Energy v. Environment: Who Wins in Race for Coal in Kentucky

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ENERGY V. ENVIRONMENT: WHO WINS IN THE RACE FOR COAL IN KENTUCKY

I. INTRODUCTION

A. The Conflict: Energy v. Environment

Mining in any form destroys at least part of our environment. Only recently, however, has this been recognized as a problem. In the past, emphasis has been on the simplest and cheapest recovery of minerals possible with little concern for the impact of mining on surrounding land and water or on the residents of a mined area. More recently, the priority given to cheap energy production has been challenged, and environmentalists along with other segments of society have demanded increased consideration of these environmental concerns. This controversy, which frequently pits environmentalists against energy producers, has its origins in our nation's inability to cope with two basic but conflicting needs: the need to produce energy and the need to protect the environment. In recent years the gravity of this problem has been intensified by the unreliability and expense of other sources of energy such as oil and gas. As a consequence of these problems, increasing demands are being made to tap alternate energy sources, especially coal.

1 National Environmental Research Center, Office of Research and Development, U.S. Environmental Protection Agency, Environmental Protection in Surface Mining of Coal 4 (EPA Pub. No. 670/2-74-093, 1974) [hereinafter cited as Environmental Protection].


3 According to a statement submitted by Senator Adlai Stevenson, Jr. to the Committee on Interior and Insular Affairs of the United States Senate in 1973:

As consumers we in the United States depend on natural gas and oil to supply 79 percent of all our energy needs. Yet natural gas constitutes only 9 percent of our total domestic fossil fuel resources, oil 8 percent and uranium 4 percent. The rest—almost 80 percent of our fossil fuel resources—is made up of our 3 trillion tons of coal. In short, we have come to rely on those fuels in shortest supply for the greatest part of our energy requirements, while our greatest single source of energy is relatively underutilized.

In 1974 the total use of new mineral supplies in the United States exceeded 4 billion tons. In the same year, over 2½ tons of coal were mined for each person in the United States, over 70 percent of which was used to generate electricity. Furthermore, domestic consumption of energy is expected to make at least a threefold increase between 1970 and 2000. Because of our extensive reserves, the logical source of this additional energy will be coal. Surface mining, because of technological advances, will probably be the predominant extraction method.

Since World War II, surface, or strip, mining has become the most economical method of extracting coal. The increase in its use has been dramatic. In 1940, only 9.4 percent of the bituminous coal mined was recovered by surface mining, but by 1972 surface mining accounted for 48.9 percent. In Kentucky alone surface mined coal surpassed deep mined by approximately 8 million tons in 1974. This increase in strip mining can be attributed to several factors. Surface mining yields a higher recovery rate than deep mining and does so more economically. Surface mining also eliminates many safety and health hazards, including cave-ins and black lung disease. In addition, the unsuitability of deep mining to certain areas leaves strip mining as the only alternative.

Despite these apparent advantages, the extraction of coal through surface mining generates many environmental problems. These include handling of spoil, revegetation, sediment control, and acid mine drainage. The improper regulation of
these aspects of the mining process can result in pollution of streams, destruction of fish and wildlife, damage to recreational areas, landslides, and flooding. The seriousness of this problem in Appalachia has been vividly documented. In 1967, the Department of the Interior estimated that there were 20,000 miles of highwalls in Appalachia alone and that 1,400 miles of outslopes in the same area had been affected by massive landslides.

In spite of the gravity of these problems, effective regulation can reduce the adverse impact of strip mining by providing a mechanism for balancing energy needs with the needs of the environment. Unfortunately, this delicate balance has seldom been attained. In the past, demands for energy have far out-weighed environmental concerns, and this societal priority has been reflected in the law. More recently the demand for coal has created economic pressure to mine in areas in which it was

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15 COUNCIL ON ENVIRONMENTAL QUALITY, COAL SURFACE MINING AND RECLAMATION, AN ENVIRONMENTAL AND ECONOMIC ASSESSMENT OF ALTERNATIVE, at IX (1973).
17 A highwall is a vertical wall consisting of the face of the coal seam, rock and soil strata underlying the original surface at the mining site. STRIP MINING IN KENTUCKY, supra note 8, at 4.
18 An outslope is the face of the downslope extending from the outer point of the bench to the toe of the fill section. EPA, ENVIRONMENTAL PROTECTION IN SURFACE MINING OF COAL (EPA-670 12-74, 1974). This slope is created by pushing the soil removed to expose the coal down the side of the mountain.
19 At this time, there is no federal legislation in this area. Since 1940, the Congress has had a number of bills before it which included provisions affecting strip or surface mining. In 1965, the Appalachian Regional Development Act (Pub. L. No. 89-4) called for a study of the problem. During the 90th Congress, the first hearings on strip mining were held, but no further action was taken. In the 92nd Congress both houses considered strip mining proposals. The House approved the Coal Mine Surface Protection Act of 1972 (H.R. 6482), but the Senate did not take action on that bill or on S. 638, a related bill, before adjournment. In the 93rd Congress both houses again considered proposals.

Early in 1973 the President proposed the Mined Area Protection Act in his State of the Union Message of February 15, 1973 to establish reclamation performance standards for both surface and underground mining. In October 1973, the Senate passed a very stringent control bill (S. 425). In July 1974, the House of Representatives also passed strip mining legislation similar to the Senate bill (H.R. 11500). President Ford pocket vetoed this bill, however, in December 1974. Another attempt at Federal legislation came in the form of the Surface Mining Control and Reclamation Act of 1975 (H.R. 25). This act was passed by Congress but vetoed by President Ford on May 20, 1975. The House vote to override this veto failed by three votes on June 10, 1975. At the time of this writing other strip mine bills are before Congressional committees.
previously economically infeasible. This too has created pressure for relaxed regulations. In addition, many smaller operators have felt that stricter mining controls will endanger the very existence of their companies. Some foresee an industry dominated by large corporations with the capital to invest in the machinery to mine previously inaccessible coal and to meet the costs of reclamation and performance bonds. At a time when the Ford administration is pushing the use of coal as a substitute for oil, small operators contend that environmental regulations must be limited.

The Kentucky Surface Mining Statute and administrative regulations are examples of the struggle to accommodate energy needs and environmental interests. The problem in Kentucky is especially serious since the coal industry will continue to play a critical role in the state’s economic welfare.

Another growing concern relates to the surface effects of

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20 The price of steam coal reached a high of $40 to $45 per ton in 1974 as utilities, steel companies, and other large users of coal engaged in “panic buying.” Two factors were responsible for this: the increased cost of foreign oil, and the need to stockpile coal in anticipation of a coal miners’ strike. Many existing operators with coal not committed to long term contracts and new operators with coal not committed to long term contracts and new operators usually with small operators entered the mining industry with uncommitted coal and were able to make profits of $20 to $30 per ton. As panic buying ceased in 1975, however, the price of coal dropped by one-half or more.

21 Interview with Mr. J. L. Jackson, President, Falcon Coal Company in Lexington, Kentucky, August 26, 1975 [hereinafter cited as Jackson].

22 In commenting on a proposed Kentucky regulation of strip mining, 25 Harlan County small operators stated: “Adoption of the proposed regulations, if strictly enforced would force all of the above companies, and most other small surface mine operators, out of business. . . . Expenditures for additional equipment, supplies and materials necessary for compliance would far exceed the reasonable and normal costs of doing business and would be an unreasonable and unbearable burden.” Written statement submitted by 25 Harlan County Coal Operators, pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), in Frankfort, Kentucky, May 20, 1975.

23 Jackson, supra note 20.

24 Another related economic concern, which is outside the scope of this note, is unemployment. Coal is one of Kentucky’s major industries. A single company, Peabody Coal for example, employed 4,350 people in 1974 in connection with its 12 surface mine sites in western Kentucky. The company’s payroll in this region was $56,076,850.

25 Written statement submitted by Peabody Coal Co., a subsidiary of Kennecott Copper Corp., pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), in Frankfort, Kentucky, May 20, 1975.


27 402 KY. ADMIN. REGS. 1:025-1:060 (1975) [hereinafter cited as KAR].
deep mining. Although the operation of the deep mines in Kentucky is regulated by the Department of Mines and Minerals, the surface effects of deep mining are at present unregulated. Regulations are proposed, however, which would expand surface mining restrictions to include deep mining.

Confrontation of these opposing interests is inevitable. Demands for coal promise to escalate dramatically, and as increased production intensifies environmental deterioration, opposition to this destruction will likewise escalate.

B. Purpose and Method

The purpose of this study is to investigate the attitudes of coal operators, state administrators, and environmentalists toward Kentucky's current surface mine statutes and regulations and to suggest methods of accommodating their conflicting needs. In examining the perspectives of the various interest groups involved in the energy/environment conflict, several approaches were used. The Kentucky state government's perspective emerged primarily through the thrust and content of its regulation of the coal extraction process. How those regulations control the nature and extent of the environmental impact of coal mining, how they apportion the responsibility for environmental protection, and how they are enforced in the field, reflect the state's current resolution of the opposing pressures in this conflict.

Examination of the coal operators' perspective was more complicated and was derived from several different sources. A general survey of strip mine operators in eastern and western Kentucky was conducted to elicit views on the substantive, procedural, and administrative aspects of the current regulations and to encourage suggestions of alternative methods for regulating surface mining and the reclamation process. The

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24 KRS § 351.030 (Supp. 1974).
26 The survey, however, was neither designed nor intended to be used as a statistically authoritative measure of coal operators' attitudes. Further, although 308 questionnaires were mailed to a representative sample of strip mine operators throughout the State, only 20 responses were received. The majority of responses (17) came from eastern Kentucky; only 3 were received from operators in the western part of the state. Thirteen respondents mined under 75,000 tons per year and seven mined over that
survey was followed by personal and telephone interviews with several of the responding operators to consider in greater depth some of the major problems and issues they raised. Finally, coal operators' testimony at hearings on proposed changes in the Kentucky Administrative Regulations was examined to provide additional information.

To determine the environmentalists' perspective, prominent environmentalists and people with a working knowledge of the Kentucky coal regulations were interviewed. In addition, studies, books, pamphlets, and bulletins by private persons and public agencies were examined to determine specific criticisms of the Kentucky regulations.

C. Methods of Mining Coal

Mining can be divided into three categories: strip or surface mining, auger mining, and deep mining. Generally speaking, surface mining, which is subdivided into area and contour mining depending on the topography of the land, entails the complete removal of overburden. When area mining is used on sites with flat to gently rolling terrain, an initial trench or box cut is made through the overburden to expose the coal. The overburden removed from this cut is placed on adjacent unmined land, and the coal is extracted. Additional cuts are made parallel to the first cut and each successive pile of spoil is placed in the cut just mined. The final cut leaves an open trench, and the ungraded piles of spoil leave large ridges resembling plowed fields. The pollution created by this type of mining, however, is not as extensive as that created by contour mining.

Contour mining is utilized most frequently in mountainous regions where successive cuts into the side of the mountain can be made to remove the overburden and the exposed coal.

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amount. Eleven of the operators mined over 5 years, eight between 5 and 10 years, and one for 20 years.

29 COUNCIL ON ENVIRONMENTAL QUALITY, COAL SURFACE MINING AND RECLAMATION, AN ENVIRONMENTAL AND ECONOMIC ASSESSMENT OF ALTERNATIVES 1 (1973).

30 Overburden is earth and other material which must be removed to expose the mineral. STRIP MINING IN KENTUCKY, supra note 8, at 5.

31 Spoil is overburden after it is removed to allow exposure of the coal. Id.

32 ENVIRONMENTAL PROTECTION, supra note 1, at 28.

33 Id. at 48.
This process creates a bench, the flat horizontal surface or shelf, and a highwall, the vertical surface or face. The resulting spoil is dumped down the hillside, piled on the bench, or stored elsewhere.\textsuperscript{34} This process continues until the depth of the overburden makes it uneconomical to continue.

Most of the environmental problems associated with contour mining involve the spoil. It erodes easily, causing sedimentation,\textsuperscript{35} and when piled on hillsides it often becomes unstable resulting in slides\textsuperscript{36} which can disturb vegetation and block streams. Problems can also arise in relation to highwalls, since materials may fall off them blocking waterways and causing drainage to be toxic.\textsuperscript{37}

The mountain-top removal method is a variation of contour mining used when the seam is near the top of a mountain.\textsuperscript{38} Spoil from the first cut is placed on the natural slope below the coal seam, creating a permanent fill bench and outslope. Spoil from subsequent cuts is then placed on the solid benches of the previous cuts. Occasionally an entire mountaintop is removed in this fashion.\textsuperscript{39}

Although economic factors usually limit surface mining to seams within 100 feet of the surface,\textsuperscript{40} its relatively low demand for capital, when compared to that of deep mining, allows strip mining to be started and stopped easily.\textsuperscript{41}

Auger mining is the extraction of coal from an exposed vertical face by use of a boring machine and auger to cut and extract the coal through a hole in the face. To maximize total coal extraction, auger mining is often used following contour mining when contour mining is no longer feasible. In this way coal may be recovered from the face of the remaining highwall.

\textsuperscript{34} Id. at 49.
\textsuperscript{35} Id. at 1.
\textsuperscript{36} Id. at 49.
\textsuperscript{37} Id. at 52.
\textsuperscript{38} Id. at 69.
\textsuperscript{39} 2 MATHEMATICA, INC. & FORD, BACON & DAVIS, INC., ENGINEERS, DESIGN OF SURFACE MINING SYSTEMS IN EASTERN KENTUCKY I-2 (1974) [hereinafter cited as MATHEMATICA]. This study was prepared for the Appalachian Regional Commission and the Department of Natural Resources and Environmental Protection.
\textsuperscript{40} Id. at III-4.
\textsuperscript{41} J. STACKS, STRIPPING 23 (1972) [hereinafter cited as STACKS].
without further stripping. The bits used in this type of mining range in diameter from 2 to 7 feet and can bore to a depth of just over 200 feet. Among the advantages of this method are high production tonnage per man per hour, greater safety, and less disturbance of surface areas. One of the major disadvantages is that it can only recover about 35 percent of the coal.

Deep or underground mining is the removal of coal without continuous disturbance of the surface or the entire overburden. There are basically three types of deep mines: shaft, drift, and slope, and all are usually limited to depths of more than 100 feet, the depth necessary to secure a solid roof for the operation. Because the roof must be supported during the mining process, large pillars must be left during extraction. This means that only about 70 percent of the coal is usually recovered by these methods.

A variation on underground mining is longwall mining. This method employs a shearing machine which moves along the vertical wall of the coal cutting as it goes, and a number of hydraulic supports used to maintain roof stability. When the shearing machine completes one full cut on the face of the coal, the supports in the area of the preceding cut are removed to allow the ceiling to cave in. Because the ceiling is allowed to collapse, there is no requirement for underground pillars, and almost all of the coal can be recovered. This method is not limited to depths of more than 100 feet as is conventional underground mining because the roof of the mine is not expected to remain. Longwall mining is therefore advocated by some authors.

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43 Id. note 8, at 12.
44 Id.
45 Environmental Protection, supra note 1, at 81.
46 2 Mathematica, supra note 39, at II-30.
47 Id.
48 Div. of Reclamation, Surface Mining and Reclamation in Kentucky 5 (1972) [hereinafter cited as Surface Mining]. Although the operation is generally the same in all three types, the method of getting to the seam differs. In a shaft mine a number of vertical shafts are constructed to reach the seam. In a drift mine the seam is entered directly from a hillside where the seam crops out, and in a slope mine, the coal is reached by a sloping shaft.
49 Id. at 6.
50 Id. at 6.
51 Id. at 5.
opponents of strip mining as the proper way to extract coal that is close to the surface since it will not substantially harm the surface environment.\(^{52}\) Damage to the surface can still occur through sinking caused by the collapse of the underground ceiling, however.

Kentucky lies astride two different and entirely separate coal fields, one in the Appalachian area of eastern Kentucky, the other in the relatively flat area of western Kentucky. The differences in the terrain of eastern and western Kentucky limit the mining methods used in those areas. In western Kentucky, where the terrain is rolling, area mining is used, while in mountainous eastern Kentucky, contour and mountain-top mining are employed.\(^{53}\) These different methods result in different environmental problems in each area.

