A STUDY OF APPALACHIA'S COAL MINING COMMUNITIES AND ASSOCIATED ENVIRONMENTAL PROBLEMS

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ABSTRACT

A STUDY OF APPALACHIA'S COAL MINING COMMUNITIES
AND ASSOCIATED ENVIRONMENTAL PROBLEMS

By

Ronald Lee Kolbash

This study was an attempt to gain a better understanding of the environmental and social problems of one of the many coal mining communities that are scattered throughout Appalachia. The community chosen was studied through an interdisciplinary approach looking at the respondents attitudes and opinions of their community, the local coal company and environmental problems, particularly the problems relating to mine acid water and slate dumps for these are most characteristic of mining communities.

To date there is a limited amount of published data on coal mining communities. A community survey questionnaire was developed and used with 112 residents of Grant Town, West Virginia.

Biological interpretation of data was made on mine acid water samples that were collected near the local mine. The samples were used in conjunction with questions relating to the environment. The slag piles that are owned and operated by the local coal company were also given consideration for they were found to be a major pollution problem for the community.

The questionnaire that was used for the study consisted of 75 closed-end questions and 7 open-ended questions. The respondent circled the answer with which he agreed. Personal data were included

to determine if the variables of age, sex, level of education, and length of residence had an influence on the residents.

Results of the data indicated that the inhabitants like their town and also approve of the presence of the local coal company despite an outward disrespect for the company regarding its operation of the local mine. Most of the residents were aware of the environmental problems of their community and thought something should be done about reclaiming the disturbed environment.

The personal survey questions showed that the variables of age, sex, level of education, and length of residence, had no notable affect on how the residents saw their community. This type of response seemed to indicate that the town was a homogeneous community. There were no notable differences in the way the residents felt about their community's environmental problems or the coal company itself. In most instances the residents were either very positive or very negative on each controversial question. Despite the residents awareness of environmental and community problems there was a lack of initiative and communication on their part.

A sample environmental education unit was recommended to be used with the residents of the town to give them a better understanding of their pollution problems. An activists' guide is also included to enable the residents of the local community or similar coal mining communities to enlist help for solving a particular community problem.

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Ronald Lee Kolbash

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INTRODUCTION

Purpose of Study

The purpose of this study was to consider some of the environmental problems that are related to coal mining communities, particularly those related to mining operations. The residents of a community were studied to see how they feel about their town, the coal company located in or near the town and the environmental problems. With the rapid succession of events that have occurred in the area of energy it is timely and important to consider these problems that are relative to coal mining communities.

Because of the energy "crisis" the coal industry has surfaced again as a possible major supplier of energy, expecting to provide substantially more than one-fifth of the nation's energy requirements it is now fulfilling (Bituminous Coal Facts, 1969). A large portion of this energy will come from the approximately 1200 coal mining communities that are scattered throughout Southern Appalachia.

This study is an attempt to take a closer look at one of these communities; Grant Town, West Virginia. The environment was studied in relation to mine acid water pollution, slag pile pollution, pollution resulting from the coal stock pile and pollution problems resulting from the preparation facility located at the Federal No I Mine. Major emphasis was placed upon the pollution resulting from the mine acid water and slag piles for these are most characteristic

of coal mining communities. People's attitudes concerning the environment, the community and Eastern Associated Coal Corporation were surveyed through the use of a questionnaire utilizing both open and closed-end questions. The responses were examined by sex, age, income, level of education and length of residence to make a comparison among coal mining community residents regarding certain environmental issues in their communities.

The mine acid water samples were collected and tested to see if a mining operation affected streams of coal mining communities and if so are the lives of the residents of these communities affected. The slag piles in the community were also observed for they too are characteristic of coal mining towns and are detrimental to the environment of coal mining areas.

This researcher studied the town and its inhabitants in relation to environmental and social problems so that awareness and motivation could possibly be established in the residents for their immediate environmental problems. An educational unit was developed focusing on mine acid water pollution and slag pile pollution that is caused by the mine and which is characteristic of coal mining communities. An activists' guide is included so that residents of coal mining communities may attempt to find solutions to their environmental problems.

