

INSTITUTIONAL CONSTRAINTS TO PRODUCTION OF RECLAIMED MINE LANDS
SUITABLE FOR DEVELOPMENT IN CENTRAL APPALACHIA¹

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Abstract. -- In central Appalachian mining regions, a steeply sloping terrain restricts land use and industrial and commercial development. Flat lands that are not prone to flooding are often highly valued but construction of flat lands by coal surface mining operations is limited. The purpose of this research was to examine the institutional context of mined land reclamation planning, with an emphasis upon identification of constraints to reclamation of mined lands so as to enhance use potentials. Landowners have an interest in reclamation to improve the potential uses and values of mined lands. Actions available to landowners include paying greater attention to post-mining landform considerations during contract development, implementing adjustable royalty rate structures, and inventorying mineable lands to identify areas with landform alteration potentials. Mining firms should also have interest in implementing landform alteration mining procedures in steeply sloping terrain, due to cost and backfill stability considerations. Regulatory revisions that would stimulate application of landform alteration techniques include the modification of hollow fill construction regulations and designation of commercial timber production as land use eligible for approximate original contour (AOC) variance.

INTRODUCTION

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In southwestern Virginia's coal mining region, unique terrain and economic conditions result in special land-use problems. The steeply sloping points-and-hollows terrain creates a fact of life: a short supply of land suitable for residential, commercial, and/or industrial development. But, coal seams and surface mining operations are abundant; an estimated 10 percent of the 1,500 mi² region have been directly affected by mining activities, the majority of which are surface mining operations (Zipper et al 1987).

Table 1. -- Mining employment, civilian unemployment rate, and average per capita income in Virginia's coal counties and the state, selected years.

Area	Mining Employment (% of total employment)	Unemployment (% of labor force)		Per-Cap. Income (\$/yr)
	(1980)	(1983)	(1984)	(1985)
Buchanan	44.7	26.1	16.8	19.7
Dickenson	43.7	18.1	16.1	20.2
Wise	29.8	13.0	9.8	15.8
State	1.1	6.1	5.0	5.6

Source: Kraybill et al 1987.

The land use-problems of southwestern Virginia are not unique. Eastern Kentucky, southern West Virginia, and northeastern Tennessee are heavily mined areas with similar terrains. Nowhere else in the United States are the environment, economy, and social conditions of as large an area as intensively affected by mining as in central Appalachia. In 1985, 40 counties of central Appalachia, occupying 0.5% of the U.S. land area, accounted for 27% of our nation's coal production. Nineteen of those counties in the heart of central Appalachia, occupying less than 0.25% of the U.S. land area, accounted for over 20% of national coal production.

Given the recognized need for and potential value of developable sites throughout central Appalachia and the capability of the surface mining industry to move earth and stone, one would expect the industry to be busily engaged in producing reclaimed lands with enhanced use potentials as a byproduct of coal production activities. However, surface mining operations seldom use opportunities to reconstruct mined-out slopes to usable contours. Almost all reconstruct these to their approximate original contours (AOC), which, in most cases, were steeply sloping. The nature of the region's land base, the typical surface mining operations, and the effects of law on mining practice contribute to this situation.

The purpose of this research was to examine the institutional context of mined land reclamation planning so as to recommend actions with the potential to increase the rate at which flat lands with improved use potentials are produced. This purpose was approached by focusing on the goals, motivations, and influences of the three major parties to post-mining landform and land use decisions: landowners, mining firms, and regulatory agencies. The research focus was the Virginia coal region. However, topography and the institutional context of mining do not differ substantially across state lines; hence, the conclusions apply to conditions throughout central Appalachia.

DESCRIPTION OF RESEARCH

Central Appalachian Topography, Mining, and Land Use

The central Appalachian region is composed primarily of flat-bedded sedimentary rocks interbedded with coal seams and dissected by rivers and streams. Long-term geologic erosion has created a landscape comprised of flat ridgetops (the remnants of ancient plateaus), long sideslopes, and alluvial areas next to streams and rivers. Steep sideslopes with thin soils are the most common landforms.