II. COAL MINING REGULATION

A. Historical Perspectives on the Regulation of Coal Mining

State regulation of strip mining has been a fairly recent development; the first such legislation was not passed until 1939 in West Virginia.\(^{54}\) Indiana followed in 1941,\(^{55}\) Illinois in 1943,\(^{56}\) Pennsylvania in 1945,\(^{57}\) and Ohio\(^{58}\) and Maryland in 1947.\(^{59}\) At present, at least 24 other states have enacted some type of regulation for surface mining.\(^{60}\) State regulation has

\(^{52}\) Id. at 6.
\(^{53}\) 2 MATHEMATICA, supra note 39, at II-6-7. Both areas have extensive coal reserves.
\(^{54}\) The coal in eastern Kentucky includes an area covering 10,270 square miles in 31 counties, while the coal in western Kentucky underlies 6,400 square miles in 14 counties. STRIP MINING IN KENTUCKY, supra note 9, at 16.
\(^{56}\) Ch. 8, et seq. [1941] Ind. Acts 172. See IND. CODE § 13-4-6-1 et seq., as amended (Supp. 1974) for present strip mining law.
\(^{60}\) Ch. 16 §§ 1-2 [1947] 2 Laws of Md. 53. See MD. ANN. CODE art. 7 §§ 502 et seq., as amended (Supp. 1975) for present strip mining laws.
\(^{60}\) ALA. CODE tit., 26 § 166 (115) et seq. (Cum. Supp. 1973); ARK. STAT. ANN. § 52-901 et seq., (Supp. 1975); COLO. REV. STAT. ANN. § 34-32-01 et seq. (1973); FLA. STAT.
posed two constitutional problems. Its opponents have argued that legislation forcing expenditures for permits, bonds, and reclamation violate due process provisions in both the federal and state constitutions. Furthermore, the permit procedure has been attacked as violative of equal protection.

Although these attacks have been made widely, only one state, Illinois, has encountered serious constitutional difficulties with them. In 1947 the Supreme Court of Illinois ruled that the 1943 Illinois Act could not be sustained as a valid use of the police power because it did not offer a valid protection of the public health and because it was based on an unreasonable classification. A year later, however, the Supreme Court of Pennsylvania, faced with a similar attack on Pennsylvania’s law, upheld strip mine regulation as a valid exercise of the state’s police power. The court also held that the monetary

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Maryland Coal and Realty Co. v. Bureau of Mines, 69 A.2d 471, 474 (Md. 1949). Maryland’s strip mining law was held violative of the constitution, not on grounds that it discriminated against coal strip miners (limestone and shale operations were excluded from the Act), but rather on grounds that the provision applied to miners in one county but not in another. Generally the Maryland Court upheld the broad police powers of the legislature for protecting the welfare, however, and found that classification by the type of mineral mined was not violative of equal protection.


"But even if the act were valid as a measure designed to protect the public health, or as a conservation measure, it is fatally defective as an unreasonable discrimination against coal strip mine operators. . . . It is the method of mining employed, not the nature of the product removed, which produces the undesirable result from a health or conservation standpoint . . . ." Northern Ill. Coal Corp. v. Medill, 72 N.E.2d 844, 848 (Ill. 1947).

burdens placed on the operators were not unreasonable and thus not violative of due process and that the state's equal protection clause was not violated because the regulations were not discriminatorily applied. This reasoning has been used widely to justify regulation through the state's inherent police powers.

The early strip mine regulatory provisions contained lofty statements of purpose but few substantive provisions. Their main thrust was the institution of some form of permitting procedure, imposition of moderate bond, and a requirement of some backfilling and grading. Revegetation was also required by some states but not by all.

Although governmental regulation of strip mining may take place at the local, state, and federal levels, in Ken-

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8 Id. at 679-81.
9 See generally Note, Constitutional Law—Governmental Regulation of Surface Mining Activities, 46 N.C.L. Rev. 103, 118-22 (1988).
10 Maryland's original statute is representative of the goals of the strip mine regulation laws. Among the purposes stated were the conservation and improvement of affected lands, protection of birds and wildlife, enhancement of the value of affected lands, deterrence of soil erosion, prevention of pollution of rivers and streams, prevention of combustion of unmined coal, and general improvement and enjoyment of affected lands. Ch. 16, § 1 [1947] Laws of Md. 53.
11 The permitting procedure for most states in the early years varied little. Usually all that was required in the application were vital statistics, a map, a permit fee, and the posting of bond. Reclamation planning before permitting was not required. See, e.g., Ch. 84 § 1 [1939] W. Va. Acts 402-03; Ch. 67, § 4 [1941] Ind. Acts 174-75.
12 The amount of bond varied among the states: Indiana, $25 per acre above 5 acres with a $125 minimum, Ch. 67 § 4 [1931] Ind. Acts 174-75; Maryland established the bond by agency subject to a $5,000 minimum, Ch. 16, § 1 [1947] Laws of Md. 54; Pennsylvania, $200 per acre with a $200 minimum, No. 418 § 8 [1945] Pa. Laws 1200.
13 The requirements for backfilling and grading were quite vague. For example, the Maryland legislation required the operator to cover the face of coal and fire clay seams with overburden and to level peaks and ridges of spoil banks to such a degree as the agency deemed suitable for revegetation. Ch. 16 § 186 [1947] Laws of Md. 55.
14 By far the strictest revegetation requirement was that of Pennsylvania which required planting of the affected area within 1 year of final operation and approval of the work prior to release of the bond. No. 418, § 11 [1945] Pa. Laws; No. 472, § 14 [1947] Pa. Laws.
16 See generally, Reitze, Old King Coal and the Merry Rapists of Appalachia, 22
The first legislative efforts to regulate Kentucky surface mining paralleled the technological and the mechanical developments which made strip mining a serious alternative to deep mining.\(^7\) Coal deposits were recorded in Kentucky as early as 1778 and by the end of the 18th century, coal was being mined in Lee County.\(^7\) Strip mining was first used in the Commonwealth in 1820 on the Green River near Paradise,\(^7\) and the first mechanical strip operation was started in 1950 in Laurel County.\(^8\) It was not until 1948, however, that legislation to regulate strip mining was introduced in Kentucky, and it was not until 1954 that the first statute was passed.\(^8\) When the 1954 legislation was enacted, the General Assembly found that:

> the unregulated strip mining of coal causes soil erosion, stream pollution, the accumulation of stagnant water and the seepage of contaminated water, increases the likelihood of floods, destroys the value of land for agricultural purposes, counteracts efforts for the conservation of soil, water and other natural resources, destroys or impairs the property rights of citizens, creates fire hazards, and in general creates hazards dangerous to life and property. . . .\(^8\)

This initial step toward regulation was an ineffective\(^8\) and token\(^8\) attempt to thwart the ravages of unregulated strip mining. Even though the Act required posting of a bond,\(^8\) receipt

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\(^7\) STRIP MINING IN KENTUCKY, supra note 8, at 21, 26.
\(^7\) Id. at 8.
\(^8\) Schneider, Strip Mining in Kentucky, 59 Ky. L. J. 652, 658 (1971) [hereinafter cited as Schneider].
\(^8\) The amount of money appropriated by the General Assembly to carry out the provisions of the new law does not suggest an earnest concern for alleviating the problems. Only $5,000 was appropriated for the remaining 1953-54 fiscal year with $15,000 for the next two years. Ky. Acts ch. 8 § 18 (1954).
\(^8\) Ky. Acts, ch. 8 § 6 (1954). A bond of $100 to $250 per acre was required under the act.
of a permit to operate,\textsuperscript{86} and preparation of a reclamation plan,\textsuperscript{87} it was riddled with ambiguities and qualifiers.\textsuperscript{88} Furthermore, no authority was given to refuse the issuance of a permit to prior violators. Enforcement was limited to vacation of the permit, forfeiture of the bond,\textsuperscript{89} and a small civil penalty for infractions.\textsuperscript{90} The legislation also created the Strip Mining and Reclamation Commission to adopt rules and regulations, issue permits, conduct investigations and research, and supervise, administer, and enforce the Act and all rules and regulations promulgated thereunder.\textsuperscript{91} During the first 6 years of the Act, however, little was accomplished and thousands of acres were destroyed.\textsuperscript{92}

In 1960 the Act was amended\textsuperscript{93} to include augering\textsuperscript{94} within the definition of strip mining; before this revision the Court of Appeals had held that auger mining was not within the scope of the statute.\textsuperscript{95} The 1960 amendments required auger holes to be covered\textsuperscript{96} and forbade operators from throwing any material into streams or onto roads or public property.\textsuperscript{97} Additional changes included provision for injunctive relief for enforcement of the Act\textsuperscript{98} and a minor misdemeanor penalty for violations.\textsuperscript{99}

\begin{footnotesize}
\item\textsuperscript{86} Id. § 6(1).
\item\textsuperscript{87} Id. § 9.
\item\textsuperscript{88} E.g., covering the face of the coal and toxic material was required only “where practicable.” Id. § 9(1). Breakthrough to underground mines had to be sealed only when it constituted a “hazard.” Id. § 9(2). Treatment of runoff water was only to reduce erosion and pollution; grading and revegetation had to be done only when it was “practicable to do so.” Id. § 9(1)-(5). Reclamation had to be completed only when it was “feasible” to do so, id. § 10(1), and planting could be deferred as long as the soil was unsuitable for such purpose. Id. § 10(2). There was also no requirement to recondition the soil.
\item\textsuperscript{89} Id. § 13(1).
\item\textsuperscript{90} Id. § 17(1)-(2).
\item\textsuperscript{91} Id. §§ 3, 5.
\item\textsuperscript{92} Schneider, \textit{supra} note 83, at 658-59.
\item\textsuperscript{93} Id. § 9(2).
\item\textsuperscript{94} Id. §§ 3, 5.
\item\textsuperscript{95} Commonwealth v. Wombles, 346 S.W.2d 299 (Ky. 1961). In November 1975, Kentucky voters approved a constitutional amendment which, among other changes, created a state Supreme Court to replace the Court of Appeals as the state’s highest appellate court. The Court of Appeals which decided \textit{Wombles} was the state’s highest appellate court at that time.
\item\textsuperscript{96} Ky. Acts, ch. 143, § 5(1)(f) (1960).
\item\textsuperscript{97} Id. § (2).
\item\textsuperscript{98} Id. § 6(1).
\item\textsuperscript{99} Id. § 6(3). Willful violation was punishable as a misdemeanor with a fine of not less than $500 nor more than $1,500 per day of violation.
\end{footnotesize}
A 1962 amendment also brought prospecting within the statute and provided for the first time that money from forfeited bonds had to be used to reclaim the bonded area.

In 1964, land affected by haul roads was added to that already subject to state control and reclamation. In addition, the Act provided that an operator whose mining permit had been revoked was not eligible to receive another permit or to have the suspended permit reinstated until he complied with all reclamation requirements in relation to the land for which the permit was revoked and reclaimed all lands for which any bond was forfeited. The 1964 amendment also required the grading of affected land to a "rolling topography."

The chief problem with the regulatory statutes during this time was that the differences in the operation of contour and area mining had been ignored. For example, grading to a "rolling topography" was suitable for area mining of western Kentucky but wholly impractical for contour mining in the eastern part of the state. The result was that until 1966 this statute had little practical effect in eastern Kentucky. In addition, the statute allowed overburden to be pushed down the side of the mountain regardless of the steepness of the slope, and bench widths which greatly exceeded those that could be maintained on steep slopes. The inevitable result was numerous landslides and unchecked erosion.

A new comprehensive bill was adopted by the 1966 General Assembly which made many changes in the statute. The maximum depth of the first cut into the mountain was limited and the section which had called for backfilling "where

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practicable" was revised to require "complete backfilling" on lands where the method of operation does not produce a bench and "terrace backfilling" on lands where a bench is produced. The grading standard was changed to "approximate original contour of the land, with no depressions to accumulate water." For the first time, a return of vegetation cover within a definite period and reconditioning of the soil with fertilizer became specific requirements. The 1966 legislation, with minor modifications, provides the basis for the statutory regulation of surface mining today.

B. Kentucky's Regulatory System

1. Structure of Administrative Agencies

In 1974, the Kentucky legislature restructured the state administrative agencies and created the Department of Natural Resources and Environmental Protection headed by the Secretary, a gubernatorial appointee. This Department, which has the responsibility for enforcing Kentucky's strip mining law, is divided into two bureaus, the Bureau of Land Resources and the Bureau for Environmental Quality, each headed by a Commissioner appointed by the Secretary. The bureaus are in turn subdivided into nine divisions, one of which is the Division of Reclamation under the Bureau of Land Resources.

2. Promulgation of Regulations

Through Kentucky Revised Statutes Chapter 350 (hereinafter cited as KRS) the legislature has provided for the regu-
lation of both surface mining and those aspects of deep mining which have surface impact. This is accomplished by detailed legislation in some instances and by empowering the Department to promulgate regulations pertaining to specific issues in others. An understanding of Kentucky's regulatory process, therefore, requires a knowledge of both the statutes and the administrative regulations.

Under the statutes, the Department may adopt rules and regulations regarding the filing of reports, issuance of permits, and other matters of procedure and administration without hearings. All other regulations must follow a statutorily defined process to become effective. Just as public demand was the impetus for Kentucky's 1966 legislation, new regulations and changes in existing ones are usually initiated by sources outside the Department; direct instructions from the legislature often initiate Department actions, for example. Apparently the Department does not see itself as an innovative body in the development of improved environmental protection techniques.

Once the need for the regulation of an activity is recognized by the Department, technical data is gathered from its own departmental engineers and from extradepartmental consultants. While considerable discretion rests with the Department as to the amount of extradepartmental material sought, voluminous research is being conducted at federal and

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120 See KRS § 350.151 (Supp. 1974).
121 KRS § 350.050(3) (Supp. 1974).
122 KRS § 13.085 (Supp. 1974). For a discussion of this process see text accompanying notes 127 to 133 infra.
123 Interview with Mr. Ken Ratliff, Acting Director of Division of Reclamation, in Frankfort, Kentucky, August 27, 1975 [hereinafter cited as Ratliff].
124 Id. Interview with Mr. Perry White, General Counsel, Department of Natural Resources and Environmental Protection, in Frankfort, Kentucky, August 18, 1975 [hereinafter cited as White].
125 Presently the Division employs three engineers: one is a surveyor and two are professional civil engineers, one with a highway department background and one with soil conservation experience. Ratliff, supra note 123. But see The Courier-Journal, Mar. 2, 1976 § E at 7 where Mr. Robert Bell, the new Department Secretary, stated that he would try to bring qualified engineers into the department. See also Hawpe & Stevens, Bell Denies Morale Problems, Favoritism in Mine Agency, The Courier-Journal & Times, May 23, 1976, at 1.
126 Ratliff, supra note 123; White, supra note 124.
state levels; a concerted effort should be made to tap these resources. When this preliminary research is completed the proposed regulations are then drafted and begin their statutorily defined path to effectuation. First the proposed regulations are forwarded to the Legislative Research Commission and published in the Administrative Register. Though state agencies are encouraged to conduct public hearings on proposed regulations on their own initiative, such hearings are not required unless requested by someone having an interest in the subject matter. All interested parties may participate in these hearings and the Department must give affirmative consideration to all written and oral statements. The regulations, as amended, are then reviewed by the Administrative Regulations Subcommittee, any appropriate interim or standing committee of the General Assembly, and the Environmental Quality Commission before being returned to the Secretary for his signature. Review of the regulations by each of these bodies, however, is limited in scope; the tone and thrust of the regulations is in fact created and controlled by the originating department. There appears to be no effective remedy for one who objects to the content of a regulation even if sound technical data supports the objection. All that is guaranteed is a right to be heard at a public hearing and notice of affirmative consideration.

While there is no serious challenge by coal operators to the necessity of regulation, there is considerable disagreement

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127 The United States Forest Service conducts continuing experimentation of coal extraction and its environmental impact and serves as a resource unit for scientific experimental results and recommendations. Interview with Mr. Willis Curtis, Surface-Mined Area Restoration Research Project of the Northeastern Forest Experiment Station of the United States Forest Service in Berea, Kentucky, August 12, 1975.
129 Id.
132 Id.
133 The Environmental Quality Commission is a citizens' advisory group created by KRS § 224.041 (Supp. 1974). It may recommend adoption or rejection of the proposed regulations under KRS § 224.045(5)(b) (Supp. 1974); if the Department adopts any matter the Commission has rejected, the Secretary must give his reasons for so doing, KRS § 224.055 (Supp. 1974).
135 Sixteen of 20 operators responded that some form of reclamation was necessary.
and dissatisfaction with various aspects of the current regulations. One major complaint of the operators sampled in the survey was the failure of the regulations to reflect their needs and interests. When asked to rank the order in which the mining regulations give priority to environmentalists, governmental interests, local residents of the mined areas, and coal operators, the respondents overwhelmingly felt that except for local residents, coal operators were given the least consideration. Correspondingly, the operators felt that the environmentalists' interests were given first priority, followed closely by governmental interests.135

When pressed to rank the priorities given by mining regulations, some environmentalists listed governmental and coal operators' interests first.137 According to two environmentalists, however, regulations should reflect the thrust of statutes promulgated by the legislature since the legislature is the proper place for environmental input.138

3. The Permit System

The Department of Natural Resources and Environmental Protection, in addition to promulgating regulations, issues the permits which an operator is required to obtain before beginning a strip mine operation.139 The Department issues approxi-

135 Of a total of 18 responses to this question 12 respondents felt the regulations gave least priority to coal interests and four felt that coal interests were third in order of priority following environmentalist's and governmental interests. Fifteen respondents felt environmentalists were given either first or second priority by the regulations.