Grant Town was chosen for this study for it is typical of the small coal mining towns that are scattered throughout Appalachia. The town, being a typical coal mining community, is closely associated with a coal mining company and many people who live in and around the community depend upon the mine for their livelihood. The town has

the visible characteristics of a coal mining community and is confronted with environmental and social problems that are characteristic of this type of community. Many coal mining communities in Southern Appalachia have similar environmental and social problems and it is hoped that this thesis can act as a model for studying coal mining communities.

History of Grant Town

Grant Town, like so many other coal mining communities, was settled at the turn of the century. The original settlers of the town were the McCoys, Toothman, Hibbs and Ballah families. The town was established by the Federal Coal and Coke Company in 1901. It was named Grant Town for Robert Grant who was at that time Vice President of the coal company (West Virginia Bluebook, 1970). Previous to this time, the area was known as Grays Flats, West Virginia. The town was incorporated November 12, 1946.

Exact population figures for Grant Town prior to the 1950 Census are lacking since the town was not incorporated until 1946. The population of the town in 1950 was 1,273; in 1960 it was 1,115. This is a negative 14 percent change for the 10 year period (U. S. Census of Population, 1960). In 1970 the population was 946, a negative 18 percent change from the 1960 population (U. S. Census of Population, 1970).

History of Federal No I Mine

The coal mine was opened in 1901. Construction of two shafts for the mine was started in 1899 and was completed in 1901 (60 Years

of Progress, 1961). This marked the beginning of one of the important mines in the Fairmont Coal Field of West Virginia (Nichols, 1952). The railroad that serves the mine was completed and the first coal was loaded for shipment in May, 1901.

The expansion of the working area progressed with daily production reaching 700 tons in 1905. By 1909 horses were being replaced by machinery and daily production had passed 1000 tons/day. Numerous changes occurred over the next 30 years and by 1942 all coal was being cut and loaded by machines. In 1949 a continuous mining machine was put into operation and daily production reached 10,000 tons. Complete underground mechanization was achieved by 1952 when all coal was being mined by continuous mining machines (60 Years of Progress, 1961).

To better serve changing markets a new preparation plant was added to the mine in the early 1960's. In the past ten years the mine has undergone further changes with long wall mining being the latest innovation.

Definition of Terms

Mine Acid Water: Mine acid drainage is that portion of water that has been rendered acidic by chemical and possibly biochemical reactions involving water, oxygen, and sulphur in pyrite, marcasite, and other minerals or ores commonly found with coal deposits. This drainage is characterized by low pH, high concentration of certain heavy metals and often a heavy silt load.

Pollution: Pollution is an undesirable change in the physical, chemical or biological characteristics of our air, land and water that may harmfully affect human life or other organisms, our industrial

processes, living conditions, and cultural assets; or that may waste or deteriorate our raw material resources.

Coal Refuse: Any mixture of rock, clay, bone, shale and other related materials that are brought to the surface of the ground in the process of mining coal or that which is separated from the coal during the cleaning and preparation operation. Coal refuse is also known as gob, culm, slag or reject.

Slag Pile-Slate Dump: Any deposit of coal refuse on or buried on the earth and usually intended as a permanent disposal of such refuse.

Water Quality Standards for West Virginia: "No sewage, industrial wastes or other substances allowed to enter any of the waters of the state shall cause therein or materially contribute to any of the following conditions thereof": (Adopted by State Water Resources Commission, 1959).

1. Distinctively visible floating or setteable solids, scum, foam, or oily slicks of unreasonable kind or quantity.
2. Objectionable bottom deposits or sludge banks.
3. Objectionable odors in the vicinity of waters.
4. Objectionable taste or odors in municipal water supplies.
5. Poisonous to man, animal or fish life.
6. Dissolved oxygen to be less than 3 ppm at the point of maximum oxygen depletion.
7. Objectionable color.
8. Requiring an unreasonable degree of treatment for the protection of potable water by modern treatment processes as commonly employed.