The most intensive use of land has occurred in the limited number of alluvial areas -- streamside lands with flat surfaces and rich soils. Aside from the limited availability of alluvial areas, the problem with locating development adjacent to streams is the ever-present danger of flooding. Consequently, landscape features have had a direct effect upon economic development; the coal industry has been and remains the major employer. Other industries have been discouraged from entering the region because of a lack of suitable sites. Unemployment and poverty rates are high in the coal counties of southwestern Virginia (table 1) and neighboring central Appalachian mining regions.

The highly dissected terrain gives excellent access to numerous coal seams. Abundant outcrops favor surface mining operations. However, the overburden-to-coal ratio (the "stripping ratio") increases with distance into the mountain. Historically and at present, the surface mining industry has been based upon an ability to recover these outcropping coals economically at low stripping ratios. The most common surface mining method is contour mining, which is used where flat-lying coal seams outcrop on hillsides. Contour mining operations move laterally and, by removing the overburden, expose the underlying coal.

Contour mining methods have been profoundly affected by implementation of the Surface Mining Control and Reclamation

Act of 1977 (SMCRA). A primary facet of SMCRA is its requirement that land surface mined for coal be returned to its "approximate original contour" (AOC), except when a variance is obtained. The primary conditions for AOC variance are that the mining plan show that the after-mining landform will provide (1) an improvement of the watershed and (2) a rendering of the land suitable for a "higher" post-mining land use, such as a residential, commercial, industrial, or public use. (Agricultural land uses also qualify in mountaintop removal mining situations.) The result of the AOC provision is that now, the majority of mining spoil is hauled by truck from the mining site to the previously mined cuts where backfills are constructed to cover the highwalls. The AOC provisions of the SMCRA are extremely controversial in Appalachian areas, in part due to the perceived constraint upon the production of landforms favorable for economic development.

Recent research has shown that the near-universal application of AOC reclamation in Virginia is resulting in problems (Daniels et al 1987; Zipper et al 1986). Put briefly, construction of AOC backfills in inappropriate locales creates slope stability problems. Unstable AOC backfills may cause, at worst, massive downslope movement of earth materials or, at best, slow but persistent surface erosion that prevents vegetative establishment and causes watershed disturbance. In addition, the research has shown that it is possible to perform contour mining operations that produce broad, near-level bench areas suitable for improved use while covering all highwalls and recovering greater quantities of coal at a cost less than or equal to the cost of AOC operations (Zipper 1986).

Mining methods capable of producing favorable topographies with improved land-use potentials, relative to the steeply sloping pre-mining contours, are termed "landform alteration" (LA) methods. If properly constructed in appropriate locales, the landforms produced by LA mining techniques are more stable, have greater land-use potential, and have more favorable environmental impacts than conventional AOC landforms. However, in spite of the potential benefits to the region, applications for variance from AOC requirements are rare.

The Institutional Context

Mining and reclamation methods are affected most directly by the decisions of three parties: landowners, mining operators, and regulatory agencies.

Landowners decide which land may be considered for mining activities and what conditions may apply. Generally, landowners contract with mining firms to develop coal

deposits, receiving per-ton royalty payments while the mining firm bears all costs of mining. The required work associated with the engineering and permitting function may be performed by the mining firm's in-house staff or contracted to other firms that specialize in those activities. Some larger mining firms subcontract some or all of the actual mining to smaller firms. In these cases, the larger firm leases mining rights from the landowner, performs the engineering and permitting functions, subcontracts mining operations, purchases mined coal from the subcontractor, and markets the coal to outside buyers.

The primary Virginia regulatory agency is the Virginia Division of Mined Land Reclamation (VDMLR). The VDMLR is responsible for enforcing the SMCRA within Virginia. Parallel state regulatory agencies exist in West Virginia and Kentucky, while the U.S. Office of Surface Mining Reclamation and Enforcement (OSMRE) administers the Tennessee regulatory program. Federal regulations implementing SMCRA throughout the United States are promulgated by the OSMRE. Each state agency promulgates and enforces regulations implementing SMCRA, applying the general statutes of SMCRA to in-state mining conditions. These regulations must be either consistent with or more specific than the regulations promulgated by the OSMRE. The OSMRE, in turn, maintains oversight responsibilities. Each state's regulatory programs must be approved by the OSMRE, and its enforcement efforts are monitored by OSMRE personnel.