137 Interview with Mr. J. T. Begley, Staff Attorney, Appalachian Research and Defense Fund of Kentucky, in Lexington, Kentucky, January 19, 1976 [hereinafter cited as Begley]. Interview with Ms. Ann Bowers of the Sierra Club in Louisville, Kentucky, October 12, 1975 [hereinafter cited as Bowers]. Interview with Mr. Harry Caudill in Whitesburg, Kentucky, October 14, 1975 [hereinafter cited as Caudill].

139 Interview with Mr. David Short and Mr. David Beals in Frankfort, Kentucky, January 27, 1976 [hereinafter cited as Short and Beals]. The proper intent of the statutes and the regulations which reflect them is preservation of the natural resources.

139 KRS § 350.060(1) (Supp. 1974). Under the vetoed federal bill coal operations "which substantially disturb the natural land surface" would require a permit. Surface Mining Control and Reclamation Act of 1975, 94th Congress, 1st Sess., Report No. 94-189, Title V, § 512(a) [hereinafter cited as Federal Bill]. The scope of the Kentucky chapter does not appear to be this broad, being limited to "the breaking of the surface soil in order to facilitate or accomplish the extraction or removal of minerals, ores, or other solid matter..." KRS § 350.010(1) (Supp. 1974).
approximately 2000 permits per year covering about 63,500 acres of
disturbed land. 140

The following information is required by statute as part of
a permit application: (1) A description of and the location of
the land to be affected; (2) the name of the owner of the af-
fected land and the owners of all surface area within 500 feet
of any part of the affected area; 141 (3) the name of the owner of
the coal; (4) a statement of the source of the applicant's legal
right to mine the coal; (5) the address of the applicant; (6) a
statement of whether the applicant or any person, partnership,
or corporation associated with the applicant holds or has held
strip mining permits; and (7) a statement of whether any per-
son or entity named in (6) is in noncompliance with the section
of the chapter concerning bond forfeiture and noncompli-
ance. 142 The application must also include copies of a geological
survey topographic map with the drainage of the area indi-
cated, 143 and a second map describing the area, adjacent deep
mines, buildings, roads, waterways, the drainage plan and the
location of the seam. 144 In addition, the applicant must include
a detailed plan of reclamation and, until recently, a statement
of consent from the holder of each freehold interest in the
land. 145 A fee must also be paid at the time of application. 146

140 Figures supplied by the Department were incomplete. For the fiscal year from
July 1974 through June 1975, the number of permits issued was 1658 and the number
of acres affected by the permits was 63,459. The Department could only provide broken
figures for the preceding years. A newspaper article said the Department was issuing
about 35 permits per week, a little over 2000 per year. The Courier-Journal, Sept. 24,
1975, § C, at 4, col. 1 (state ed.).
141 The state has only recently begun notifying property owners when a strip mine
permit application has been filed for acreage on or within 500 feet of their land. The
statute requires that a public hearing be held for persons seriously objecting to the
permit issuance (KRS § 224.081); until recently, however, this procedure has been
little used because surface land owners were unaware of the permit application until
the permit was issued and the operation begun. The Courier-Journal, Sept. 24, 1975,
§ C, at 4, col. 1. (state ed.).
142 KRS § 350.060(2) (Supp. 1974). H.B. 626 passed by the 1976 General Assembly
also adds a provision requiring that public notice of intent to mine be given.
143 KRS § 350.060(3) (Supp. 1974).
144 KRS § 350.060(4) (Supp. 1974).
145 KRS § 350.060(7)-(8) (Supp. 1974). Subsection (8) was added in 1974 and took
effect January 1, 1975. Ky. Acts, ch. 373, § 2 (1974). This section was declared uncon-
stitutional in Department for Natural Resources & Environmental Protection v. No. 8
Ltd., 528 S.W.2d 684 (Ky. 1975).
146 KRS § 350.060(9) (Supp. 1974).
A permit may be denied for a number of reasons, including lack of probable cause to believe that the proposed method of operation, backfilling, grading, or reclamation can be carried out in a manner consistent with the law. In addition, if the Department determines that the placement of spoil on certain parts of the land will cause landslides, substantial sedimentation of streams or acid water pollution, it may delete that part of the land from the permit. Permits may also be denied for areas within 100 feet of any public road, stream, lake, or other public property and for any operation which would constitute a hazard to dwelling houses, public buildings, churches, public roads, and other specified types of property. Even though the state has this authority to prohibit mining in a given area, it is not exercising this power sufficiently. Five percent of eastern Kentucky coal mine areas should not be mined at the present time. In the eyes of the authors, the most important provision is probably the least used. This is KRS § 350.130 which addresses the denial of permits. Under subsection (3),

An operator whose mining permit has been revoked or suspended shall not be eligible to receive another permit or to have suspended permits reinstated until he shall have complied with all the requirements of this chapter in respect to all permits issued him, provided, further, that no operator shall be eligible to receive another permit who has forfeited any bond unless the land for which the bond was forfeited has been reclaimed without cost to the state or the operator has paid such sum as the department finds is adequate to reclaim

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147 KRS § 350.085(1) (Supp. 1974).
148 KRS § 350.085(2) (Supp. 1974). In essence, this gives the Department the power to prevent strip mining in slide prone areas. This would have also been provided for in the vetoed federal bill, Federal Bill, Title V, § 522, supra note 139, and is advocated by critics of state regulations.
149 KRS § 350.085(4) (Supp. 1974).
150 KRS § 350.085(3) (Supp. 1974).
151 Interview with Mr. Elmore Grim and Mr. Ron Hill, EPA Research Group in Cincinnati, Ohio, August 21, 1975 [hereinafter cited as Grim]. Since enough areas exist which are not prone to slides, the state could prohibit mining on these slide prone areas until new methods are developed, or a definite need to mine them arises (such as a national defense emergency). It appears, however, that even though the Department can prohibit mining in certain areas of eastern Kentucky, a few permits are still being granted for areas that are highly susceptible to slides. 1 MATHEMATICA, supra note 39, at I-40. This report estimated that 3 percent of permits issued in eastern Kentucky were for lands on which slides are likely to occur if conventional contour mining is used.
such lands. The department [through the Division of Reclamation], shall not issue any additional permits to any operator who has repeatedly been in noncompliance or violation of this chapter, or who has had permits revoked on more than three (3) occasions.\textsuperscript{152}

This section, however, has not been enforced due to the absence of regulations defining enforcement procedures and the lack of an adequate record system.\textsuperscript{153} On October 9, 1975, the Department held public hearings on the first regulations to enforce this section.\textsuperscript{154} These proposed regulations define noncompliance and state specifically what constitutes "repeated noncompliance."\textsuperscript{155} Under the existing statute a permit may be revoked for noncompliance,\textsuperscript{156} but this too is rarely, if ever, done.\textsuperscript{157}

Fourteen of the twenty operators in the survey indicated that the Department almost always approves reclamation plans and issues the permit. The operators felt that the most frequent reason for rejection of a permit application was the probability of adverse environmental effects.\textsuperscript{158} Several disgruntled respondents remarked that more frequently "red tape" and lack of government understanding were the real bases for rejection.

Environmentalists concurred on both points noting that while few permit applications are rejected, when they are it is usually because of the potential for adverse environmental ef-

\begin{footnotesize}
\begin{enumerate}
\item[152] KRS § 350.130(3) (Supp. 1974).
\item[153] Kenneth Ratliff, Acting Director of the Division of Reclamation, \textit{supra} note 123, stated that he thought this section had been used only once since 1966. He stated this was due to the inadequate record keeping system of the Division.
\item[154] Information provided by the Division of Reclamation.
\item[155] An operator is deemed to have been in repeated noncompliance when three noncompliances (as defined by the regulation) for the same permitted area have been served upon him within 18 months. Noncompliance includes a failure to obey an order or suspension, a failure to obey a revocation of a permit (with each day constituting a separate noncompliance), an absence of a permit when required, a failure to maintain current reclamation and other such acts. Unpublished draft of regulation (unnumbered). A spokesman from the Department stated that this regulation will probably be entirely rewritten before it becomes law.
\item[156] KRS § 350.130(1) (Supp. 1974).
\item[157] Ratliff, \textit{supra} note 123.
\item[158] Adverse environmental effects were listed eight times; inability to comply with the proposed method of operation and backfilling listed six times, problems with handling overburden six times, and hazards to property listed twice. Multiple entries were frequently made on the responses.
\end{enumerate}
\end{footnotesize}
Environmentalists felt, however, that plans are not sufficiently reviewed because the Department is understaffed and because KRS § 350.090 requires approval or denial of the plan within 20 days. Before receiving a permit, the operator must post a bond in a sum to be determined by the Department. This bond cannot be less than $500 nor more than $1500 per acre of land affected, with a minimum bond of $5000. In determining the amount of the bond, the character and nature of the overburden and the costs of backfilling, grading, and revegetation are to be considered.

While 16 of the 20 responding operators felt that the standards used in setting the bond assured compliance with state law and resulted in proper reclamation, many environmentalists felt the bonds were woefully inadequate. Some environmentalists also advocated a more flexible approach based on the individual characteristics of the land involved. Operators also complained about the form of the bond. Small operators objected to the requirement that the bond be either a cash deposit with the state or a surety bond issued by an insurance company, arguing that this method sidetracks needed capital into savings accounts. The operators advocated state accept-

159 Begley, supra note 137; Bowers, supra note 137; Caudill, supra note 137; Elmore Grim, EPA Cincinnati, Ohio, by correspondence of January 9, 1976 [hereinafter cited as Grim by correspondence]; Short and Beals, supra note 138.

160 Begley, supra note 137; Short and Beals, supra note 138. The problem usually is not that the plans are inadequate but is rather in verifying that the operators are following the plans. But see H.B. 697 which was passed by the 1976 General Assembly. This bill amends KRS § 350.090 and extends the time in which approval or denial must be given from 20 to 30 days.

161 KRS § 350.060(1) (Supp. 1974). The maximum bond per acre was increased to $3000 by the passage of H.B. 459 by the 1976 General Assembly.

162 Id.

163 Four operators felt that the standards used in setting bond requirements did not assure compliance with state laws. A similar number felt the bonding requirements were effective in insuring proper reclamation of stripped land. Two felt they were not and two failed to respond to the question.

164 Bowers, supra note 137; Short and Beals, supra note 138. But see Caudill, supra note 137, an environmentalist, who believed the bonds were adequate.

165 Begley, supra note 137; Bowers, supra note 137.

166 Written statement of C. Bruce Haskins, Hyden, Kentucky, pursuant to public hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 30, 1976. Insurance surety bonds also tie up needed funds because the company normally requires the mine operator to turn over a certificate of deposit made payable to the company for the amount of the bond.
ance of personal bonds instead. It should be noted, however, that the state would have to sue to collect a forfeited personal bond, and if the operator were a "shell" corporation, the state could have no money with which to reclaim mined land, the purpose for which the bond is required.  

Before the bond can be released, backfilling and grading must be completed and approved by the Department, and the soil pH level must satisfy the regulations. When these steps are completed, the bond is released in its full amount less $200 per acre. This amount is released only when planting and revegetation are completed. The operator has the option of meeting the planting requirements, paying the Division the cost of revegetating the land, or forfeiting the remainder of his bond.

Considerable dissatisfaction was expressed by coal operators with the length of time which passes before release of the bonds. Because regulations require that vegetation be established for at least two growing seasons before the bond is released, "if you mine any tonnage at all, your money is tied up much too long." Thirteen of the twenty operators who responded to the survey felt they were harmed by this delay. According to one coal operator, an additional problem is created for large and small operators alike; bonding companies object to the accumulation of bonds not released on time and are reluctant to issue bonds in the interim period, a situation which limits future mining operations. Environmentalists were satisfied with the 2 year waiting period.

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167 Short and Beals, supra note 138. The state makes every effort to encourage the operator to reclaim because the large administrative costs, incurred when the state is forced to undertake this burden, leave less money available for reclamation. Id.
169 In 1976 the General Assembly passed H.B. 697. This allows the retention of $300 of the bond, rather than the previous $200.
170 KRS § 350.110 (Supp. 1974). The vetoed federal bill would have required the operator to run a newspaper advertisement before the bond is released. This would state that release had been requested and would have given all interested parties an opportunity to object to its release. Federal Bill, Title V, § 519, supra note 139.
171 KRS § 350.110 (Supp. 1974). See also text accompanying note 140, supra.
173 Anonymous reply to questionnaire.
174 Six respondents indicated they were not harmed by delay in the release of the bond, and one did not answer this question.
175 Begley, supra note 137; Bowers, supra note 137; Caudill, supra note 137.
The current statute also provides for penalties. Any person violating KRS Chapter 350 or a regulation promulgated thereunder may be penalized from $100 to $1000, with an additional $100 to $1000 per day penalty if the violation continues.\textsuperscript{176} Willful violation constitutes a misdemeanor and can be punished by a fine of $500 to $5000.\textsuperscript{177}

Seventeen of the operators who responded to the survey felt that the coal industry generally complied with the reclamation requirements. Somewhat surprisingly, nine of the operators indicated that the penalties imposed for violations were satisfactory. Only seven indicated that they were too severe.\textsuperscript{178}

4. Operating Procedures

In addition to the administrative structure of the Department, its promulgation of regulations, and its permit system, operating procedures must also be considered. Several specific areas of management deserve discussion: (1) The efficiency and effectiveness of mine inspection activities; (2) the means for adequately monitoring and evaluating the consistency, fairness, and rigor of regulation enforcement; and (3) the means for extracting management information from the data collected by the Department.\textsuperscript{179}

According to Ken Ratliff, Acting Director of the Division of Reclamation, every active mining operation should be visited once every 2 weeks, but since an inspector's current caseload averages 40-70 mines, each site is lucky to be inspected once a month.\textsuperscript{180} In addition, he noted that the coal industry has grown so rapidly that the Department needs one-third

\textsuperscript{176} KRS § 350.990(1) (Supp. 1974). The federal bill would have allowed a penalty of up to $5000 with history, business size, seriousness of violation and good faith of the company taken into account in the setting of the penalty. Federal Bill, Title V, § 518(a), \textit{supra} note 139.

The 1976 General Assembly passed H.B. 459. This legislation raises the maximum possible civil penalty from $1,000 to $5,000.

\textsuperscript{177} KRS § 350.990(3) (Supp. 1974). The federal bill would have been more stringent in this area, too. The fine could have been up to $10,000 and the violator could have been imprisoned for a period of up to one year or both. Federal Bill, Title V, § 518(f), \textit{supra} note 139.

\textsuperscript{178} One operator felt the penalties were not severe enough and three did not respond to this question.

\textsuperscript{179} 2 \textit{MATHEMATICA}, \textit{supra} note 39, ch. VII, iv.

\textsuperscript{180} Ratliff, \textit{supra} note 123.
more staff members to keep pace. Environmentalists cited this lack of inspectors, insufficient number of mine visits, and the need for better trained inspectors as reasons for inadequate enforcement of existing regulations.181

Although 12 of the operators who responded felt that inspections insured compliance with regulations, many expressed dissatisfaction with the lack of uniformity in the standards applied and the variation in enforcement from county to county.182 In some instances operators have complained that after receiving approval from one inspector, the same operation will be cited by a second inspector several days later.183 This can be attributed to an overlap in mine inspections, caused by three factors: (1) The absence of a central co-ordination of mine inspection schedules; (2) an inadequate number of inspection personnel; and (3) the lack of expertise among inspectors. An environmentalist states that it is not uncommon to find cases when mine A, inspected only 2 weeks ago, will again be inspected, while mine B, inspected 4 to 5 weeks ago will be overlooked. As long as these practices persist, Kentucky will not receive the kind of compliance it should have.184 Others attribute this problem to the lack of technical expertise among the inspectors. According to one large operator, highly qualified engineers and other specialists are often needed but “most employees of the division of reclamation are not qualified.”185 Other operators suggest that in addition to a lack of technical training, understaffing and overwork account for many of the problems.186 Despite the under-current of dissatisfaction with the inspection process generally, 10 of the operators responding felt that the mine inspector was the easiest enforcement official with whom to work.187

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181 Begley, supra note 137; Bowers, supra note 137; Caudill, supra note 137; Grim by correspondence, supra note 159. Mr. Begley stated that it is a matter of economics. The better inspectors are soon drawn away by the coal operators who pay better than the state.

