Strip Mining: Kentucky Begins To Close the Reclamation Gap

Strip mining for coal creates such a blot on any landscape that it is hard to take the unemotional view. But it is worth making an attempt to do just that, since the controversy over the control of strip mining has recently taken on sharpened economic and political dimensions.

In any such effort, the state of Kentucky invites attention because strip mining is currently a very live issue for the courts and for the state government. Kentucky, furthermore, is unique in having within its borders two major bituminous-coal-mining areas representing the two quite different types of strip-mine operations.

In the rolling lands of western Kentucky coal lies near the surface. During the 1950's the development of very large, electric-powered shovels designed to remove the surface dirt or "overburden" from the coal seams opened up new vistas to operators. Improved equipment and new markets for the middling-quality coal available in huge quantities caused a great acceleration in "area stripping" in the western Kentucky coal fields, especially in the mining counties in the region drained by the Green River. Strip mines lie close to the main roads, and the tourist is likely to feel a sense of shock at the sight. Dunes of lifeless spoil cover large expanses, and a common sight is the boom of a big shovel towering over a spoil bank with the bucket tearing at the earth like a monstrous throwback to prehistory.

In the mountains of eastern Kentucky strip-mining techniques are quite different. There coal seams are generally found at the upper levels of the hills, rather like the meat in a sandwich. Strip miners in this area characteristically bulldoze a "haul road" up to the seam and then carve a long, broad horizontal "bench" at the level of the top of the seam. Much of the dirt, stone, and debris dug out by power shovel from the face of the hill is dumped over the side of the bench, cascading down the hillside. The coal is then stripped from the exposed seam. Overburden and coal frequently have to be blasted loose, and the development of rotary drilling equipment and better explosives and excavators has contributed to the increased scale and efficiency of such "contour stripping" operations.

In many instances, after stripping on the benches in eastern Kentucky has been completed, more coal is removed from the coal "outcrop" on the face of the "highwall" (the perpendicular surface cut into the mountain above the bench) by means of mechanized augers, some as large as 87 inches in diameter (see illustration).

In both sections of Kentucky acid pollution of soil and water is a concomitant of strip mining. The chief culprits are the pyrites which are characteristically found in association with coal seams and which, when hit by air and water, produce sulfuric acid. Runoff from mining spoil contaminates soil, streams, and groundwater. Spoil banks when freshly exposed not uncommonly have a *p*H of 3, a degree of acidity which is fatal to trees and other vegetation. Such growth does not reappear until after a considerable period of leaching.

Problems of reclamation differ markedly in the two coal fields. In western Kentucky the grading of spoil-bank ridges to restore the land eventually to productive use is viewed as the main problem. In eastern Kentucky, a region of flash floods and galloping erosion, the main difficulty is water control and the stabilization of the spoil banks.

Strip mining has a long history in Kentucky, but it was overshadowed by underground or "deep" mining until the 1950's. A voracious demand for more electrical power resulted in the building of many steam generating plants after World War II, and advances in furnace technology in these plants opened up a vast market for relatively low quality coal if it could be produced at low cost. The question of whether the market or the mining machinery came first is in the chicken-or-the-egg category, but the development of new machines and techniques was most spectacular in the western fields. By the early 1960's an electric shovel 20 stories high and capable of moving 115 cubic yards of overburden at a crack was operating, and enormous open-bodied tractor trailers—too big for public roads—were hauling 120-ton loads of coal on specially built mine roads to a railhead or steam plant located in the coal fields.

In the eastern mountains, a similar but smaller-scale revolution had occurred, the giant auger being the paramount postwar technological advance.