Any firm wishing to mine coal in excess of 250 tons must file a permit application with the appropriate state regulatory agency. Within that application, the firm states its proposal to reclaim the land at issue to a specific post-mining use and describes the procedures it will follow to render the land suitable for that use. If an AOC variance is proposed, the post-mining use must be "higher" than the documented pre-mining use, and additional documentation is submitted to support the firm's ability to reclaim as proposed, including design approval by a registered engineer and certification of watershed improvement. Permit packages judged to be incomplete by the regulatory agency are returned to the mining firm with instructions detailing required remedies. When the required conditions and standards are met, the package is approved.

After permit approval, a performance bond must be posted by the mining firm. The purpose of this bond is to prevent the mining firm from abandoning the site after mining, but before reclamation. The original regulations implementing the SMCRA in Virginia stipulated that the permit contain an estimate of reclamation cost given a "worst case" scenario and that the mining firm post bond in this amount.

However, recent revisions allow firms with good reclamation records to reduce the cost of bonding through participation in a "bonding pool"; money accumulated in the pool is used for site closure and reclamation in the event of abandonment.

Interests, Barriers, and Goals of the Parties

In investigating the interaction of the parties involved in post-mining land use decisions, it was necessary to determine: (1) What interests do the landowners, the mining firms, and the regulatory agencies have in producing landforms that have improved-use potentials through mined-land reclamation, (2) what barriers hinder their abilities to work toward production of altered landforms, and (3) what are their goals?

Landowners

In general, owners of mined land should have the greatest interest in the use of landform alteration (LA) mining activities because they stand to gain the greatest benefits. Where the use of LA techniques increases coal recovery, landowners' royalty receipts also increase. Moreover, if future increases in the price of coal should make it economically advantageous to remine an area, the use of LA techniques during the initial mining operation will facilitate the re-mining efforts. Large, near-level areas produced by LA mining methods will serve as a favorable "base of operations", and the amount of backfilled spoil requiring rehandling will be reduced. Finally, the improved land-use potential of the reclaimed area will benefit the landowner because changes in land-use patterns in future years may make industrial, residential, or commercial development possible on currently inaccessible areas. Widespread use of LA mining techniques within a given area will make such changes more likely. In the meantime, beef cattle and softwood timber can be produced upon properly reclaimed mined lands, particularly when the presence of subsurface minerals allows the cost of landownership to be written off to future mining activities (Zipper 1987a).

In practice, the influence of landowners upon mining and reclamation decisions is, for the most part, limited. Generally, mining firms are responsible for permit preparation and mining-plan development. Participation by the landowner in these procedures will, in many cases, be contrary to established practices and, in some cases, contrary to the terms of standing contracts. Furthermore, an AOC variance application adds to the cost of permit preparation and may add to the time required for permit approval. This raises the question of whether it would be economically

advantageous for the landowner to bear these additional costs. From a financial standpoint, such costs will only be advantageous if the landowner expects the value of profits from the planned land use to be greater than the increase in permit preparation costs. However, the costs must be borne in the present, while profits are expected to provide income in future years. The ability of the expected profits to compensate for present-day costs is handicapped by the long period that commonly occurs between the start of permit preparation and the conclusion of mine reclamation activities (typically a 3 to 5 year period) and by the risk that a change in the price of coal will postpone or prevent mining.

The time lag between permit preparation and post-mining land use implementation* also hinders the landowners' ability to implement reclamation technologies developed through research. For example, the development of environmentally sound, cost-effective methods for constructing residential waste disposal systems (modified septic drainfields) on mined lands would have a tremendous impact on the feasibility of establishing residential housing on mined lands. Perhaps the next few years will bring development of such methods. However, mine planning decisions are being made today that will determine the post-mining land uses to be implemented on areas to be reclaimed in future years, thus potentially limiting the immediate impact of such development.