182 Four respondents felt that inspections did not insure compliance with the strip mining regulation, and two did not respond to this question.

183 Begley, supra note 137.

184 Id.

185 Jackson, supra note 20. But see comment in note 125.

186 Anonymous replies to questionnaire; telephone interview with Tom Duncan, President, Kentucky Coal Association, Sept. 22, 1975.

187 Six listed the middle level administrators as easiest to work with. Four felt the highest levels were the most difficult to work with.
Inspection activities can be improved by advanced surveillance equipment and better trained and qualified field inspectors.\textsuperscript{188} The equipment problem could be alleviated by the use of helicopters\textsuperscript{188} and satellite imagery\textsuperscript{189} which is currently being considered by the Department. The problem of the inspectors themselves, however, may be more difficult. The average monthly salary for Kentucky mine inspectors is $583; this could explain the shortage of 13 inspectors in September 1975.\textsuperscript{191} In addition, turnover in personnel is rapid and expensive; many Department personnel are hired by coal companies who can save money by being assured that their operations are in compliance with state and federal laws.\textsuperscript{192} Political patronage is cited as an additional explanation for staff problems.\textsuperscript{193} Inspection procedures might also be strengthened by the frequent movement of inspectors in order to avoid pressures from state and local officials.\textsuperscript{194} In addition, in scheduling inspections the Department should strive for unexpected visits without prior notice;\textsuperscript{195} regularity in inspection gives the mine operator the opportunity to adhere to regulations only when necessary.\textsuperscript{196}

In addition to problems with inspections, operators also disagree about enforcement, a disagreement which stems in part from antagonism between large and small operators. Violations are more frequent among larger operators "because of their political power from the county level up," according to one small operator who responded to the questionnaire. A large operator, however, counters that violations are more frequent among small operators because a large activity is easier to supervise.\textsuperscript{197} Most environmentalists interviewed felt that large

\textsuperscript{188} I MATHEMATICA, supra note 39, at I-63.
\textsuperscript{189} Interview with Robert Penn, Assistant to the Commissioner of the Bureau of Land Resources, at Frankfort, Kentucky, August, 1975, [hereinafter cited as Penn].
\textsuperscript{189} Ratliff, supra note 123.
\textsuperscript{192} Id.; Penn, supra note 189.
\textsuperscript{193} Lexington Herald-Leader, supra note 191.
\textsuperscript{194} Grim, supra note 151.
\textsuperscript{195} Federal Bill, Title V, § 517(b)(3), supra note 139 (provides for inspections without prior notice).
\textsuperscript{196} I MATHEMATICA, supra note 39, at I-63-64.
\textsuperscript{197} Jackson, supra note 20. But see II MATHEMATICA, supra note 39, at VII-18 (Table VII-10):
and small operators were equally capable of violating the regulations, while one stated that the larger operators are more responsible because they have more to lose. Small operators, however, have neither the money nor the equipment that the larger operators have to comply with the regulations. Other small operators agree. Because they must rely on the fluctuating spot market, they often lack the capital resources to comply with the law. But as one operator stated, "if you have to break the law to be competitive, you're in the wrong business."

Adequate administrative procedures must be developed to avoid existing inconsistency, unfairness, and lax enforcement. The problem is how to achieve them. The answer may be directly related to the development of adequate means of extracting management information from available data. The necessary information is in the hands of the Department, but because of the retrieval methods used by the Department, it is for all practical purposes inaccessible.

In 1971 inspectors compiled data on 202 landslides in areas mined after the 1967 bench width amendments; they found violations on 50 percent of these sites. Because the Department does not compile an accessible record of reclamation violations, the frequency of bench width violations in 1972 and 1973 is unknown. Even though a permit file for each company contains all the transactional material for that operation, these

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<th>To (tons)</th>
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<th>Percent of Companies</th>
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198 Begley, supra note 137; Bowers, supra note 137; Caudill, supra note 137.
199 Begley, supra note 137.
200 Id.
201 Anonymous reply to questionnaire; reply to questionnaire from Scotty Hall, owner, Shawnee Mining Company.
202 Jackson, supra note 20. The view was expressed by others who responded that it is mainly out-of-state operators who break Kentucky law.
203 2 MATHEMATICA, supra note 39, at Part VII, iv.
204 1 MATHEMATICA, supra note 39 at 1-40, 41.
205 Id. at I-42.
files are not consulted in making decisions about subsequent permits.\footnote{Ratliff, supra note 123.} A random sample of 22 eastern Kentucky surface mines indicates that 3 percent of the permits issued allow mining in areas where landslides are very likely to occur. Information such as this will continue to be useless until better access to it is available to the Department.\footnote{\textsuperscript{27} 1 \textsc{Mathematica}, supra note 39, at I-40.} Forty percent of the 1971 inspections resulted in at least one violation.\footnote{2\textsuperscript{8} 2 \textsc{Mathematica}, supra note 39, at ch. VII, v.} The nature of these violations, their location, frequency, origin, and cumulative effect are all available but functionally inaccessible to Department management.\footnote{2\textsuperscript{9} \textit{Id.} Part VII at iv.} A computer based information system\footnote{2\textsuperscript{10} \textit{Id.} at vi.} capable of compiling, categorizing, and summarizing this statistical information is necessary in assessing the effect of deterrence and detection procedures.

The Department apparently works under a disadvantage with an inadequate number of personnel, a lack of technologically adequate data handling equipment, and the constant presence of political pressures. In addition, the Department deals daily with representatives of coal companies at the different levels of its regulatory activities, but there is no established administrative channel for regular contact with environmentalists.

While this is true during the administrative state, under KRS \textsection224.091 any citizen can confront a public officer with his failure to perform his duty or enforce existing regulations and can ultimately resort to an action of mandamus. In addition, any person aggrieved by an order or determination of the Department about which he has not previously been heard has 30 days to file a petition for hearing.\footnote{2\textsuperscript{11} KRS \textsection224.081 (Supp. 1974). The 30 day period begins after the petitioner has had actual notice of the order or determination complained of, or could reasonably have had such notice.} The Department notifies each person named in the petition, and within 21 days a hearing is conducted by a hearing officer chosen by the Department.\footnote{2\textsuperscript{12} \textit{Id.} at vii.} This officer makes findings of fact, conclusions of law, and recommends action to the Secretary, who makes the actual

\begin{footnotes}
\item[\textsuperscript{26}] \textit{Id.} at vi. \item[\textsuperscript{27}] \textit{Id.} at vi. \item[\textsuperscript{28}] KRS \textsection224.081 (Supp. 1974). The 30 day period begins after the petitioner has had actual notice of the order or determination complained of, or could reasonably have had such notice. \item[\textsuperscript{29}] KRS \textsection224.018 (Supp. 1974). \end{footnotes}
determination. Each party has 30 days to appeal the action of the Secretary to the Franklin Circuit Court.

In 1972 the then-Acting Director of Reclamation summarized the regulatory status. "We can never completely eliminate these problems [environmental damage caused by surface mining] and continue to strip mine, but we certainly have not even minimized the damages as yet. . . . [W]e still have quite a way to go, particularly with enforcement. . . ."

III. CRITICAL ENVIRONMENTAL ISSUES INVOLVED IN COAL MINING

A. Handling of Spoil

The most obvious effect of any strip mine operation is the physical disruption of the land. In addition to destroying the physical beauty of the land, however, strip mining may also result in landslides from the careless placement of spoil and acid pollution from the highly acidic soil brought to the surface during mining. If a coal operator is allowed to abandon a mine without backfilling and grading, a permanent change in the environment may result. Without proper reclamation, surface mine sites are so unstable that the land may be useless for agriculture, timber, construction, or recreation.

The goals of backfilling and grading are the prevention of erosion and, to whatever extent possible, the preservation of

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213 KRS § 224.083 (Supp. 1974). Illustrative of this procedure is the Poor Bottom Hollow petition to revoke a surface mining permit granted Hurricane-Elkhorn Coal Corporation in January, 1975. The Courier-Journal, Mar. 6, 1975, § A, at 1, col. 6 (state ed.). The hearing officer recommended continuation of the permit on the grounds that there was no abuse of discretion by the Department in the granting of the permit. Report of Hearing Officer: In Re Childers v. Department of Natural Resources and Environmental Protection. The final decision rests with the Secretary (KRS § 224.083 (Supp. 1974)) who ordered the revocation of the permit. Opinion of the Secretary, Kentucky Dep't of Natural Resources and Environmental Protection, Permit No. 3282-745 #2, Oct. 10, 1975 (unpublished).

214 KRS § 224.085 (Supp. 1974).

215 Id. MATHEMATICA, supra note 39 at 1-8, citing B. BREACH, "Strip Mining Reclamation in Kentucky" at 3-4, April 7, 1972 (paper presented at the Civil Engineering Seminar, College of Engineering, University of Kentucky).

216 The spoil bank is a ridged area created by the deposited spoil or overburden material. The lower outside portion of the spoil where the sloped surface meets the horizontal is the "toe." STRIP MINING IN KENTUCKY, supra note 8, at 5.

217 Battle Over Mining that Scars the Land: Intense Debate between Conservationists and Industry over Surface "Stripping" of Coal, U.S. NEWS AND WORLD REPORT, Sept. 25, 1972, at 76.
the beauty of the land. Because mining is carried on in different terrains, different requirements have been formulated for mountainous and flat regions.\(^{218}\) In mountainous regions, such as eastern Kentucky, a seam of coal is reached by cutting into the side of a mountain. This creates a bench and a highwall; in contour mining the overburden is removed across this bench and dumped over the natural slope of the mountain\(^ {219}\) creating a spoil bank which alters the mountain’s slope and is one of the largest sources of strip mine sediment.\(^ {220}\) Its most severe effect, however, is the creation of a potential for landslides. Even though the area in slides, as a percent of all eastern Kentucky average affected by surface mining, was reduced from 12 percent to 4.5 percent after the 1966 strip mine law, the total number of acres in slides has increased due to increased mining.\(^ {221}\)

Kentucky has attempted to remedy the problems of landslides, acid drainage, and visual and environmental disruption caused by spoil banks through legislation and regulation.\(^ {222}\) By statute, only 40 percent\(^ {223}\) of the overburden may be placed beyond the solid bench and over the outslope when the operation is being conducted on steep slopes.\(^ {224}\) Regulations promulgated by the Department for Natural Resources and Environmental Protection prescribe the allowable width of the

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\(^{218}\) Deep mining should be regulated similarly to strip mining in mountainous terrain because the surface disruptions are similar. See, e.g., Kentucky's proposed regulation of underground mining. 402 KAR 1:011 (published in error as 1:010) (1975).

\(^{219}\) 1 MATHEMATICA, supra note 39, at III-22.

\(^{220}\) Environmental Protection, supra note 1, at 1. See also notes 354 to 399 infra and accompanying text on effects of sedimentation.

\(^{221}\) 1 MATHEMATICA, supra note 39, at I-34. In 1964, an analysis of aerial photographs showed that 12 percent of eastern Kentucky acreage affected by surface mining was in slides. Id. at I-33.

Landslides can be traced to: (1) The sheer weight of the material dumped over the outslope; (2) water entering between the original earth and the spoil, reducing normal friction and adding to the weight of the overburden; and (3) wood and other organic material decaying in the overburden, leaving pockets in the slope and therefore increasing the chances of a slide. Surface Mining, supra note 48, at 33.

\(^{222}\) KRS chapter 350 (1971); 402 KAR (1975).

\(^{223}\) KRS § 350.093 (Supp. 1974). The statute reads “forty percent or less.” KRS § 350.093(2)(h) (Supp. 1974). Thus, regulations could reduce the amount below 40 percent and could completely prohibit the dumping of spoil over the outslope.

\(^{224}\) KRS § 350.093 (Supp. 1974). The statute does not define “steep” but leaves this to the regulations.
first cut into the mountain according to the degree of slope; as the slope becomes steeper, the allowable width diminishes. The regulation also prescribes the maximum scalping distance allowable: this likewise diminishes as the slope increases. Finally, all highwalls, except those composed of solid rock, must be reduced or backfilled. Backfilling and grading must be kept current.

A general complaint from coal operators is that these statutory and regulatory standards lack flexibility. Many operators argue that the goals of reclamation should be clearly specified, but methods of achieving these goals should be left up to the individual operator. As one operator contends:

You can handle earth improperly on a 10 degree slope and damage the environment; you can handle it properly on 40 degrees and protect the environment.

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225 402 KAR 1:030 § 2(2)(b) (1975). "Degree of slope means a measurement taken from the outcrop [where the horizontal coal seam meets the outside surface of the hill] of the coal seam, to be mined, down the slope on which the overburden will be placed."

226 402 KAR 1:030 § 1(1)(4) (1975).

227 Scalping is the operation of removing all the vegetative cover off the slope. The "scalped" material is placed at the proposed toe of the spoil. 402 KAR 1:030 § 2(2)(b)(2) (1975). This operation reduces the tendency of the spoil bank to slide.


224 402 KAR 1:030 § 6 (1975). While backfilling and grading are required to be current, this may not be enough to prevent prolonged exposure of coal seams to surface elements. Under the Kentucky regulations, if area mining is for some reason suspended, complete backfilling and grading are required within 90 days. With contour mining, coal must be removed within 30 days and backfilling and grading shall follow within 15 days. Id. Perhaps an interim requirement of coverage would be in order to prevent exposure of the coal seams. Under Pennsylvania regulations, if operation is suspended for any reason, coal seams are to be covered immediately to prevent exposure, 25 PA. RULES and REGS. § 77.92(a)(4) (1972), even though complete backfilling is not required at that time.

Other states with mountainous terrain place similar limits on the creation of fill benches and spoil banks. E.g. Tennessee prohibits fill bench formation on slopes greater than 28 degrees (TENNESSEE DEPARTMENT OF CONSERVATION, DIVISION OF SURFACE MINING, § 11.22(a) (1974) [hereinafter cited as TENN. DEPT. REGS.]), as compared to Kentucky's 27 degrees. 402 KAR 1:030 § 2(2)(b) (1975) (Table 1). West Virginia has a relatively high cutoff of 33 degrees. WEST VIRGINIA DEPARTMENT OF NATURAL RESOURCES, SURFACE MINING RECLAMATION REGULATIONS ch. 20-6, Series VII 8A.01 (1971) [hereinafter cited as W. VA. REG.].

222 E.g., Anonymous replies to questionnaire: Remarks at Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), May 20, 1975, Frankfort, Ky.

231 Statement by J.L. Jackson, President, Falcon Coal Company, quoted in
As an alternative to specific regulations, he suggests, "What the law should say is: You can't have landslides, you can't have sedimentation. If you do, we'll fine you, shut you down, and not issue you another permit." Other operators contend that whether the land can be stabilized should be the critical determinant of whether a mined area can be reclaimed and not the degree of slope. Stabilization, they say, is a function of the strength of material on the slope, not of its degree. Twelve of the coal operators responding believe that statutory limits on bench production based on the mountain's slope hinder their operations.

Environmentalists differ as to what is the most important determinant of potential problems. Some cite the degree of slope while others contend it is the stability of the slope and the size of the cut. Although this difference exists, many people outside the coal industry contend that existing regulations are not effective in preventing overloaded outslopes. Accordingly, some critics advocate that no spoil be dumped over the outslope. Such a prohibition would be costly to the operation; it would require hauling the soil away from the mine site, storing it during operations, and replacing it later, but it would minimize the disturbance of the environment and vegetation.

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231 Id. at 12.


233 Caudill, *supra* note 137; Grim, by correspondence, *supra* note 159.

234 Bowers, *supra* note 137.


236 *Williams, Changed Spoil Dump Shape Increases Stability on Contour Strip Mines, 247* (1972) (reprint from Research and Applied Technology Symposium on Mined Land Reclamation).