The growing resistance to the prevailing strip-mining practices in eastern Kentucky stem in part from the peculiarities of Kentucky law. Late in the last century and early in this one, land companies moved into eastern Kentucky and acquired control of large tracts of land either by outright purchase or, in many cases, by buying mineral rights. These mineral rights were obtained for as little as 50 cents an acre, and hardly ever for more than a dollar or two. Timber and coal were what the exploiters were after; a lot of coal was mined, and fine Kentucky hardwood trees were cut for lumber, rail ties, and mine tunnel props. The mountaineers, however, still had their land, retaining the "surface rights" or renting farmland and cabins from the land companies at nominal costs. Mining in the old days meant deep mining, which involved a pit mouth and perhaps a road or track across the land. The trees grew again, and the mountaineers in many cases seem to have felt that the deeds and the cash money they brought represented as good a bargain for them as for the outsiders. But that was two or three generations ago. When strip mining began to spread across the hills things were different.

Coal operators leased tracts for stripping from the land companies which held the mineral rights. Land that had already been mined beneath the surface was put to the bulldozer, the shovel, and the auger. The effects on the people living near the strip mines (almost nobody lives *up* the hill from a strip mine) were in many cases devastating. Benches and poorly engineered mine roads became spillways for water. Acid and silt flowed down into fields, streams, and roads.

License for these activities is to be found in the so-called "broad-form"

deed, which was the favored legal instrument for conveying mineral rights in the days of the land boom.

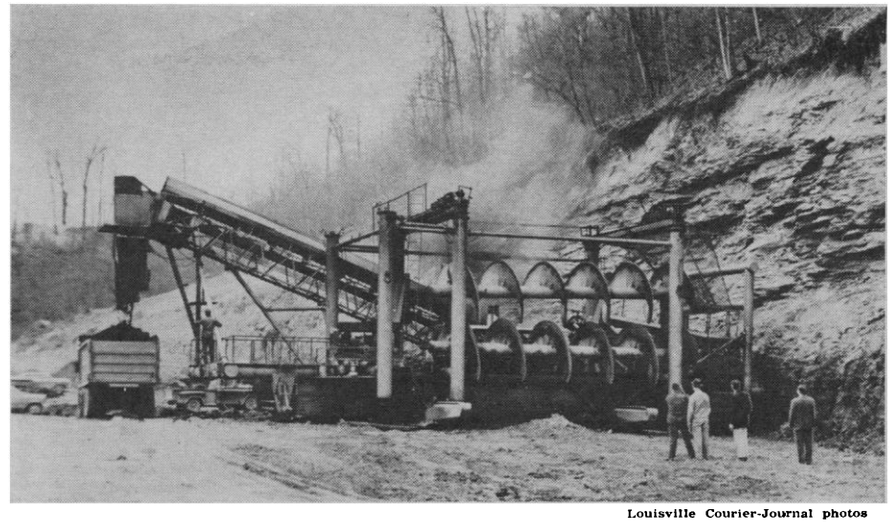
These deeds are remarkable documents. A typical one guarantees the purchaser of the mineral rights apparently perpetual carte blanche in enjoying those rights. The party of the second part can, for example, claim whatever timber is necessary whenever he needs it for his operations. He can claim exclusive rights-of-way for railways, tramways, haul roads, and pipelines, and he may build or remove any structure as he deems "necessary or convenient." To top it off, he has the right "to use, divert, dam and pollute water courses," all of this regardless of the effect on the owner of the surface rights.

State courts have so far upheld the validity of these leases and their application to strip mining. Matters took something of a legal and political turn a few months ago when a group of residents in the heavily strip-mined Clear Creek area of Knott County blocked the movement of a bulldozer onto leased property. The coal company countered by obtaining a restraining order. To rally support in behalf of the landowners an Appalachian Group to Save the Land and People was formed, and a suit was filed which had as its real target a declaration by the courts that the long-term deed not apply to strip and auger mining.

At this juncture Governor Edward T. Breathitt entered the picture, visiting strip-mining sites first in eastern, then in western Kentucky. After his first trip he said he would act at once to relieve the problems of landowners in Knott County, and he ordered the state Attorney General's office to provide assistance in the legal attack on the broad-form deed.

While the broad-form deed is loaded with emotional dynamite, state legislation on the control of strip mining has heavier ultimate import. Like most state laws governing strip mining, the Kentucky statute has developed over a period of years, growing sharper teeth in the process.