In some areas, corporations specializing in mineral and timber development are major owners of land mined for coal, owning both mineral and surface rights. However, in other areas, the land ownership pattern is extremely complex; mineral rights to the various coal seams are under a variety of ownerships. In some cases, these "owners" are not identifiable as single parties, but constitute complex assemblages of the heirs of an earlier individual owner. Complex surface and mineral rights ownership patterns are a definite hindrance to the establishment of improved post-mining land uses, due to the difficulties of achieving consensus.

Another problem results from the existence of subsurface coal below many surface-mining sites. The presence of deep mines can render the land surfaces unsuitable for development that requires major building construction or paved roads because of the danger of subsidence. Thus, in most cases, agricultural or horticultural enterprises will be the most feasible land uses currently eligible for AOC variance. However, many Appalachian landowners are unfamiliar with such enterprises, traditionally uncommon within the coal regions. Also, success will depend upon the mining operator's ability and willingness to prepare a deep, productive soil upon the mined area.

Developing contractual arrangements to effect such practice is hindered by current long-term contracts and by the fact that, in many cases, the landowner does not deal directly with the subcontracting firm that conducts actual mining.

Mining Firms

There are situations where the mining firm should have an interest in shifting from the AOC mining techniques to the LA mining techniques. Primary among these are the operational cost advantages of LA mining in favorable locales, of having greater operational flexibility, and of reducing the incidence of working machinery on steeply sloping surfaces (Zipper 1986, Zipper et al 1986).

However, these advantages might be offset by three major factors. First, in many cases, any potential profits from a post-mining land use would not benefit the mining firm. This fact reduces the mining firm's incentive to engage in unfamiliar mining and reclamation techniques. Second, current commonly used mining-cost estimating methods are, generally, quite time consuming and not always accurate. Thus, the mining firm seldom has the ability to estimate, during permit preparation, the comparative cost effects of alternative mining and reclamation plans.

Third, there are two large, external risks to profitability to which the mining firm may become more vulnerable through engagement in LA procedures. The first is a potential increase in the cost of meeting SMCRA regulations. Engagement in LA procedures could be perceived as opening the door to increased regulatory costs in two ways: by attracting increased regulatory scrutiny and by causing entry to an area of unfamiliar regulatory interpretation. The second external risk is imposed by potential changes in the price of coal. In conventional (AOC) contour-mining, the mining operation proceeds linearly along the outcropping coal seam; unanticipated price drops can be accommodated by adjusting the stripping ratio or by delaying or stopping mining. The LA techniques will put the firm in a more vulnerable position, as the landscape reconstruction activities, once initiated, will often require long-term commitments and more complex spoil-handling plans than conventional AOC methods. These consequences reduce the operator's ability to respond to coal price changes and may increase performance bonding requirements.

Regulatory Agencies

State and Federal regulatory agencies should also have interests in stimulating the use of LA mining techniques on steeply sloping terrain. First, it is in the public interest, and also in the long-term

interest of the mining industry, to prevent construction of AOC backfills where they are not appropriate. Appropriately constructed LA landforms will have more favorable environmental effects (e.g., less surface erosion and greater stability) than steeply sloping AOC backfills (Daniels et al 1987). Second, it will benefit the local economy to allow the mining industry to produce sites suitable for development. Third, the present time is a good time to work toward reclamation policies more appropriate to the steeply sloping terrain of the Appalachian coal mining regions; currently, the price of coal is relatively low and, consequently, there is a low level of surface mining activity. Should coal production expand because of a sharp or even modest price increase, regulatory agencies would have tested and have in place appropriate policies rather than have them under development.

Regulatory agencies are hindered from taking direct action by the SMCRA's constraints and by the intricacy of the Federal-State oversight system. However, they do have the ability to promulgate policy changes through the rules and regulations implementing SMCRA.