237 Ratliff, *supra* note 123. Mr. Ratliff stated that he personally liked the idea of prohibiting spoil on the outslope, because this would relieve the sedimentation problem. He pointed out that by using the new Kentucky bench width requirement, the amount of spoil allowed to be placed on the outslope may be reduced from 40 to 20 percent. [The allowable amount of spoil placed on the outslope is regulated by the width of the first cut; if this width is reduced, the allowable amount of spoil on the outslope will be reduced.]

240 Grim, *supra* note 151.

241 *Strip Mining in Kentucky, supra* note 8, at 48.

242 Grim, *supra* note 151.
In spite of these arguments, few jurisdictions have outlawed dumping spoil over the outslope. Tennessee prohibits spoil from being placed "more than fifty (50) feet downslope from the cropline ..." and Virginia requires retention of spoil on the bench to the maximum extent practicable. The vetoed federal strip mining bill would have allowed dumping on steep slopes only if the operator could demonstrate that the material would not slide. A 1974 study indicated that the number of landslides could also be reduced by modifying bench width regulations, prohibiting mining in slide prone areas, enforcing existing bench width regulations, using methods such as drainways to prevent slides, and developing new mining methods which do not result in a permanent fill bench such as the box cutting method. The box cutting method, which is infrequently used in eastern Kentucky, may allow reclamation to a closer approximation of the original contour. In this method, a narrow strip of outcropping coal and overburden are left intact during mining thus improving the stability of the spoil bank by catching spoil which is stacked on the bench. This method has produced favorable responses from land owners.

In addition to overburden being placed over the mountainside, the presence of highwalls after mining has been completed also creates disagreement. Environmentalists feel that the land should be returned to its original contour including the removal of highwalls. Kentucky regulations, while not requiring

215 Federal Bill, supra note 139. A "steep slope" is described as any slope above 20 degrees or "such lesser slope as may be defined by the regulatory authority after consideration of soil, climate, and other characteristics of a region or State." Id. Title V, § 515(d)(4).
216 1 Mathematica, supra note 39, at 37. The report found that in 1971, bench width regulations had been exceeded at 50 percent of landslide sites; from this percentage, the report estimated that landslides were five times more likely to occur where regulated bench widths are exceeded than where they are adhered to.
217 2 Mathematica, supra note 39, at 9.
218 2 Mathematica, supra note 39, at II-9.
219 Id. See also id. at II-11-19 for other methods of mining which also reduce the tendency of spoil to slide. Small operators should consider these alternative methods for they may be more economical than traditional mining techniques.
220 Interviews with environmentalists who insist that the aesthetic benefits outweigh the cost of reducing the highwall. Begley, supra note 137; Short and Beals, supra note 138.
removal of highwalls completely, discourage their retention. In contour mining, all highwalls must be “reduced or backfilled, except where the highwall will be composed of solid rock” while highwalls from auger mining must be reduced to 45 degrees or less. Other states also attempt to eliminate highwalls. Tennessee allows highwalls only on orphaned lands and Ohio allows retention of highwalls only when they are included in the planned future use of the land. Pennsylvania generally requires reclamation to the approximate original contour. More lenient requirements are found in Virginia, which requires that highwalls be reduced to the “maximum extent practicable,” and West Virginia, which requires the area to “be sloped toward a reduced highwall.” The vetoed federal strip mine bill would have required the operator to backfill and grade to the original contour of the land, eliminating all highwalls, spoil piles, and depressions.

214 402 KAR 1:030 § 2(2)(f) (1975). Variations, however, may be granted in some circumstances.
215 Id.
216 TENN. DEPT. REGS. § 11.23(a)-(b) (1975). Orphaned land is land which has previously been mined.
217 OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF RECLAMATION, RULES FOR OHIO SURFACE MINE LAW NRim-III-06 (1975) [hereinafter cited as OHIO REGS.].
218 PA. RULES AND REGS. § 77.92(a)(5) (1972). “Contouring,” which allows no highwalls or terraces, is the preferred method of regrading and failure to plan this method in Pennsylvania must be substantiated with a full explanation. 52 PA. STAT. ANN. § 1396.4(a)(2)(e) (Supp. 1975).
220 20-6 W. VA. REGS. 8A.02 (1972). However, under W. VA. CODE ANN. § 20-6-13 (1973) highwalls in contour mining can only be retained if blasting is needed to dislodge the material and there is insufficient soil to establish a vegetative cover. In no event can a highwall exceed 30 feet.
221 Federal Bill, supra note 139, at § 515(b)(3). Where highwalls are retained, thought should be given to the public safety hazard posed. Ohio requires that if highwalls are retained, access to them from the top of the slope should be prevented by some type of barrier. OHIO REGS. NRim-III-07(D).

Some coal operators who responded to the survey also question the wisdom of reclaiming mountainous land to its original slope or to an approximation of the original contour. They argue that flat land may be more useful to the owner of the surface rights than hilly land, and that substantial backfilling and grading are very costly to operators. They also perceive little use from the land after it is “reclaimed.” Phelps, supra note 14, at 119.

Environmentalists, however, contend that realistically very little productive use will be gained from retention of benches, and at the same time the land will be disfigured. Begley, supra note 137. They also argue that aesthetic and social benefits outweigh the productive use to which most flat areas could be put. Short and Beals, supra note 138.
Because of differences in terrain, many of the problems faced in eastern Kentucky are not found in western Kentucky. Western Kentucky, however, has problems unique to itself. Generally the flat terrain there makes it easier to get to the coal seam, frequently by use of large shovels to remove the earth and expose the coal. The flat terrain also makes reclamation easier and less costly for the operator. Because of this, Kentucky's requirements are stricter for operators who engage in area mining, generally requiring that the land be returned to its original contour.

Complete backfilling shall be required, beginning at or beyond the top of the highwall and sloped to the toe of the spoil bank at a maximum angle not to exceed the approximate original contour of the land with no depressions to accumulate water, and all highwalls and spoil peaks shall be eliminated.\textsuperscript{29}

Environmentalists have little quarrel with these regulations because they seemingly meet the basic objective of environmental groups: returning the land to a state closest to its natural condition. However, 12 of the coal operators who responded to the survey felt that these backfilling and grading requirements impose a heavy burden on the industry. Economic hardship was the general reason given for objection.

Area strip miners are also critical of the prohibition against depressions which might accumulate water after final grading.\textsuperscript{240} As an official of Peabody Coal Company stated:

\begin{quote}
In the last few years coal companies in Kentucky have been required to eliminate all depression from graded spoils. This has placed both the coal operators and the adjacent landowner (usually farmers) on the horns of a dilemma. In fulfilling the laws we are creating the perfect conditions for both flash flooding and maximum offsite damage. Prior to smooth grading requirements this problem was not evident because of the numerous enclosed ponds within the ungraded spoil.\textsuperscript{241}
\end{quote}

Furthermore, operators argue that the price of coal and related items, such as electricity, steel and synthetics, will be inordinately increased because reclamation is expensive and costs will be passed on to the consumer. Anonymous replies to questionnaire.

\textsuperscript{29} 402 KAR 1:030 § 2(1)(a) (1975).
\textsuperscript{240} 402 KAR 1:030 § 2(1)(a) (1975).
\textsuperscript{241} Remarks of Wayne Rosso, Reclamation Supervisor, Peabody Coal Co., at a
As a result of this flood problem, depressions may be desirable in some instances. Operators are currently allowed to create ponds, but the ponds must cover at least one-half acre in surface area. In addition to being more economical to create and maintain, operators contend that smaller ponds foster the diversification of fish and other wildlife species on reclaimed land. Agronomists also point out that ponds are needed if reclaimed land is to be used for grazing cattle. Environmentalists argue, however, that these size limits are required to prevent western Kentucky operators from backfilling and grading and calling wherever water happens to settle a pond.

Inadequate methods of soil segregation and toxic material storage are two related issues which create special environmental hazards during mining. When the overburden is removed, earth, rock, slate, pyrite and other materials are exposed to air and water. The loose coal and pyrite oxidize and combine with water to form a highly acidic runoff. If topsoil is stored with this material it may also become acidic. Once backfilling and grading with this acidic mixture are complete, the soil cannot support plant life as well as natural soil.

Segregation of soil entails the separate removal and storage of topsoil to prevent contact with material from the earth’s lower strata and thus prevents the resulting acidity of the topsoil. Near the end of the reclamation process this soil is graded over the top of the site to provide a neutral medium for plant growth. In other states topsoil is segregated economically; the directors of reclamation in West Virginia and Pennsylvania attribute their state’s success in mine area restoration to the topsoiling techniques required by their respective statutes.


22 KRS § 350.093(3) (Supp. 1974).
222 402 KAR 1:030 § 3(1)(b) (1975).
223 Remarks of Wayne Rosso, supra note 261.
224 Written comment of Richard I. Barnhisel, Associate Professor of Agronomy, University of Kentucky, pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975, on file in the Division of Reclamation, Department for Natural Resources and Environmental Protection, Frankfort, Kentucky.
225 Short and Beals, supra note 138.
226 STACKS, supra note 41, at 36.
227 ENVIRONMENTAL PROTECTION, supra note 1.
228 STRIP MINING IN KENTUCKY, supra note 8, at 169.
Many other coal producing states have included this procedure in varying degrees. Kentucky, however, does not currently require topsoil segregation. The proposed regulations for surface effects of deep mining give the Division of Reclamation the authority to require segregation at its discretion. Coal operators, especially in eastern Kentucky, are opposed to this concept, however. One coal representative noted that segregation in eastern Kentucky makes little sense because there are few acid bearing coal seams and little topsoil is good and worth reclaiming. The president of one coal company argued that while in some situations the upper strata contains the necessary nutrients for healthy growth, more frequently, a mixture of several layers of earth provides the best growing medium. Without hesitation, however, all environmentalists advocate the removal and segregation of topsoil during mining operations to avoid acid contamination. The common feeling is that the topsoil has to be better than strip mine spoil.

Kentucky requires that all acid-producing or toxic materials disturbed during the stripping process be buried under at least 4 feet of clean overburden. This mandatory cover helps prevent acid mine drainage and resulting stream pollution. Like Kentucky, other states also require special treatment for toxic materials. Practical problems arise, however, because

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270 Ohio currently requires that topsoil and subsoils be segregated and stored in a fashion to prevent acid contact. "Clean" soil is required to be placed on graded soil to a compacted depth of 8 inches on acid producing material and 6 inches on all other material. Ohio Regs. NRim-III-08 (1975). Pennsylvania's regulations require similar segregation and replacement to a depth of 12 inches after final grading. 25 Pa. Rules and Regs., § 77.92(5)(5) (1972). West Virginia restricts required segregation to situations where overburden has acid potential. 20-6 W. Va. Regs. § 8.02 (1971). Tennessee requires segregation for area mining only. Tenn. Dept. Regs. § 8.02 (1971). Virginia has no provision for segregation of soil but if soil tests show high acid levels after grading "suitable soil" cover is required. Virginia Department of Conservation and Economic Development, Division of Mined Land Reclamation, Coal Surface Mine Regulations and Law § 10.03 (1972) [hereinafter cited as Va. Regs.].

271 Proposed 402 KAR 1:011 § 4(2) (1975) (published in error as 1:010 § 4(2)).

272 Interview with Tom Duncan, President, Kentucky Coal Association in Lexington, Kentucky, Sept. 22, 1975. See also Ratliff, supra note 123.

273 Phelps, supra note 14.

274 Begley, supra note 137; Bowers, supra note 137; Grim by Correspondence, supra note 159; Short and Beals, supra note 138.


276 Ohio requires the isolation of all acid producing refuse in locations that will minimize acid water formation and prevent surface water contact. Regulations further
potential acidity or toxicity of overburden cannot be determined at sight by an untrained individual. Tests must be conducted prior to and during the stripping and operation to determine where the potentially toxic seams lie. The method of stripping must then be modified to remove toxic materials.

B. Revegetation

Revegetation of an area that has been mined serves three basic purposes: stabilization of the spoil, improvement of the landscape’s appearance, and return of the land to productive use. The stabilization of spoil, which prevents erosion, is required because erosion is the primary cause of high water sedimentation, control of which was the main reason the Kentucky General Assembly passed the 1966 legislation requiring revegetation of surface spoils. Revegetation alone, however, has not been adequate to control the sedimentation problem since

require a prompt covering of such materials with 3 feet of nonacid producing material. Ohio Regs. NRim-III-02 (1975). Tennessee provides for segregation within the pit and coverage of 4 feet. Tenn. Dept. Reg. § 11.11 (1974) (an alternative is given in allowing the formation of a permanent water impoundment over the pit). West Virginia requires separation of toxic materials and coverage with 4 feet of material suitable for vegetative growth. 206-6 W. Va. Regs. 8A.05-06, 8B.02 (1972). Pennsylvania’s regulations set out a detailed scheme for covering toxic materials varying with the type of mining conducted. Generally, acid-forming materials must be spread along the bottom of the pit close to the spoil line, along the low wall of the cut. After covering, the material must be graded to repel water. 25 Pa. Rules and Regs. § 99.36 (1971). Virginia also requires segregation of toxic materials, which must be placed back into the pit before final grading and must be covered with a minimum of 4 feet of material suitable for plant growth. Va. Regs. 4.06c(1) and (2) (1972).


278 Id.

Other states have implemented overburden analysis in some form as a prerequisite to all surface mining. West Virginia requires preplan operations to show the presence of any acid-bearing materials which may result in spoil with a pH below 3.5. W. Va. Code Ann. § 20-7-9 (1973). In Pennsylvania, the results of test borings are required with each application for a mining permit. Pa. Stat. Ann. tit. 52, § 1396.4(a)(1) (Supp. 1975). Ohio regulation requires an extensive geological data report with every application. Test borings are mandatory with the compilation of test results for pH content, calcium carbonate deficiency, sulfur content and neutralization potential. Ohio Regs. NRim-IV-01 (1975). Virginia requires only a statement of possible adverse effects and a sketch of anticipated geologic strata in the highwall. Va. Regs. 4.06c(1) and (2) (1972). With mandatory preoperation testing, many problems associated with spoil handling and acid runoff could be better handled.

279 1 Mathematica, supra note 39, at I-52.

280 1 Mathematica, supra note 39, at I-43, 44.
much of the sedimentation in streams occurs during the process of mining before revegetation begins. In addition, vegetative cover alone is not adequate to control post-mining erosion until at least the third growing season after seeding.282

Kentucky has attempted to assure revegetation in two ways. First, Kentucky requires that the operator submit a proposed revegetation plan with his permit application.283 This preplanning is crucial to a successful revegetation program.284 By making operators, who are not normally long range planners,285 submit this plan with their application, the Department has made revegetation an integral part of the strip mining process.286 This, together with keeping revegetation current as the regulations require, minimizes the cost of revegetation.287 Second, the operator must post a bond which is not totally released until certain stages of revegetation are achieved.288 If the operator fails to revegetate the area, the state has the forfeited bond to pay for the revegetation.289

KRS § 350.095 and 402 Ky. Admin. Regs. (hereinafter cited as KAR) establish comprehensive revegetation requirements. Specific requirements provide for time limits on work, chemical analysis of soil, minimum fertilizer requirements, mulch requirements, density of tree planting, use of shrubs for wildlife, inoculation of seeds, and preparation of land for seeding.290 Bonding requirements and standards for permanent vegetation are also set out.291

282 Id.
283 402 KAR 1:040 § 1 (1975). The vegetation plan consists of a description of the overburden composition, a prediction of what the soil condition is expected to be after grading and before revegetation, and speculative answers to questions concerning scarification, use of lime, use of fertilizer, use of mulch, use of seed, and the anticipated date of reaching ground cover requirements.
284 402 KAR 1:035 (1975) allows a strip mining permit to be issued only if revegetation requirements can be met.
285 2 Mathematica, supra note 39, at IV-18; Environmental Protection, supra note 1, at 153.
286 2 Mathematica, supra note 39, at IV-14. Revegetation costs are substantially affected by the time lapse between grading and seeding.
287 See 402 KAR 1:040 § 1(1).
288 2 Mathematica, supra note 39, at VI-I, Revegetation costs are substantially affected by the time lapse between grading and seeding.
290 See notes 169-176 and accompanying text, supra.
291 402 KAR 1:040 § 1(1)-(8) (1975).
Because Kentucky does not require the segregation of topsoil, the initial step in revegetation is often soil preparation. A 1974 report which discussed eastern Kentucky revegetation problems reported that adequate vegetative cover can be established on strip mining sites only when certain conditions are met. Of these four conditions, three pertain to soil preparation: the pH of the soil must be greater than 5.0; seedbeds must be properly prepared (e.g., scarified) prior to seeding; and seedbeds must be properly fertilized. To prepare soil for vegetation, operators can apply certain chemicals; the application of lime, for instance, can increase the water pH of the soil to the 5.5 minimum, and phosphate and nitrogen applications at the time of seeding are helpful in establishing initial plant cover.