The first serious attempt to pass strip-mine legislation in Kentucky came in 1948, but the first law was enacted in 1954. The statute was amended in 1956, 1960, 1962, and 1964, the 1964 amendments representing the first major change in the original law. The Kentucky law is now regarded as second in stringency to Pennsylvania's. (West Virginia was the first state to put strip-mine legislation on the books, in 1939. Illinois, Indiana, Maryland, and Ohio, as well as Kentucky and Pennsylvania, followed suit.)



Louisville Courier-Journal photos

A big coal auger on a strip-mine bench in eastern Kentucky.

Kentucky's law resembles other state statutes in requiring reclamation of stripped areas. A strip-mine operator is required to buy a permit before he begins mining; post a bond against performance of the reclamation requirements; report on the progress and extent of operations; and, finally, grade and revegetate stripped areas to satisfy specifications.

The administrative regulations implementing the law in fact determine its real impact, and in Kentucky the regulations are in the process of revision. There is no question that public attention and the Governor's interest are tending to stiffen these revisions.

State officials say the new regulations are aimed primarily at contour stripping in eastern Kentucky, and the state's Natural Resources commissioner has said the objective is to "limit or eliminate" stripping on steep slopes.

The draft regulations would restrict the height of the highwall to 48 feet where the slope is greater than 20 percent. At present there is no limit.

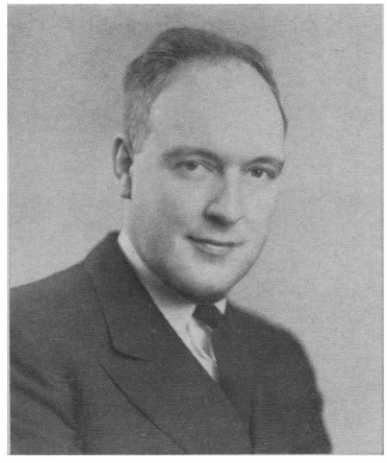
Other revisions aimed at contour

Aerial photo by Billy Davis

Contour stripping on both sides of a ridge in eastern Kentucky.

New Surgeon General

President Johnson last week appointed William H. Stewart as Surgeon General of the Public Health Service. On confirmation he will succeed Luther L. Terry, who resigned to become vice president of the University of Pennsylvania. Stewart, 44, a PHS officer since 1951, became director of the National Heart Institute in August, with the rank of Assistant Surgeon General. Prior to that, he had been Assistant to the Special Assistant to the Secretary (Health and Medical Affairs) of PHS. A native of Minnesota, Stewart attended the University of Minnesota, and received his medical degree from Louisiana State University in 1945.



William H. Stewart

stripping include limitation of the width of the bench to 250 feet. Where a slope is 30 degrees or more, the limit would be 95 feet. To help control runoff and erosion, areas immediately below spoil heaps must be left undisturbed. The width of these areas must increase with the steepness of the slope.

These are draft regulations, and no changes will be made until after a second set of hearings, to begin 5 October, when opponents of the regulations are to be given their innings and are expected to ask for modifications.

While the new regulations are still in the mill, the state Strip Mining and Reclamation Commission (the state's policy-making body on strip mining) set a significant precedent this summer by refusing to grant a permit to a coal company to strip-mine 10 acres in Defeated Creek Valley in Knott County. The rejection was made chiefly on the grounds that the reclamation plan submitted by the company made no adequate provision for relocation of the creek and a county road and for protection of surrounding land which would be affected by the operations. The application had earlier been turned down by the Division of Strip Mining and Reclamation in the Department of Natural Resources, the chief enforcement agency for the strip-mine law. It was the first such refusal.

Opposition to the new regulations, based on their economic effects, has been growing. Opponents argue that the proposed regulations would put some strip-mine operators out of business in both eastern and western Kentucky, but contradictory views on this are easy to find. In July an anti-anti-strip-mine group called the Association to Save Jobs and Industry was set up, claiming to be acting in the interests of 8000 salaried employees—equipment operators and service people involved in strip mining in eastern Kentucky. A motorcade of coal trucks to Frankfort, the state capital, was scheduled, but this was called off when the holding of hearings in October, after a cooling-off period, was agreed to.

