domestic livestock.

There are three recreation developments by private individuals established on a fee basis. They have received some public financial support in the past for partial reshaping of the spoil banks and for some re-vegetation work. For the most part, these operations are only modestly successful, the owners all having other primary sources of income.

Individual landowners have not typically planted trees in their efforts to reclaim spoil banks. There are, however, a few notable exceptions which have been quite successful. For the most part, tree planting is viewed as an aesthetic correction to the landscape. In one case there is a modestly successful Christmas tree plantation.

A few small areas of spoil banks close to Pittsburg have been reclaimed for country homesites. These are extremely popular but there is little hope that such highly developed use will have a major impact on reclamation.

We currently estimate that nearly 3,000 acres of formerly abandoned spoil banks have been reclaimed to pasture--mostly fescue--by private individuals using one or more of available federally financed grants through the Resource Conservation and Development District or the Agricultural Stabilization and Conservation Service.

This leaves us approximately 32,000 acres still inadequately treated.

FOREST MANAGEMENT CONSIDERATIONS

The abandoned spoil bank lands we are dealing with were all mined prior to 1969, the median age of the acreage being over 30 years old. Substantial weathering of spoils has taken place during that time, and to some extent, time has already healed the wounds.

Natural revegetation by cottonwood has been substantially successful on 20% of the area, and almost 60% of the unreclaimed area has cottonwood and other volunteer hardwood cover between 20% and 50% stocking.

It is our conclusion that we can expect biological success in tree planting most of the time if we use cottonwood, black locust, loblolly pine, and pin oak. Black walnut, bur oak, European alder, and autumn olive are also highly reliable species for vegetation.

Economic success of reforestation appears to be marginal at best. It is our current belief that salable quantities of cottonwood and black locust can be produced from plantations, and there is some hope for loblolly pine. The other species appear to be sub-marginal.

Socio-political successes in reforestation seem to be geared to the fact that the local public will accept a limited amount of "forest" in the region. It is also important to realize that these forest areas are acceptable to the public from the viewpoint of aesthetics, recreation and wildlife habitat. Economic productivity is not a significant public issue at the levels of forest which will be readily acceptable.

The critical considerations for us are the wants, needs, and attitudes of the individuals who own the mined lands in question. It is generally true in Kansas that people who make their living directly from the land don't plant trees, while those people with other primary sources of income do plant trees. Thus, reforestation efforts on Kansas mines are more limited by landowner attitudes than by biological, economic or political constraints.

In cases where stands of trees are already established, we still find the landowners divided as to what production alternatives they will consider, although we do have broader general acceptance of forestry practices on existing stands from all classes of owners.

Reclamation of naturally stocked spoil banks is relatively easy. In most cases, the principal requirements are to (1) develop access routes into the areas for logging purposes and (2) to find markets for relatively low-value products. In the first case, we are developing a reclamation model which will use public funds for development of low-cost access routes. In the second case, we are depending upon the increased market for fuelwood to consume the majority of our product output.

A general guide for the reclamation of spoils in Kansas was prepared by the Soil Conservation Service and Kansas State University (USDA, 1969). Spoils classification, site preparation, species selection, management practices, and conservation measures are outlined.

OTHER CURRENT STUDIES

The Center for Public Affairs and the Kansas Applied Remote Sensing Program of the University of Kansas are jointly conducting an inventory of abandoned mined lands in Kansas. The project is funded by the Office of Surface Mining. The primary objective of the inventory is to identify health, safety and environmental problems associated with abandoned coal mines in the state. Interviews with county agency personnel, local officials, and area residents are being conducted to identify specific problem areas. In addition, existing medium-scale and high altitude color infrared photography are being used to evaluate general site conditions and to identify problems resulting from acid spoil conditions and consequent poor revegetation. On-site visits are conducted to evaluate and document the problems. The information gained from this inventory will be used by the Office of Surface Mining for prioritizing the reclamation of abandoned mined lands in Kansas.

This same team is also conducting a Prototype Study in southeastern Kansas which will be used to assist OSM and the coal producing states in improving the quality and utility of inventories. The tasks of the Prototype Study are included among six major research components. These components are as follows:

- 1) Assessment of Mine Spoils and Mine Soils.
- 2) Assessment of Erosion-Sedimentation Problems.
- 3) Assessment of Vegetation Problems.
- 4) Assessment of Water Quality Problems.
- 5) Assessment of Socio-Economic Factors and Problems.

- 6) Assessment of Research Methodologies, i.e., Photo Reconnaissance, for components 1 through 5.

A considerable amount of previous research has focused on mine soils associated with reclaimed lands. In contrast, little research has been directed towards the conditions of mine spoils or mine soils on abandoned mined lands. The Prototype Study will determine the specific physical and chemical properties of mine spoils that should be measured prior to reclamation. This information can be used to determine reclamation alternatives and reclamation techniques. In addition, sampling methods are being tested in the Prototype Study to determine the most efficient and economical means of collecting the mine soil and mine spoil data. Refinement of these methodologies will lead to the development of systematic sampling schemes for use in states that are involved with the reclamation of abandoned mined lands.

Erosion and sedimentation have been identified as major problems associated with abandoned mined lands in Kansas. The Prototype Study is being used to (1) determine whether there are significant flood hazards associated with sedimentation in problem areas, (2) assess the impacts of erosion and sedimentation on vegetation in problem areas, and (3) test data collection techniques and identify the best methods for acquiring the data. In order to maximize the understanding of the interactions involved with the aging of mine spoils, erosion and sedimentation are being assessed in areas coincidental with and immediately adjacent to those selected for vegetation and spoil analyses. Both studies will be completed in February, 1981.

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