In addition to these soil requirements, Kentucky regulations require a stable water pH of at least 5.5 on a minimum of 90 percent of the disturbed area before any part of the bond may be released. The regulations further require a chemical analysis of the spoil to determine its lime and fertilizer require-

292 1 MATHEMATICA, supra note 39, at I-54. At the time of this report it was estimated that only one-third of the operators in eastern Kentucky prepared seedbeds prior to seeding, but at that time seedbed preparation was not required during late winter and early spring.

293 A pH of 7 is neutral; a pH of less than 7 is acid, and becomes more acidic as the pH decreases; conversely, a pH of more than 7 is alkaline, and becomes more so as the pH increases. W. BERG, DETERMINING pH OF STRIP-MINE SPOILS, (USDA Forest Service Research Note NE-98, 1969). "Below a pH of 5.0 the solubility of iron, aluminum, and other elements increases to the point that they may be toxic to plants. Low pH affects the ability of most plants to grow." ENVIRONMENTAL PROTECTION, supra note 1, at 150.

294 1 MATHEMATICA, supra note 39, at I-53. See also 402 KAR 1:040 § 1(3) (1975) which sets out in detail the fertilizers required. While this section describes the amounts of fertilizers needed, it also states that the Division may approve lesser amounts "if approved soil tests indicate lesser amounts are needed for satisfactory revegetation." This flexibility is achieved directly by Ohio and Pennsylvania, where fertilization requirements depend solely on the soil tests of the area. OHIo REGS. NRim-III-09 (1975); 25 PA. RULES AND REGS. § 77.22, .62 (1971). This method reduces waste of unneeded fertilizer but still protects against vegetative failure due to lack of fertilization.

295 ENVIRONMENTAL PROTECTION, supra note 1, at 171. See also text accompanying note 297 infra.

296 ENVIRONMENTAL PROTECTION, supra note 1, at 172.

297 402 KAR 1:040 § 1(2) (1975). Areas approved for grasses and legumes alone require a pH of 6.5. Id.
This is necessary because the proper application of agricultural limestone to achieve the desired pH may vary from 1 ton per acre for slightly acidic spoils to over 25 tons per acre for highly acidic spoils.

Although KRS § 350.093(6) provides that after "backfilling and grading have been completed and approved by the department, [and] the soil pH [sic] level required by the department regulations has been satisfied, the secretary shall release the bond . . ." less $200 per acre, the regulations state that "[n]o portion of the bond shall be released" until other revegetation requirements are met. This discrepancy has not been explained, and it is uncertain which provision applies. The amount retained is held by the Department to reclaim the land if the operator fails to comply with the law.

The Division of Reclamation uses the presence and continued growth of the vegetation to evaluate the success of the operator's reclamation. Once the vegetative growth is sufficiently established, the bond is released in its entirety. While this appears to be a reasonable policy to force complete compliance with the reclamation requirements, there is also merit to the argument that partial bond release should accompany the completion of each stage of reclamation because the bond should not be punitive but rather should exist only to cover the cost of reclamation if the operator fails in his duty to reclaim.

The Department also requires the placement of mulch.

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294 Id.
295 University of Kentucky, College of Agriculture, Department of Agronomy Bulletin, LIME AND FERTILIZER RECOMMENDATIONS FOR RECLAMATION OF SURFACE-MINED SPOILS (AGR-40) at 2 (1975) (Chart). In addition, pH levels differ according to the ultimate use of the land. Id. at 1. If the cover crop is desired, a pH of 5.5 is satisfactory, but a pH of 6.4 is required for hay and pasture production.
296 The 1976 General Assembly increased the amount withheld from $200 to $300. See H.B. 697.
297 402 KAR § 1(4) (1975).
298 Id.
299 402 KAR § 1(4) (1975).
300 See 402 KAR § 1(4) (1975).
301 But see letter from R.I. Barnhisel to the KENTUCKY LAW JOURNAL, dated Feb. 23, 1976, in which he states that while this is true in theory there is sometimes not enough money for reclamation because of the need for regrading of eroded spoils, "Hence the bond should be used as a punitive measure for protection of our environment since past history has shown that all operators are not responsible."
on slopes which exceed 15 degrees, on disturbed areas with a buffer pH below 5.0 prior to liming, on all areas where seedbed preparation is impossible, and on all areas that are seeded with predominantly cool season species from June 1st to August 1st. This is done to prevent erosion and to reduce the surface temperature of the ground. In some instances materials to hold the mulch in place may also be required. Tennesee requires mulching with seeding on all disturbed areas, while other states require mulch applications only in certain situations. Ohio requires mulch only where necessary to promote seed germination and to control erosion. West Virginia demands it on slopes over 20 degrees, and Virginia Regulation 10.05A requires mulch to be placed on all “critical areas” unless the operator can show that quick cover can be established without erosion. Environmentalists heartily endorse the use of mulch, especially where it is beneficial to retain ground moisture and reduce ground temperature.

As important as it is, however, soil preparation is only the initial step. In eastern Kentucky except between October 15 and February 15 seeding must be completed 15 days after grading and “shall be kept within 500 feet of the first cut coal removal on the outslopes.” In western Kentucky seeding must be done 45 days after grading is finished. This provision does not, however, apply between October 15 and February 15 and May 15 and August 1. A 1974 report on eastern Kentucky asserted that the time required to establish vegetative cover could be reduced by adoption of an “all seasons” planting procedure. Although this has been found feasible by the United

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205 A buffer pH is a solution capable of neutralizing acids and bases and thereby maintaining the original hydrogen-ion concentration, used to measure soil pH. WEBSTER’S SEVENTH NEW COLLEGIATE DICTIONARY 109 (7th ed. 1971); KENTUCKY DEPT FOR NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION REVEGETATION MANUAL 33 (no date) [hereinafter cited as REVEGETATION].

206 402 KAR 1:040 § 1(4) (1975).

207 Id.

208 TENN. DEP’T REGS. § 11.87 (1975).

209 OHIO REGS. NRim-III-09 (c)(1975).

210 20-6 W. VA. REGS. 9D.01 (1971).

211 Begley, supra note 137; Grim by correspondence, supra note 159.

212 402 KAR 1:040 § 1(1)(a) (1975). A 30 day extension may be granted.

213 402 KAR 1:041 § 1(1)(b) (1975).

214 1 MATHEMATICA, supra note 39, at I-54.
States Forest Service\textsuperscript{315} it has not been adopted by the states. Ohio and West Virginia require planting only in favorable seasons,\textsuperscript{316} while Pennsylvania sets out detailed planting times according to the types of plants used.\textsuperscript{317}

The survey indicated that some of the responding operators were dissatisfied with Kentucky's time limits. Although 13 of the operators responding felt the limits were reasonably designed to balance environmental interests with those of coal operators, a vociferous minority argued that the limits were very burdensome. A western Kentucky operator remarked that since mining cannot be completed on a strict schedule due to weather and market conditions, the limits are unrealistic. Another operator in Harlan and Leslie Counties felt that a longer time was needed to allow for suitable cover. He suggested extendible time limits, especially for multiple seam operators to allow for total coal extraction before the seeding operation is begun.\textsuperscript{318}

At one time trees were immediately planted to reclaim an area.\textsuperscript{319} It is now recognized, however, that the establishment of a herbaceous ground cover is necessary to reduce and control runoff and erosion.\textsuperscript{320} In view of this need, West Virginia and Ohio require preliminary herbaceous cover even for areas to be planted with trees.\textsuperscript{321} Kentucky regulations require under most circumstances the planting of not less than 800 trees per acre,\textsuperscript{322} but the regulations also provide for the planting of "shrubs for wildlife" in lieu of tree seedlings.\textsuperscript{323} In contrast, the proposed federal bill would have required the operator to establish a

\textsuperscript{315} Id.

\textsuperscript{316} \textit{Ohio REGS. N.Rim-III-10 (A)(1975); W. VA. REGS. § 9B.01(1971).}

\textsuperscript{317} See, e.g., \textit{25 RULES AND REGS. §§ 77.17, .25, .56 and .65. (1971).}

\textsuperscript{318} Comments by C. Bruce Hoskins, President, Windy Hill Mining, Inc., in response to questionnaire.

\textsuperscript{319} \textit{ENVIRONMENTAL PROTECTION, supra} note 1, at 818.

\textsuperscript{320} W.R. Curtis, Vegetating Strip-Mining Spoils for Runoff and Erosion Control, paper given at Mining Symposium, Dec. 2-4, 1971, at Pipestream State Park, West Virginia; \textit{REVETEATION, supra} note 305, at 4.

\textsuperscript{321} W. VA. REGS. 9C.01 (1971); \textit{Ohio REV. CODE ANN. § 1513.07(9) as amended (Page, Supp. 1974).}

\textsuperscript{322} \textit{402 KAR 1:040 § 1(5) (1975). Areas where trees are not required are benches formed by contour mining, level areas created by mountain top removal, and areas in western Kentucky that are approved for grasses and legumes only.}

\textsuperscript{323} \textit{402 KAR 1:040 § 1(6) (1975).}
“diverse, effective, and permanent vegetative cover . . . capable of self revegetation at least equal in extent of cover to natural vegetation of the area . . . ,” and would have permitted species which are not native to the area to be introduced.

Environmentalists point to the social costs of replacing hills full of softwood and hardwood trees and other native vegetation with one type of tree (black locust) that happens to thrive on the slightly acidic conditions which are often present at strip mine sites. They contend that the landowner should be consulted because he is the person most affected by and concerned with the condition of the land. Reclamation, they argue, should be more than the mere stopping of erosion and planting of trees; it should also be the restoration of the flora and fauna that existed prior to mining.

To assure that reclamation laws are complied with, KRS § 350.060(9) requires a bond of at least $500 but no more than $1500 per acre of land affected with a minimum total bond of $5000. At present Kentucky's bonding requirements are generally adequate, but to assure faithful performance and to

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324 Federal Bill, supra note 139, Title V. § 515(b)(19).
325 Id.
326 Short and Beals, supra note 138.
327 Begley, supra note 137; Short and Beals, supra note 138. Surface owner input need not be in the form of a veto as was recently struck down in Department of Natural Resources and Environmental Protection v. No. 8 Limited of Virginia, 528 S.W.2d 684 (Ky. 1975). The regulations should recognize the moral if not legal right of the surface owner to have some input into just what shape and form his land will take. The landowner is the party who will bear the burden and responsibility of returning the land to some productive use and therefore he should have some voice in the form that reclamation takes.

An example of vegetation which backfired is the kudzu vine, which was imported to eastern Kentucky because it grows well in acid conditions. It grows very rapidly in good soil and will smother trees and cover entire mountains if unchecked. Short and Beals, supra note 138.

328 The 1976 General Assembly increased the maximum bond per acre from $1,500 to $3,000. See H.B. 459.
329 In West Virginia the bond is between $600 and $1,000 per acre of land affected, with a minimum total bond at $10,000. W. VA. CODE ANN. § 20-6-16 (1973). Tennessee has a minimum bond of $1,000, TENN. DEP'T REGS. § 2.02 (1974), while Virginia has a minimum of $200 and maximum of $1,000 per acre. VA. CODE ANN. § 45.1-206 (1974). (A total minimum of $2,500 is imposed for operations affecting more than 5 acres). Ohio has no upper limits. This allows for sufficient bonds in cases of difficult reclamation. Ohio also requires a total minimum bond of $5,000. OHIO REV. CODE ANN. § 1513.08(A) as amended (Page, supp. 1974).
330 Some coal operators contract with companies such as Kentucky Reclamation Association to revegetate strip mining spoil after backfilling and grading. Because the
encourage compliance, the Department should not hesitate to require the maximum bond, especially in doubtful cases. The Kentucky regulations, however, do have some weaknesses in this area. Even though those who responded to the survey felt the current requirements fairly balanced environmental needs with the interests of the coal operators, in Kentucky,\(^3\) as in Tennessee,\(^3\) the operator may not immediately put the land to a more productive use, such as planting crops, because such crops are not permanent vegetation. Some experiments with planting crops on reclaimed land have been successful in producing yields equal to yields from land that has not been mined,\(^3\) however, and Pennsylvania and West Virginia allow for temporary planting of crops in certain soil conditions.\(^3\)

Ohio, even though it specifically provides for planting of grasses and trees, also allows exceptions and provides a special standard for evaluation of the success of agricultural crops.\(^3\)

In addition, a variety of hardwood and softwood trees should be required as revegetation to avoid a concentration of any one type. In Pennsylvania no more than 50 percent of any operation may be planted with one species of tree.\(^3\)

Under KRS § 350.113 the operator must file a report on the completion of planting. The report is then followed by an inspection.\(^3\) Before the bond is released, 70 percent of permanent vegetation ground cover must be established in each acre, and in areas where only grasses and legumes are approved at

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1. 402 KAR 1:090 § 1(1) (1975).
3. Barnhisel, supra note 301.
4. 25 PA. RULES AND REGS. § 77.67 (1971) (pertaining to anthracite operations);
20-6 W. VA. REGS. 9B.04(a) (1971).
5. OHIO REGS. NRim-III-10 (1975).
6. 25 PA. RULES AND REGS. §§ 77.11, 77.51 (1971). In anthracite regions eight rows of each species are to be planted together.
7. KRS § 350.113(3).
least 80 percent ground cover must be established. One professional reclamation company has estimated that it currently takes 2 to 5 years to release bonds fully, and the smaller operators feel that it is a hardship to have their money tied up so long. The proposed federal bill, however, would have made the operator responsible for successful revegetation for 5 full years after completion of work on the tract.

Pennsylvania has implemented an interesting alternative. Under its law operators are required to submit with their application "[a] detailed timetable for the reclamation plan, and the operator's estimate of the cost of each such step and the total cost to him of the reclamation program." After satisfying each step, a proportion of the bond is released with 5 percent of the bond being held for 5 years after completion of the work to compensate for any failure. Ohio, on the other hand, allows half the bond to be refunded before seeding if all work prior to that time is acceptable.

Overall, the regulations pertaining to revegetation need further development. Permits may not now be specifically denied for areas with overburden of potentially excessive acidity, even though this type of overburden may be especially difficult to reclaim. In addition, many feel constrained by the specificity of the regulations. For example, the Kentucky Reclamation Association felt that emphasis should be on the results of the revegetation process and not the process itself. Since the ultimate goal is successful revegetation, they felt that each operator should be allowed to use his own judgment to attain the required results. Revegetation specialists also complained

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33 Remarks by Karl Kump, Executive Vice President, Kentucky Reclamation Association, at Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975. The problems of bond release are more fully discussed supra at notes 168 to 175.
34 Federal Bill, supra note 139, at Title V, § 515(b)(20).
38 402 KAR 1:035 (1975) provides that surface mine permits are to be issued on the condition that the reclamation plan can be carried out. The problem is verifying that the operator is properly carrying out his reclamation plan.
39 Written comment to the Kentucky Reclamation Association pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975.
that the regulations are too specific in the amount of chemicals required; application of the required chemicals does not assure a desirable level of acidity; dates for seeding are arbitrary; tillage has a greater effect on vegetation than mulching; there is no systematic, statistically sound technique for determining the percentage of a ground cover on any specific location; and time limits for completing revegetation should be flexible because of yearly changes in growing conditions and weather. It also pointed out that some permanent plant species can be established more easily without a cover or companion crop. It appears that the state should continue to attempt to make the requirements better suited for the operators, but only if this can be done without sacrificing the success of the revegetation process.