RECOMMENDATIONS

Landowners should have strong interests in developing widespread use of LA mining techniques that can render steeply sloping pre-mining contours into post-mining landforms capable of supporting "higher" uses. However, in the current context, landowners have only a minor influence over mine planning and reclamation. To increase their influence, landowners will have to work more closely with mining firms during permit preparation procedures. Private landowners who plan to mine small individual tracts will need to insure mining firm cooperation during contract development. Corporate landowners might use royalty reductions as bargaining chips when negotiating the mining plan with mining firms. Similarly, the credit and assets of the corporate landowner can be used to provide cooperating mine operators with performance bonds or to reduce the cost of such bonds. An adjustable royalty rate structure responsive to the price of coal would allow landowners to bear a portion of the price risk for mining operators who are leery of long-term commitments.

These tools can be used most beneficially by landowners who inventory mineable lands to identify areas suitable for landform alteration with favorable pre-mining contours and geology. The ability to develop altered landforms will be favored by proximity to present or planned public services and by the absence of subsurface mines or substantial unmined coals. Landowners may wish to exert control over deep mining activities

adjacent to potential LA sites, since the deep removal of surface-mineable coal will prevent future economical engagement in LA surface-mining methods. The development of a livestock industry in the region will enable landowners to use altered landforms underlain by deep coal for livestock production. The establishment of programs by corporate landowners to lease acreages to individuals for livestock production will help develop such an industry.

In the long run, mining firms should have interests in more widespread use of LA mining techniques because of the positive effects these techniques have upon mining costs and because these techniques may allow coal to be mined economically in some excessively steep areas that are unsuitable for AOC mining. Mining firms wishing to engage in LA techniques can benefit by concentrating attention on reclamation activities during current operations and by developing a record of good reclamation. Regulatory personnel are required, when evaluating variance applications, to determine whether there is a "reasonable likelihood" that the land reclaimed will be suitable for the proposed land use. The demonstrated ability of the mining operator to construct suitable surface soils and landforms may be considered by regulatory personnel when evaluating the "reasonable likelihood" criteria.

Regulatory personnel can also affect the frequency at which favorable landforms are produced and stimulate mining firms to examine alternative mining methods by restricting AOC mining to appropriate locales and by placing closer scrutiny on AOC mining activities. Regulatory authorities might also adopt a stance of openly advocating the use of LA procedures in the steeply sloping points-and-hollows terrain where it can be applied most effectively. This could be accomplished by focusing favorable publicity upon environmentally sound operations that produce lands with favorable characteristics for development in locales where they are needed. Such a step would eliminate any perceived stigma from AOC variance applications.

Another, and indeed a giant, step would be to designate production of commercial forest as a "higher" land use eligible for AOC variance. The use value of land devoted to commercial forest is greater than that devoted to unmanaged forest, and the deep, productive soils required for profitable softwood timber production would contribute to watershed improvement. Such a step would eliminate a current paradox: the eligibility of livestock production enterprises for AOC variance in mountaintop removal mining operations when commercial timber production is ineligible. This situation is paradoxical because the potential profitability of softwood timber production on appropriate sites can be

greater than that of livestock production, while the environmental impact of timber production is likely to be less (Zipper 1986).

CONCLUSIONS

In central Appalachia, there exists a unique opportunity to improve land-use potentials through use of appropriate surface mining operations. All the elements required to effect this change are in place. In order for the change to occur, there must be increased understanding by and cooperation among landowners, mining operators, and regulatory authorities. Because there is a relatively low level of surface mining activity currently, the present is an opportune time to establish precedents required for effective and widespread use of landform alteration (LA) mining procedures.

If surface coal mining operations are to produce reclaimed sites with development potentials, as are sorely needed in many central Appalachian communities, it is essential that those uses be planned at the outset of mining. Spoil handling and reclamation must proceed with the specific objective of supporting that use so as to prepare a reclaimed landscape with appropriate characteristics. Once mining and reclamation are complete, it becomes very costly to rework a mining site. The future ability to construct usable lands as a byproduct of surface coal production operations will be limited, as near-surface coal reserves are being rapidly depleted.

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