Various Methods of Coal Mining

Coal mining in the United States is limited to a small area most of which is located in Kentucky, West Virginia, Pennsylvania, and Virginia. The industry employs approximately 240,000 workers and this number is increasing. This represents a decline in employment when compared to the 400,000 who were employed in 1950 (Bureau of Labor Statistics, 1964). There are between 7000 and 8000 bituminous coal mines in the United States today and the technologies of the miners range from simple handloading to the handling of the complex continuous mining machine and the latest innovation in coal mining in the United States, long wall, which requires special skills.

Four basic types of underground mining techniques are handloading, conventional, continuous, and long wall. These types represent the historical development of underground mining techniques in the United States; however, all four types remain in operation today.

Handloading represents the oldest of the techniques and is also the least productive method of mining. Handloading accounts for less than 10 percent of the coal mined in the United States today. In a handloading operation the miners shovel blasted coal onto small cars which are then hauled to the outside of the mine. The tonnage per man is much less with handloading techniques therefore the proportion of men working as handloaders is greater than the percentage of coal produced by this method.

The conventional method of mining coal involves a mechanical loading machine which picks up the coal that has been blasted, drilled or otherwise removed from the face. Conventional methods account for

approximately 30 percent of the coal mined and this figure is being reduced as companies update their procedures of mining.

Continuous mining accounts for approximately 40 percent of the coal being produced in the United States today. The continuous mining machine brakes the coal from the coal face and loads it in one operation. The continuous miner operator is said to have one of the worst jobs in the mine for he is exposed to great quantities of coal dust. This method of mining was introduced in the late 1940's.

The most recent production method to be introduced in the United States is long wall mining. Most large companies have at least one section loading coal by the long wall method. Approximately 30 percent of the coal being mined today is by this method. This figure will increase as more companies switch to this method not only for the increase in production but also safety.

Coal mines may also be classified by the type and location of coal strata which is being mined. The mines may be drift, shaft, slope, or surface which are also known as strip mines.

A slope mine is a mine in which the seam of coal lies very close to the surface and the entrance to the mine slopes from the surface.

The drift mine is located where there is a seam of coal that makes an outcropping on the side of a hill or mountain. The coal is mined by going directly into the seam from the outside.

The third type is the shaft mine in which the coal lies further below the surface, in some instances this can be as much as 1000 feet or more. The shaft mine is entered by means of a shaft which is sunk into the ground through which a series of elevators carry men, supplies

and the mined coal. As the mine advances from the original entry new shafts must be sunk to carry men and supplies.

In a strip mine operation the coal lies very close to the surface or even outcrops from the side of a hill. Large earth moving equipment is utilized in removing the overburden; the coal is then loaded onto trucks by steamshovels. The trucks then carry the coal to a processing plant to be crushed and cleaned.

There are other methods of classification of mines. These being size of operation, type of processing done at the mine site and the number of men employed. Truck mines refer to mines which truck their coal from the mine to an oustide processing plant which in most instances is owned and operated by another company. Tipplemines are those mines which have their own processing facilities. It is these mines that are generally the larger operations with railroad connections.

Although underground mines differ from one another, they all exhibit certain general characteristics and working in a coal mine differs considerably from other occupations. Mining involves working in dark, damp, dirty and dangerous underground rooms that range in height from 24 inches to 21 feet. The average height in a coal mine is usually over four feet. The work area may be from 200 feet to several miles from where the miner entered the mine. Except for the illuminated haulage routes in the larger mines, the work places are dark. The only light that is available are the battery operated lights the miner wears on his hat.

LITERATURE REVIEW

Mine Acid Water

The ecological problems associated with mine acid water are well known and papers documenting such deterioration of aquatic ecosystems are many; especially those papers dealing with acid water from coal strip mines.