For the outsider, strip mining offends the eye and the sensibilities so sorely that there is a temptation to ignore the arguments *for* strip mining. To do so, however, would be to ignore the facts of life and of economics in the mining regions.

In eastern Kentucky strip mining has become a symbol of wanton destruction. Viewed in perspective, however, strip mining is but the latest and most conspicuous abuse of the land in a sorely abused part of the country.

Eastern Kentucky, it must be emphasized, is not a rural area in the ordinary sense. The mountain counties are the most heavily populated in Kentucky except for a few counties in which the larger cities are located. Despite the Dogpatch image, most people live on the flat. They are concentrated along the highways and streams of the bigger valleys and the gravel roads and creek beds of the hollows and "coves." Farming today provides a livelihood for a relatively limited number of those who live in eastern Kentucky. The birthrate and the emigration rate are very high, and the population is dominated by the very young and the old. Social Security and federal surplus-food, aid-to-dependent-children, and unemployment-insurance programs keep eastern Kentucky from slipping from the status of a depressed area to that of a disaster area. In terms of industry, however, in good times and very bad, coal has been king in eastern Kentucky for more than half a century.

[The history of the region has been recounted forcefully and feelingly by Harry Caudill in *Night Comes to the Cumberland* (see *Science*, 6 Sept. 1963). A lawyer from a mining county, Caudill as a state legislator was active in the cause of conservation and education reform and has been involved this year in the moves against the broad-form deed.]

The ravages of strip mining have to be looked at squarely. But it should also be remembered that for generations eastern Kentucky farmers "cropped out" the land or cut timber and burned off the brush in a way that exposed the thin soil on the steep hills and allowed it to wash into the creeks and rivers.

On the score of stream pollution, the effects of terrain and local habits must be noted. Modern plumbing and trash collection are rare outside the towns in eastern Kentucky, and there is a well-founded saying that everything goes into the creek. The North Fork of the Kentucky River, which runs through Hazard in Perry County, is said to have a concentration of coliform bacteria which in some places is too high to count. Acid drainage into the water inhibits bacterial growth, so garbage and sewage do not decompose as quickly as they might. In Hazard, which draws its water from the river, a water treatment plant takes care of the bacteria, but people worry because the purification system does not insure removal of viruses.

Strip mining and particularly auger mining contribute acid to the pollution burden of the streams, but state officials estimate that 75 percent of acid pollution orginates in underground mines, particularly in abandoned deep mines. And the same thing is reportedly true in western Kentucky.

Whatever the esthetics, strip mining

is safer than underground mining, and healthier for the miners. And wages for the machine operators and truck drivers are better than for the thousands of miners who now work the small underground truck mines, the "dogholes," which can't match the efficiency of the big mechanized deep mines, where union wages are paid.

An estimated 40 percent of coal mined in eastern Kentucky is now strip- and auger-mined, and it is mined by proportionally fewer men than produce the deep-mine coal. With its mechanization and higher miner productivity, stripping, therefore, extends the trend toward better jobs for fewer men.

It should also be noted that resistance to the broad-form deed can be misconstrued. State officials familiar with eastern Kentucky and sympathetic to the landowners affected by stripping say that the landowners' objections are centered not on the effects of stripping—though these are bad enough—but on the fact that they have lost the right to bargain.

This is not to minimize the effects of strip mining but only to suggest that it is by no means the only problem besetting eastern Kentucky. In this region and in western Kentucky the pattern has been for the state not to require much of strip-mine operators in the way of reclamation and for the operators to do no more than is required. The Kentucky Reclamation Association, an organization of coal companies, has operated since 1948, giving technical advice to member companies on reclamation problems and cooperating with federal, state, and private agencies on projects in reclamation research and field experimentation. While the association can point to successes in rehabilitating slopes and ponds in stripped areas, few people, even coal partisans, are likely to argue that the industry can't do more.