C. Sediment Control

A problem related to revegetation is sediment, one of America's greatest pollutants. It is estimated that through the process of erosion more than 1 billion tons of sediment annually reach the major streams of the United States. Erosion has its damaging impact on land and water alike reflected in reduced carrying capacity of streams, clogged reservoirs,

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346 Remarks of Earl Kump, Executive Vice President, Kentucky Reclamation Association, at Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975.
347 Id.
348 Written statement by Richard I. Barnhisel, Associate Professor of Agronomy, University of Kentucky, pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975.
349 Written statement of Jim Powell, Reclamation Supervisor, Peabody Coal Co., pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975. An environmentalist, however, argues that the most important thing is establishing a quick ground cover. Whether tillage or mulching has the greatest effect is not relevant. Begley, supra, note 137.
350 Written statement of the Kentucky Reclamation Association, pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975.
351 Anonymous reply to questionnaire.
352 Written comment of Jim Powell, Reclamation Supervisor, Peabody Coal Company, pursuant to Public Hearing on Kentucky Reclamation Regulations (402 KAR 1:025-1:060), Frankfort, Kentucky, May 20, 1975.
353 Environmental Protection, supra note 1, at 101.
destruction of the habitat of fish and other aquatic life, filled navigation channels, increased flood crests, degraded facilities for water-based recreation, increased industrial and water treatment costs, premature aging of lakes, and reduced productivity of flood plain soils.\textsuperscript{355}

Normally, erosion may be viewed as a gentle action by which soil particles are detached by the impact of raindrops.\textsuperscript{355} Surface mining, however, accelerates this natural process. Of concern to environmentalists is the rate at which sediment is deposited and the methods of controlling erosion at its source, for control at the source both conserves the soil in place and minimizes the accumulation in reservoirs and harbors.\textsuperscript{357}

While many factors affect the rate of erosion, the susceptibility of strip-mined land to erosion depends chiefly upon the amount of rainfall, vegetation, soil type, and land slope.\textsuperscript{358} Kentucky receives an average of 45.7 inches of rain annually, with over 50 inches a year in the southeastern region.\textsuperscript{359} An eastern Kentucky stream which normally contains about 500 parts per million of silt may receive surface mine runoff containing 30,000 parts per million during a storm.\textsuperscript{360} Vegetation is important because it provides significant protection against erosion caused by rainfall. This cover absorbs the energy of the falling drops as well as generally reducing the drop's size.\textsuperscript{361} Soil type and other physical characteristics of overburden are also critical; a well-cemented soil will resist erosion more readily than loose soil. In addition, erosion generally increases when the soil is sandy\textsuperscript{362} and decreases with the presence of water-stable aggregates.\textsuperscript{363} The susceptibility of strip mined land to erosion also depends on the degree and length of the slope.\textsuperscript{364} Erosion

\textsuperscript{355} \textit{Environmental Protection}, supra note 1, at 101.


\textsuperscript{357} R. Linsley, \textit{Hydrology for Engineers} 278 (1st ed. 1958).

\textsuperscript{358} Id.


\textsuperscript{360} \textit{Surface Mining}, supra note 48, at 31.

\textsuperscript{361} R. Linsley, \textit{supra} note 357, at 279.

\textsuperscript{362} Id. at 280. This is due to the loss of cohesion in sandy soil.

\textsuperscript{363} Id. A soil whose individual grains do not tend to form aggregates will erode more readily than one in which aggregates are plentiful.

\textsuperscript{364} \textit{Environmental Protection}, supra note 1, at 101.
is greater on steep slopes because the steeper the slope the greater the impact of splash erosion in moving soil downslope. Flow velocities are also much greater on steep slopes.

In addition to sediment from the strip mine operation itself, improperly designed and constructed haul and access roads are potential sources of large sediment yields. Because these roads are a major source of disturbed and uncovered soil, they are highly susceptible to erosion. Recognizing this fact, Kentucky regulates their construction, maintenance, and abandonment. These regulations acknowledge the significance of proximity of the road to stream beds, steepness and length of grades, proper drainage, revegetation where possible, proper surfacing, and adequate protective procedures at abandonment. The most crucial question, however, is the extent to which these requirements retard erosion. Consideration must be given to recommendations for changes in the regulations which would achieve greater sediment control without creating undue burdens on the mining industry. One suggestion has been to subject these haul roads to the same regulations as any surface, including removal and segregation of topsoil.

Sediment yields vary, not only with the extent of disturbance within the watershed, but also with the proximity of the disturbed area to the natural stream channel. The latter problem is reduced by the provision that no “haul or access road shall be constructed in a stream nor shall any stream or stream bed be used as a haul or access road.” A provision of KRS Chapter 350 further prohibits the destruction of any part of the surface within 100 feet of a stream. It is note-

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255 R. LINSLEY, supra note 357 at 279.
256 Id. at 278.
258 Id., § 1(2)(c), (d) (1975).
259 Id., § 1(2)(e),(f),(g),(h),(m),(n),(p),(q) (1975).
260 Id., § 1(2),(j) (1975).
261 Id., § 1(2)(e) (1975).
262 Id., §1(2), (h) (1975).
263 Begley, supra note 137.
264 ENVIRONMENTAL PROTECTION, supra note 1, at 102.
266 KRS § 350.028(4).
267 402 KAR 1:011 § 4(3),(a) (1975) requires miners to place spoil so that no surface
worthy, however, that there is no satisfactory definition of "stream." Other surface mining operations cannot come within 50 feet of a natural drainway, but haul roads are expressly excepted. Therefore, it appears that haul roads can be constructed along the same depressed paths surface runoff will follow after any significant rainstorm.

Although the regulations preclude surfacing these roads with any acid producing material, there is no general requirement that any surfacing material be used. However, a 1974 study recommends surfacing with sound, durable, nonacid-producing elements, such as slag, crushed stone, reddog, or stream gravel. This covering would reduce the area of uncovered loose soil available to erode. While 402 KAR 1:025 § 1(2)(n) acknowledges the need for special provisions upon abandonment of roads, no attempt is made to insure that natural drainage patterns will be restored.

Although access roads are a major catalyst of sedimentation problems, an equally serious problem is created by water flowing into, within, and from surface mining areas. Proper sediment control involves adequate diversion of water coming into the mining area, construction of holding basins, use of adequate settling or treatment processes, and proper release of the water from the mining area. Development of erosion and sedimentation plans before the mining operation begins can help prevent strip mining's most serious consequences. Kentucky has this requirement. Before a permit is issued, for either a surface or underground operation, such plans must be approved and initial constructions begun. As the existing Kentucky legislation and the previous discussion of erosive factors suggest, the key to minimizing erosion and sedimentation

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runoff results, without attempting to keep a required distance between the operation itself and streams. Overburden is not the only source of sedimentation; the entire area can erode.

377 This potential contradiction was explained by the Office of General Counsel, Frankfort, Kentucky. A natural drainway is not a stream.

379 402 KAR 1:030 § 2(2)(c) (1975). This regulation as published appears ambiguous; no cases had been prosecuted with respect to it as of October 1, 1975.


381 "ENVIRONMENTAL PROTECTION, supra note 1, at 119.

382 Id. at 101.

383 Id.

problems is the control of water in the surface mining area. Even though the regulations spell out the procedural requirements for a sediment control plan, they give little if any detail of the substantive issues considered crucial by the Division of Reclamation. These issues should be clearly outlined.

The chief mechanical means of controlling sedimentation is the use of sediment retention basins. Water entering the mining area is diverted into these basins and is treated before being released into natural drainways. There are basically three types of primary basins: excavation, earth embankment, and leaky dams. These are often supplemented with more primitive secondary structures.

Careful monitoring of sediment basins should yield sufficient information to ascertain whether gravitational settling alone is adequate to clarify muddy water. If this is not enough, additional treatment can force settling before the water is released. Routine maintenance and cleaning is essential to efficient use of these basins.

During the heavy rains in the spring of 1974, some 30 to 40 sedimentation structures collapsed in western Kentucky. The regulations now require that such structures be certified by professional engineers or the local conservation district. Adequate enforcement of this regulation should overcome recent criticism that many basins are poorly designed or, even if properly designed, not constructed in accordance with the design plans. It should also be recognized, however, that there are locations where the physical characteristics of the terrain are such that effective sediment control basins cannot be con-

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385 402 KAR 1:060 (1975).
386 Environmental Protection, supra note 1, at 103. See also § V, B supra for a discussion of vegetation as a means of controlling erosion.
387 See generally Environmental Protection, supra note 1, at 104-106 for a discussion of the types of basins. See also Dep't of Natural Resources Division of Reclamation, Drainage Handbook for Surface Mining (W. Va. 1972) for a technical discussion of primary basins.
389 Environmental Protection, supra note 1, at 104-106.
391 402 KAR 1:060 § 1(1), (2) (1975).
392 Grim, supra note 151.
structed; here surface mining should be prohibited.\textsuperscript{393}

Another problem is drainage. To avoid the rush of large quantities of water over the outslope, proper drainage of the pit or bench is necessary.\textsuperscript{394} In addition, at sites where a highwall is created, diversion ditches\textsuperscript{395} above the highwall are necessary to divert water away from the work area.\textsuperscript{396}

Pit drainage is the process by which water is removed during actual mining operations to avoid siltation of receiving streams.\textsuperscript{397} Surface runoff, rainfall, and seepage water often collect in the working pit areas and must be removed. Should this water be in close proximity to operating equipment, large quantities of spoil can be churned up and put into suspension.\textsuperscript{398} A frequent industry practice is to bulldoze a cut through the bench crest and discharge the water onto the outslope. This practice is harmful, however, because it often results in the destruction of entire streams. The more prudent course would be to release pit water slowly through the use of siphons or pumps with outlets below the toe of the outslope.\textsuperscript{399}

D. Water Quality

Coal mining, whether by surface or subsurface methods, has the potential for destroying our indispensable water supplies. The magnitude of mine-related water pollution has already reached startling proportions. In 1965, a U.S. Geological survey of stream quality in the Appalachian coal region reported that 61 percent\textsuperscript{400} of the major streams in an area of 160,000 square miles were measurably influenced by mine drainage.\textsuperscript{401} A 1969 estimate indicated that it would cost approximately $6.6 billion to clean up our Appalachian

\textsuperscript{393} Environmental Protection, \textit{supra} note 1, at 107.
\textsuperscript{394} Id. at 109.
\textsuperscript{395} A diversion ditch is a man-made waterway used to change the normal or usual course of water.
\textsuperscript{396} Environmental Protection, \textit{supra} note 1, at 111.
\textsuperscript{397} Id. at 108.
\textsuperscript{398} Id. at 109.
\textsuperscript{399} Id.
\textsuperscript{400} 194 out of 318 streams studied. U.S. Dep't of Interior, Environmental Effects of Underground Mining and of Mineral Processing 102 (unpublished working paper ordered Jan. 29, 1971). This study was not endorsed or published by the Department of the Interior. [Hereinafter cited as Environmental Effects.]
\textsuperscript{401} Id.
The severity of this problem becomes even more acute in light of the present prediction of soaring national fresh water requirements in the near future.\textsuperscript{403}

Mine-related water pollution presents two major problems: physical pollution,\textsuperscript{404} resulting from the disturbance of vegetative cover, and chemical pollution, resulting from the dissolving and oxidizing action of surface elements on exposed minerals in the overburden. While the problems of physical pollution and sediment control have been dealt with in previous sections, chemical pollution from mining operations deserves special attention since it is not affected by sedimentation control structures.\textsuperscript{405}

The major source of chemical pollution is the formation of acid. Sulfide minerals, often present in overburden, produce sulfuric acid when they react with oxygen.\textsuperscript{406} The chief mineral responsible for this acid formation is pyrite, an iron and sulfur compound. In essence, acid mine drainage is a function of the type and amount of pyrite present in the overburden, the duration of exposure, the amount of water available, and other characteristics of the overburden.\textsuperscript{407}

Acid discharge is a major source of the economic damage resulting from mine-related water pollution.\textsuperscript{408} It affects surface water by runoff and ground water by percolation. In addition, it promotes a low pH in surrounding soil, rendering it less suitable for most vegetative cover. It is estimated that acid mine drainage affects 5,700 miles of Appalachian streams.\textsuperscript{409}

Surface mining, however, is not the major contributor of acid mine drainage. Inactive mines and refuse piles account for 78 percent of the drainage, with inactive underground works responsible for two-thirds of this amount.\textsuperscript{410} Of the total active
mining operations, underground mining contributes 85 percent of the acid mine discharge.\textsuperscript{411}

Acid discharge alone is not totally responsible for degradation of our water resources; other dissolved minerals also enter streams as a result of mine operation. As the pH of water is lowered through acid formation, minerals such as iron, manganese, copper, and zinc become more soluble and enter into solutions\textsuperscript{412} which are free to mix with our water supply.

Chemical pollution may be controlled through abatement at the source,\textsuperscript{413} necessitating among other things the control of oxygen contact,\textsuperscript{414} or treatment to remove the pollutants after the pollution occurs.\textsuperscript{415} To abate the problem at the source, it is important to cover the exposed acid producing materials as quickly as possible. With underground mining the mine must be sealed or flooded to prevent the oxidation of pyrites and other sulfur bearing minerals.\textsuperscript{416} The second way to control acid effluence from mines requires treatment after the water has entered the stream or while it is still in sedimentation basins. This treatment usually consists of lime neutralization. Subjecting the water to lime increases the pH, resulting in the dissolved minerals returning to their normal insoluble state.

While the mechanisms for control exist, major objections have been raised to their employment. Sealing and flooding underground mines to prevent oxidation are both expensive and not entirely successful. In addition, treatment of acid water by lime neutralization may place a burden on operators since lime is relatively expensive to acquire. Furthermore, this process produces high volume, low density sludge which must be disposed of properly. In addition, from an environmentalist standpoint, there exists the possibility that overtreatment may render the discharged water highly alkaline.\textsuperscript{417} Despite these problems few would recommend that coal mining's pollution should go uncontrolled. Mineralization of water poses too many

\textsuperscript{411} ACID MINE DRAINAGE, supra note 408, at 36.
\textsuperscript{412} ENVIRONMENTAL PROTECTION, supra note 1, at 197.
\textsuperscript{413} See generally ACID MINE DRAINAGE, supra note 408, at 50.
\textsuperscript{414} ENVIRONMENTAL PROTECTION, supra note 1, at 198.
\textsuperscript{415} Id. at 199; ACID MINE DRAINAGE, supra note 408, at 57.
\textsuperscript{416} ACID MINE DRAINAGE, supra note 408, at 54.
\textsuperscript{417} EPA LEGAL PROBLEMS OF COAL MINE RECLAMATION 32 (1972).
hazards to health and its costs are too high to industry.\textsuperscript{418}

One very serious source of mine-related water pollution has received very little attention in Kentucky. While approximately 70 percent of all Kentucky's acid pollution originates from underground mines,\textsuperscript{419} this is not presently regulated. From an environmentalist standpoint, this gap stands in stark contrast to the extensive regulation of mine drainage by such states as Pennsylvania. Under Pennsylvania's present regulations, operators of both deep and strip mines must obtain a permit for any mine drainage. Applications must be accompanied by plans for drainage, pollution prevention, and treatment,\textsuperscript{420} and permit approval is subject to the approval of affected water supply surveyors.\textsuperscript{421} Reports are to be made monthly where significant water flow or any discharge occurs.\textsuperscript{422} The general discharge limitations are strict. No acid discharge is allowed, and iron cannot be discharged above 7 milligrams per liter; pH must be maintained between 6.0 and 9.0. In addition, other chemical pollutants such as aluminum, sulfate and manganese may also be restricted.\textsuperscript{423}

The obvious objection to such a system of regulation is the cost incurred by the mine operator in obtaining the permit, instituting abatement plans, and monitoring its success. On the other hand, advocates of such control assert that by incorporating control techniques in the mining operation, the coal industry can absorb the additional costs as overhead.\textsuperscript{424}

To control the adverse effects of acid drainage from abandoned underground mines, it is possible to place permanent responsibility on a mine operator for control of water infiltration,\textsuperscript{425} adequate sealing,\textsuperscript{426} and diversion and treatment of discharge.\textsuperscript{427}

\textsuperscript{418}Id. at 30-31; Davis, The Costs of Strip Mining, AGRIC. ENG. (Dec. 1973).
\textsuperscript{419}ACID MINE DRAINAGE, supra note 408, at 36.
\textsuperscript{420}25 PA. RULES AND REGS. § 99.11, .12 (1971).
\textsuperscript{421}Id. § 99.14.
\textsuperscript{422}Id. § 99.32.
\textsuperscript{423}Id. § 99.33. See also 402 KAR 1:055 § 2(3) (1975).
\textsuperscript{424}ACID MINE DRAINAGE, supra note 408, at 116.
\textsuperscript{425}Environmental Protection Agency, Development Document for Effluent Limitations, Guidelines and Standards of Performance for Coal Mining Point Source Category at 81. (Jan. 1975) (draft) [hereinafter cited as Effluent Limitations].
\textsuperscript{426}KRS § 352.090(3) (Supp. 1974). This statute refers casually to sealing. Sealing is not required and is considered a safety problem.
\textsuperscript{427}Effluent Limitations, supra note 425, at 86.
Kentucky purportedly regulates another problem related to underground mine acid drainage. When abandoned underground mines are encountered during strip mining, there is a rapid discharge of large volumes of polluted water which may make complete reclamation impossible. This hazard is particularly acute because 70 percent of all eastern Kentucky surface mines are on or near sites of underground works.\textsuperscript{428} Present Kentucky regulations\textsuperscript{429} require that all breakthroughs to underground works be reported to the Division of Reclamation, but the Division admits that reports are seldom made.\textsuperscript{430} The regulations also require that no "drainage shall be discharged into underground mine workings,"\textsuperscript{431} but establish no remedial steps to prevent surface water from entering the mine. In addition, Kentucky requires that the operator submit plans for permanent control within 5 days. The operator then has 30 days after approval to comply with these plans.\textsuperscript{432} From an environmentalist viewpoint, regulations in this area should place a greater emphasis on totally preventing breakthrough drainage initially.\textsuperscript{433}

Kentucky's water quality is currently protected by the Department of Natural Resources and Environmental Protection through its Divisions of Water Quality, Water Resources, and Reclamation. The latter has jurisdiction over all water problems created by coal extraction except those specifically delegated to the Division of Water Resources.\textsuperscript{434} These regula-

\textsuperscript{428} Id. 1 Mathematica, supra note 39, at I-51. According to one study, seven out of ten auger mines visited were augering the surface pillar left by previous underground mining. 2 Mathematica, supra note 39, at IV-40.