When natural waters come into contact with waste from abandoned or operative coal mines, certain reactions occur that can leave the water unfit for aquatic life. This drainage water is characterized by a low pH, high concentration of certain heavy metals and often a heavy silt load. These water conditions are very common where coal is being mined, whether by underground or surface methods. These conditions constitute a massive pollution problem in coal mining communities (Crawford and Butler, 1973).

Many streams are completely decimated by acid mine water and even in small creeks the total dollar loss may exceed $10,000 for a single occurrence (Branson, 1973). Fish are not the only thing that suffer because of mine acid water. Whole ecosystems are degraded as a result of mine acid water pollution for it is toxic to animal and plant life. Local terrestrial animals that feed in these waters are reduced in numbers. Most large game animals will not drink this toxic water and consequently will not be found near

such water polluted with mine acid drainage. Fish behavior has been found to be abnormal and fish are deformed at pH levels of 4.5 to 5.2. Egg production and egg hatchability of the fathead minnow, *Pimephales promelas* Rafinesque, were reduced at pH 5.9 and lower, and all eggs were abnormal. Water quality standards allowing pH values lower than 6 will not provide protection for the species (Mount, 1973). High concentrations of ferric hydroxide will cause juvenile brook trout, *Salvelinus fontinalis* Mitchill, to be smaller in size and weight (Sykora et al., 1972). There is an increasing loss of sodium from the body of brook trout as the pH of the water is lowered from 7.0 to 3.0 with a very rapid change occurring at pH 5.0 to 4.0 (Packer and Dunson, 1970). They explained the loss of sodium as having a secondary role in the death of the fish. The primary cause of death was thought to be due to lowered blood pH interfering with the ability of the blood to pick up and transport oxygen.

The sources of this pollution have been shown by Kasowski (1973), and Branson (1974), to be the iron sulphur pyrites and marcasites that are exposed to weathering. The proposed sequence of steps in the oxidation of coal mine pyrites, in the presence of moisture, leading to the formation of acid are:

$$2FeS_2 + 7O_2 + 2H_2O = 2FeSO_4 + 2H_2SO_4$$

Iron sulfides when exposed to air and water oxidize to form ferrous iron, sulfate, and hydrogen (Leathen et al., 1953). As the acid is formed and enters the water the heavy metals become more soluble and readily enter into solution. Of the many alterations in water quality that are generated by the contact of acid water with the exposed soils,

increased aluminum concentration has the greatest effect on the rate of recovery (King et al., 1974). Mine drainage occurs not only from the mine itself, but also from waste dumps and tailings areas. The latter two sources often have a higher concentration of metal ions because the sulfides have been concentrated in these locations (Hill, 1972).

While bacterial activity seems to accelerate acid formation, the net effect of the oxidation of pyrites is the formation of two equivalents of acid for every mole of sulfate formed (Temple and Delcamps, 1952; Branson, 1974). It has been estimated by some observers that bacteria can cause a 250 to 450 percent increase in the amount of acid formed from sulfur balls and pyrites. Although the role of bacteria in oxidation of sulfides has been well documented it is still the focus of much debate (Baker and Wilshire, 1970). Data obtained from underground coal mines indicates roughly two equivalents of acid associated with each mole of sulfate where as strip mine drainage yielded 0.9 to 1.3 equivalents of acid/mole of sulfate (Singer, 1970).

There are approximately 10,500 miles of streams that are significantly affected by coal mine drainage pollution, and 6,700 of these are being polluted on a continuous basis (Crawford and Butler, 1973). In West Virginia alone, there are about 1,150 miles of potential fishing streams and 1,353 surface acres of reservoirs and ponds affected by mine acid pollution (Kinney, 1963). This acid discharge results from deep, shaft, and surface mining of bituminous coal.

Acids change the water quality of streams into which they are discharged and in most instances affect fish and wildlife as previously reported. Acids in great enough concentration can be lethal or they may bring about changes in conditions of existence and rate of growth of fishes (Boccardy and Spaulding, 1968). Acids also depress or prevent reproduction of desirable sport fishes. The lack of desirable fish and wildlife in and around these acid streams results in a decreased value for land in the area. If acid pollution is high, in particular, streams, the water cannot be used for household purposes, livestock watering or industrial purposes without expensive treatment.