The 1964 Kentucky law and the projected revised regulations obviously tighten controls on strip-mining methods. Governor Breathitt has stated that further action will be required in the 1966 Legislature. Because, with tightened controls, companies in states with strip-mine laws less demanding than Kentucky's, or with none at all, would enjoy a competitive advantage over Kentucky companies, Breathitt has advocated a federal strip-mining law. He is also working for adoption of interstate compacts containing uniform standards of regulation and reclamation by strip-mining states.

Until recently the states, through choice or inaction, have been essentially on their own in dealing with strip mining. The good offices of federal research agencies have not been used in strip-mine reclamation as extensively as they have been, for example, in dealing with other problems in agriculture and forestry. A fair amount of productive research on strip-mine reclamation problems has been done over the years, especially by the Soil Conservation Service and Forest Service of the Department of Agriculture, but the knowledge has not been widely or systematically applied and the state of the art is far from having reached its ultimate boundaries.

Recently, prospects for cooperation between federal and state agencies have broadened. Kentucky, for example, has sought aid from federal experts in setting criteria under new regulations. The Appalachia Act provides for a survey of the extent and condition of stripped land and includes funds for reclamation work on public lands affected by stripping. And the Tennessee Valley Authority has lately —belatedly, critics say—thrown its weight on the side of mandatory reclamation by coal operators. The implications of greater federal involvement in research and regulation and the pivotal role of TVA will be discussed in another article in this space.

—JOHN WALSH

DOD: Johnson Appoints Foster, Chief of Weapons Laboratory, to Head Pentagon Research Unit

President Johnson's penchant for making surprising appointments was displayed again recently with his nomination of John S. Foster, Jr., to be Director of Defense Research and Engineering (DDR & E). Foster, who has been Director of the Lawrence Radiation Laboratory at Livermore, California, since 1961, has a reputation as a creative weapons scientist and talented administrator. In his views on matters affecting politics, however, he has been only slightly less controversial than his more vociferous Livermore colleague Edward Teller. Like Teller, Foster was among the small band of scientists who publicly opposed the test-ban treaty with the Soviet Union in 1963.

Foster, a 43-year-old physicist who looks barely 33, is the son of physicist John Stuart Foster. Foster Jr., whom everyone he has ever met appears to call "Johnny," was born in the U.S. but grew up in Canada and attended McGill University. His undergraduate studies were interrupted by World War II, when he moved to Cambridge, Massachusetts, to work in the Radio Research Laboratory at Harvard on electronic countermeasures to German radar. In 1944–45 he followed up his laboratory work by serving as a civilian adviser to the 15th Air Force in Italy, helping to train crews in the proper use of the countermeasure equipment. Returning to Canada after the war, Foster graduated from McGill with honors in 1948, then moved on to Berkeley for graduate work in physics under E. O. Lawrence.

Foster obtained his Ph.D. (for work on ion properties) in 1952, the year in which the long argument over building the hydrogen bomb came to an end with Truman's decision to go ahead. The debate, and the conviction of many war-scarred scientists at Los Alamos, the government's chief atomic weapons facility, that the H-bomb was not needed, had persuaded many defense and scientific leaders that an additional source of scientific talent and advice in the weapons field was desirable. Lawrence was chosen to set up a new laboratory, and with him to Livermore went a group of young men who have subsequently played key roles in shaping the U.S. defense establishment. In his new post Foster will follow two other Livermore "graduates," Herbert York (now Chancellor of the University of California at San Diego) and Harold Brown, who is moving over from the DDR & E post on 1 October to become Secretary of the Air Force. (Both York and Brown also preceded Foster as directors of Livermore.) Other members of the Livermore staff have served in other Pentagon roles.

Livermore men have generally been noted for an exuberant, enterprising spirit and, particularly in the case of Foster, for a relative freedom from the kinds of moral uncertainties about weapons development that have characterized older generations of atomic scientists. An article about Livermore which appeared in *Fortune* in 1962 quotes Foster as saying: "Force, nuclear force or any other, is not in itself immoral. Morality involves how it is used."

At Livermore, Foster rose through a series of promotions, becoming a division leader in 1955, associate director in 1958, and director in 1961. After beginning his work there on Project Sherwood, one of the laboratory's at-