\textsuperscript{429} 402 KAR 1:030 § 4 (1975).

\textsuperscript{430} Ratliff, supra note 123.

\textsuperscript{431} 402 KAR 1:055 § 2(5) (1975).

\textsuperscript{432} Id. Other states have also taken steps to tighten procedures in an attempt to prevent this type of acid discharge. Tennessee requires that any seepage resulting from a mine breakthrough must be reported within 24 hours, plans for permanent control submitted within 5 days, and work completed to control the problem within 30 days. Tenn. Dep't Regs. § 11.12 (1975). Ohio requires immediate filling of the opening with compacted, impervious material to a depth of three times the dimension of the break. The seal must also be inspected prior to backfilling. Ohio Regs. NRim-III-05(D) (1976). West Virginia has a similar provision. W. Va. Code Ann. § 20-6-14 (1973). In Pennsylvania no deep mines can be intercepted without prior approval. 25 Pa. Rules and Regs. § 77.92(i)(3) (1972).


\textsuperscript{434} See 402 KAR 1:030 § 3(1)(K) (1975).
tions set out effluent standards with limits on pH, iron, total acidity, settleable matter, and suspended material.

Superimposed upon this regulatory system is federal jurisdiction under the Water Pollution Control Act. The Environmental Protection Agency has the authority to establish its own effluent standards and operate a point source permit system for coal mining operations. At the moment, EPA has developed guidelines which limit pH, total iron, dissolved iron, aluminum, manganese, nickel and zinc content and total suspended matter, but has no binding regulations. It has only begun to accept permit applications.

Serious questions have emerged concerning the ability of surface mine operators to comply with EPA guidelines, and coal operators complain that should the EPA guidelines become enforceable regulations, they would be subject to two conflicting standards. For instance, Kentucky has never set limitations on five of the substances controlled in the EPA guidelines, and Kentucky's limit on suspended matter is 330 mg/1 except during precipitation when 2200 mg/1 is the maximum. EPA would restrict suspended matter to a 35 mg/1 daily average over a 30 day period with a 70 mg/1 limit for any daily maximum load.

Another problem in this conflict between EPA and state standards is the method of measuring the amount of suspended matter in mine discharges. Kentucky's regulations provide that "suspended matter in parts per million . . . may not exceed the Jackson Turbidity units multiplied by 2.20." Jackson Turbidity units measure the optical quality of water turbidity while parts per million measure the amount of matter which will settle in the water. At least one coal company asserts

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425 402 KAR 1:055 § 1(1) (1975).
426 Id. § 2(3).
428 Ratliff, supra note 123; Grim, supra note 151.
429 Effluent Limitations, supra note 425, at 5.
430 Ratliff, supra note 123.
431 Grim, supra note 151.
432 402 KAR 1:055 § 2(3) (1975). 150 Jackson Turbidity units x 2.20= 330 mg/1.
433 Effluent Limitations, supra note 425, at 5.
434 402 KAR 1:055 § 2(3) (1975).
435 Interview with Jerry Lombardo, Director of Environmental Affairs for Island Creek Coal Co., in Lexington, Kentucky, October 8, 1975.
that there is no relationship between the Jackson Turbidity Unit and the parts per million criteria.

Another complaint voiced by operators is that because the federal statute preempts the area, the state cannot enact other standards except through its water division. KRS § 224.037 designates the Department of Natural Resources and Environmental Protection as the agency to carry out the purposes of the 1972 Federal Water Quality Amendments. By promulgating other regulations for mine drainage, operators feel the Division has intruded on the prescribed law and will interfere with federal permits.\textsuperscript{446} Operators wish to avoid the confusion and added expense of complying with two sets of standards and being held accountable to state reclamation authorities as well as federal and state water officials. To alleviate part of this confusion, serious thought should be given to requiring that permit applicants be certified as also complying with EPA standards or otherwise incorporating the EPA criteria into the Kentucky regulations.

Advocates of water quality preservation assert that specific stream quality standards\textsuperscript{447} should be used in conjunction with effluent standards. Such a scheme would protect the present quality of streams by allowing stricter discharge limits where needed.

The Division of Water Quality has recently promulgated regulations establishing stream use classifications.\textsuperscript{448} Categorized uses are public water, food processing,\textsuperscript{449} industrial cooling and processing (other than food processing),\textsuperscript{450} recreation,\textsuperscript{451} and water for agriculture and stock.\textsuperscript{452} In addition, basic quality standards are set to maintain aquatic life\textsuperscript{453} with special criteria for streams designated by the Division as put and take trout

\textsuperscript{446} Written statement of Peabody Coal Co., pursuant to public hearings on Kentucky Reclamation Regulations (402 KAR 1:025-1:060) in Frankfort, Kentucky, May 20, 1975.

\textsuperscript{447} \textit{See}, e.g., 25 PA. RULES AND REGS. § 93 (setting out individual stream standards for every substantial stream in the Commonwealth of Pennsylvania).

\textsuperscript{448} 401 KAR 5:025 (1975).

\textsuperscript{449} Id. § 4.

\textsuperscript{450} Id. § 5.

\textsuperscript{451} Id. § 8.

\textsuperscript{452} Id. § 1.

\textsuperscript{453} Id. § 6.
steams.\textsuperscript{454} While not as comprehensive or detailed as those of some states,\textsuperscript{453} these regulations represent a start in attaining a set of workable stream standards which, when combined with effluent standards, will better protect the water quality of the state.

Although the regulation of water quality in relation to mining has made strides to alleviate some of the major problems that exist, there are still areas that have received far too little attention. Acid pollution from deep mines is a serious problem for which a workable solution must be found. Furthermore, in the interest of both the coal industry and environmental protection, steps must be taken to alleviate the disparities and confusion involved in complying with both federal and state water quality standards.

E. Problems Unique to Underground Mining

The initial impact of opening a deep mine involves many of the same environmental problems as a strip mine operation, but until 1974 none of these activities were regulated. In 1974, however, the Kentucky legislature directed the Department of Natural Resources and Environmental Protection to promulgate regulations governing the surface effects of underground mining;\textsuperscript{456} several drafts have been prepared, proposed, and rejected.\textsuperscript{457} The latest proposals are not yet regulations but are indicative of the state's perception of this aspect of the extraction process. The proposals for regulation of backfilling, water quality, and revegetation are virtually identical to current strip mine regulations.\textsuperscript{458} Common environmental problems presented by both surface and underground mining are

\textsuperscript{454} Id. § 7.

\textsuperscript{455} The Pennsylvania regulations, for example, set out a detailed, systematic criteria for quality standards applicable to each substantial stream in the Commonwealth. Standards are keyed to several stream use factors such as aquatic life, water supply, recreation, power, navigation, and treated waste assimilation. The specific water quality criteria has been formulated for 23 constituents. By sorting these criteria into three main groups, separate stream quality standards are assigned in a systematic and comprehensive manner. 25 Pa. RULES AND REGS. § 93.

\textsuperscript{456} KRS § 350.151 (Supp. 1974).

\textsuperscript{457} The Courier-Journal, Apr. 12, 1975, § B at 6, col. 6 (state ed.).

\textsuperscript{458} Compare proposed August 15, 1975 regulations on surface effects of deep mining (proposed 402 KAR 1:011) with surface mine environmental regulations (402 KAR 1:025-1:060).
dealt with in comparable fashion. There are, however, major environmental hazards unique to deep mining which have not been adequately recognized. These include mine fires, burning refuse banks, post-mining underground and surface water pollution, surface subsidence, and the generation of solid wastes.\footnote{Environmental Effects, supra note 400, at 8.}

Eight million acres have been undermined in the United States and over two million acres have been affected by surface subsidence,\footnote{Id. at 52. Subsidence is the natural sinking at the surface into the void left by removal of the underground coal seam.} which can have adverse effects on surface structures, crops, drainage patterns, and land values.\footnote{APPALACHIAN RESEARCH AND DEFENSE FUND, DISPOSING OF THE COAL WASTE DISPOSAL PROBLEM 29-30 (1972).} Approximately 4 percent of Kentucky's mining area has subsided,\footnote{U.S. DEP'T OF INTERIOR, LAND UTILIZATION AND RECLAMATION IN THE MINING INDUSTRY 47 (1974).} with Madisonville designated as an urban area under which mining has occurred.\footnote{This could be achieved through the use of adequate support pillars or by filling the voids left by the extracted coal.}

Predicted land uses of undermined surface areas should be used to determine whether subsidence should be immediately induced or permanently prevented.\footnote{Environmental Effects, supra note 400, at 88.}

While Kentucky did recognize in 1932 that surface owners may recover damages for subsidence,\footnote{North-East Coal Co. v. Hays, 51 S.W.2d 960 (Ky. 1932). See also North-East Coal Co. v. Picklesimer, 68 S.W.2d 760 (Ky. 1934).} this is not mentioned in the regulations.

Another problem is waste disposal. Prior to 1966, 18.5 billion tons of waste material covering 1.8 million acres were created by underground mining and coal processing.\footnote{30 C.F.R. §§ 11.1-100.8 (1975).} Twelve percent of the 240,000 acres of land utilized by mining in Kentucky is covered by this waste.\footnote{Environmental Effects, supra note 400, at 125.}

Extensive research has been conducted in this area and the Mine Enforcement and Safety Administration of the U.S. Department of the Interior has promulgated extensive regulations.\footnote{30 C.F.R. §§ 11.1-100.8 (1975).} Kentucky also regulates waste disposal but only minimally. While refuse may be stored in pits or buried, proper drainage is required. In addition, all
refuse piles must be compacted in layers and graded to an approved slope with no holes or depressions.\textsuperscript{469} There is, however, no state requirement that the operator comply with federal standards.

Underground fires burning uncontrolled in abandoned mines together with burning refuse banks also contribute to air pollution.\textsuperscript{470} While 402 KAR 1:010 § 1(2)(b) expressly names prevention of mine-related air pollution as a goal of the proposed regulations, they do not contain a single reference to sources of air pollution incidental to mining nor any attempt at prevention.

\textbf{IV. Conclusion}

Resolution of conflicts between the coal industry and environmentalists requires a balancing of each group's views along with society's need for fuel. The nation's demand for energy is doubling every 14 years, and the demand for electricity doubles every 10 years.\textsuperscript{471} Because nuclear generation of electricity has not developed as quickly as anticipated,\textsuperscript{472} the United States may have to rely on coal for the next 30 years. Kentucky's coal reserves, 66 million tons, are the third largest in the country;\textsuperscript{473} its mining regulation policy must affect the energy use in the rest of the nation.

Environmentalists point out that current regulation has not totally removed land and water hazards and argue that strip mining should not be allowed where it is geographically unsuitable. Other shortcomings of regulation include lack of topsoil segregation, weak enforcement of bench widths, failure to prevent water pollution, and failure to assure the complete restoration of soil fertility.

Overall, however, operators as well as environmentalists recognize that regulation is needed and that the current statutes and regulations are useful. Beliefs among Kentucky sur-

\textsuperscript{469} 402 KAR 1:010 § 4(5) (1975).
\textsuperscript{470} Environmental Effects, supra note 400, at 138, 139.
\textsuperscript{471} Overton, Special Situation Report: The Energy Crisis, AMERICAN MINING CONGRESS, Dec. 6, 1971.
\textsuperscript{472} Id. Currently, it is anticipated that nuclear power will be able to supply 23 percent of the United States' electricity by 1990.
\textsuperscript{473} Id.
face operators range from recognition of a need to protect the
public in general to a realistic assessment of human nature
that "people and companies, generally speaking do about what
they are required to do." While the operators recognize the
necessity of regulation, they almost unanimously feel that Ken-
tucky's current statutes are sufficient. "We have sufficient laws
now to protect the land. Most improvements can be made
through modifying and enforcing the regulations under the ex-
isting law," concluded one large operator.

Environmentalists view Kentucky's regulations as ade-
quate on their face, but barely so. As one person stated, "We
don't need more laws statewide—we merely need to enforce the
ones we have." Although it can be argued that the only way
to protect the land adequately is to prohibit strip mining to-
tally, most environmentalists recognize the nation's need for an
economical, abundant, and domestically-produced energy sup-
ply and that some degree of disruption of the land must be
tolerated.

The Commonwealth of Kentucky has attempted to bal-
ance these interests through statutes and regulations. Analysis
of the content and enforcement patterns of the Kentucky sys-
tem indicates that the existing regulatory scheme is so flexible
that the vigor of enforcement and the content of the regulations
is determined primarily by those in charge at any given time.
This difference in enforcement is illustrated by an analysis of
the period from July 1, 1974 through June 30, 1975. During the
last 6 months of 1974, the Kentucky Division of Reclamation
found 244 noncompliances, suspended 74 strip mine permits,
and made 43 out-of-court settlements for $71,200. During the
first 6 months of 1975, under a different governor and a differ-
ent Secretary, the Division of Reclamation found 472 noncom-
pliances, suspended 163 permits and made 82 out-of-court set-
tlements for $315,500.

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474 Anonymous reply to questionnaire.
475 Anonymous reply to questionnaire.
476 Jackson, supra note 20. See CENTER FOR SERVICE IN THE PUBLIC INTEREST,
477 Caudill, supra note 137.
479 Id. Throughout this 1 year period, the Division was operating under the same
administrative regulations.
This flexibility on the part of top administrators is partially because Kentucky's regulations are loosely drafted. Additional discretion is allowed the inspector at the strip mine site because Kentucky is a field enforcement state. This flexibility not only has varying effects on the environment, it also angers operators who rely on consistency of enforcement for planning.

Enforcement of regulations is further complicated by the need for each state to protect the economic competitiveness of its coal. As more burdens are placed upon the operator, the price for coal increases, thereby shifting downward demand on the national market. Any decrease in demand for the coal of a coal producing state can have a vast impact on that state's whole economy.

Because of enforcement difficulties within states and competition between states, federal regulation seems inevitable. The current Kentucky administration favors federal control, and most environmentalists interviewed found it highly desirable. Large multistate coal operators also find benefits in national standards. Under federal control, all states would be placed on an economic par in the market place. In addition, uniform regulations would be easier to comply with, and economic planning would be facilitated. This would also remove from state governors and administrators the political and economic pressures of well-organized coal lobbies. The greatest difficulty with a federal approach would be the need to accommodate the extensive geographic differences among mining areas.

No matter what level of government regulates coal production, the conflicts between energy producers and environment-
tal interests will remain. The Kentucky experience suggests that governmental regulation can achieve some degree of acceptability from both groups. It is clear, however, that regulation cannot be approached solely from the political or economic viewpoint. Regulation which is general and flexible can be enforced with flexibility and selectivity. Regulation which sets definite guidelines for each problem area can be enforced with more uniformity, but creates attendant problems of rigidity. Easy solutions to these conflicts are hard to find. Perhaps in the end the strength of the system will depend on the good faith of all participants. Without this, even the best planned, most thorough system of regulation will fail, either through the weight of its own inequity or through the resistance of those it regulates and the obstinacy of those it serves.

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