There are many other problems associated with mine acid drainage that are beyond the scope of this thesis. However, the abatement of acid mine pollution is a definite possibility and would make a minimum of 5,890 miles of streams and 15,000 acres of impoundments in the United States available for sport fishing (Kinney, 1963).

In most instances mine acid water is usually pumped into or allowed to flow into a holding pond where it is then treated with either lime, limestone, ammonia, sodium carbonate, or sodium hydroxide (Hill, 1972). In most instances lime is used because of its low cost and it reacts rapidly; however, its disadvantage is that voluminous sludge is formed. Limestone would be the best choice; however, it is not effective above a pH of 6.5 because it has a very slow attack by acidity at higher pH. The purpose of these alkaline reagents is to raise the pH to acceptable criteria before allowing the acid water to enter the local stream or river.

Most companies do not take care of their mine acid water as they should and in some cases fail to meet minimum standards established by the respective state. If proper abatement were practiced by coal companies and methods for neutralization were used many cases of pollution could be remedied and the streams so affected restored to at least an acceptable state (Wilmoth and Hill, 1970; Hill, 1972).

The ultimate solution to mine acid drainage is preventing the problem before it ever begins. The formation of acid is dependent upon oxygen and water coming in contact with sulfides; if this contact could be prevented there would be no formation of acid mine water and no need for neutralization practices.

Slag Piles-Slate Dumps

Inseparable from the process of extracting coal from below the earth's surface, is the problem of waste disposal. Coal cannot be mined pure, consequently a large amount of dirt has to be separated out before it can be sold. Despite the use of modern mechanized methods it is impossible to mine coal without producing "dirt". Even with these modern mining methods there is a tendency towards an increase in the amount of dirt produced per ton of coal being mined (Northcott, 1967).

Mine dumps usually impress themselves upon an individual as an eyesore. This has been the case since the beginning of coal mining. The defilement of streams by mine dumps, especially after heavy rains, was mentioned as early as 1904 (Roberts, 1904). It is a well

accepted fact that slate dumps are a source of air and water pollution in coal mining towns. Slate dumps are almost invariably composed largely of pyrite shale which is then exposed to the most favorable conditions of air and water for acid formation (Wright, 1932; Branson, 1974).

Despite all we know about slate dumps and their reclamation there is still a large portion of our land which is virtually barren wasteland due to the harmful affects of slate dumps and stripping (Adams et al., 1972). In West Virginia alone there are at least 14,000 acres of land covered by coal refuse piles and 195,000 acres have been disturbed by surface mining (Kaufman et al., 1972).

Coal mine refuse does not easily decompose to dust with the passage of years. Because of this fact the damage, rather than diminishing with time, has a cumulative affect. Coal demand is estimated to grow by 60 percent by 1985 (McAteer, 1973; Kaufman et al., 1972). With increased coal consumption, and the fact that environmental demands for cleaner coal dictate higher percentages of coal refuse, point to a future in which the coal waste problem will be of staggering dimensions.

Early attempts to correct and reclaim the coal mine refuse were usually carried out by the mining companies. These efforts included covering the refuse with rock and/or sludge and the establishment of plant life on the piles (Northcott, 1967). The establishment of plant life on coal refuse piles is an effective method of reclamation, except in the case of piles that are on fire. Some see reclamation by covering with vegetation as the only possible alternative to slag pile reclamation (Smith and Bradshaw, 1972). The establishment of

plant life on slag piles was found to be a mechanical problem rather than a chemical one (Brierley, 1955). He points out that the vegetation must have some firmly anchored object such as a rock to provide it shelter. The configuration of the slag pile was found to influence the distribution of natural vegetation, spoil moisture, erosion and possibly fertility (Hall, 1953).

The reclamation of slag piles by grasses of various types is greatly determined by the genetic character of the particular grass used (Gregory and Bradshaw, 1964; Jowett, 1959, 1964). Since the early 1960's numerous grasses have been used along with various types of trees in reclaiming coal mine refuse piles. A slag pile in Marion County, West Virginia, was planted with Alta fescue, ryegrass and yucca. Later white pine, Virginia pine, and black locust were planted, all are doing quite well (Smith, 1972). Others have also used these grasses in revegetation of strip mine spoil (Mellinger et al., 1966). However, greatest promise under harsh reclamation conditions has been shown by Kentucky 31 fescue, rye and red top grasses and birdsfoot trefoil (Adams et al., 1971).

The scattered attempts to revegetate coal mine refuse dumps have met with varying degrees of success and it is argued by some that a scarcity of top soil in Appalachia has retarded efforts as compared to Europe (Kaufman, 1972).

A method for reclaiming coal mine refuse piles through the use of fly ash was developed by Adams and Capp (1971). This method holds promise for fly ash utilization as well as reclaiming coal refuse piles. The cost of spreading fly ash and planting was $328/acre which is $100/acre less than reclaiming coal refuse piles

by soil layering and planting with vegetation. This figure can vary considerably depending upon the topography of the sites and the distance the fly ash must be trucked and the quality of the fly ash. Though fly ash does show some promise in reclaiming coal refuse piles there is still the problem with the fineness of the ash and its high levels of boron, aluminum, and manganese which are toxic to plant growth.

The average acid formation for an entirely restored coal refuse pile in a study was estimated at sixteen pounds acid as $CaCO_3$/acre/day (Kosowski, 1973). This was a reduction of 91 percent compared to the original unrestored pile.

Reclaiming coal refuse piles by various planting methods is an ecologically and environmentally sound procedure. However, the Resource Recovery Act of 1970 emphasized the philosophy of resource recovery as a major objective. Coal mine refuse should be considered a resource recovery problem rather than a pollution problem. The technology is now or soon will be available to make it possible to utilize most of the coal waste being produced today and in the past (Doyle and Chen, 1972).

Community Survey

There are literally thousands of scales and indexes to measure social variables, such as personality tests and scales, attitudes, achievement orientation, citizen political activity and measurement of social participation. Despite the availability of these indexes and variables, measures of community variables are scarce. One of

the first attempts to measure such variables was made by Thorndike (1939). His research provided the first good attempt to evaluate our cities using "goodness" variables but these variables were not too easily obtained from the residents of the cities. This work was followed by a technique that was shorter which was based upon occupational distribution of the city (Gillen, 1951). Another early community attitude scale that was easily administered, either by an interview or questionnaire, was developed by Bosworth (1954). This scale dealt with such areas of the community as living conditions, religion, education, youth programs, utilities and business and industry. Despite all the indexes and scales that are available to researchers today, most find it necessary to adapt the scales and indexes to fit their particular research needs.

Studies of coal mining towns are limited, especially those dealing with environmental issues. Most of the studies of coal mining have been about or related to the industry rather than concentrating on a particular town and its inhabitants. One early study of a coal mining community was done by Roberts in 1904. He discussed anthracite coal communities of Pennsylvania in great detail; however, he did not measure any social variables. Some describe the coal miner as an "isolated mass" that is not integrated into the general society (Kerr and Segal, 1954). Others point out the high rate of mortality in the coal industry (Enterline, 1964; Kerr, 1968). In 1973, the West Virginia Coal Industry was studied in great detail, the problems of safety and working conditions of the miners were considered (McAteer, 1973). The study did not consider any one community but rather the whole coal mining industry. Little attention

has been given to environmental problems of coal mining communities except once in a while, after a Farmington, West Virginia or Buffalo Creek, West Virginia disaster; then the miner and his problems are news worthy for a few days. As a result little has been written about specific areas such as Southern Appalachia Coal Mining Communities and the problems of the people. A study in 1951 by Arenholz of the communities in West Virginia considered the factors affecting social participation in coal mining communities. He looked at such variables as housing, churches, schools and recreational facilities to see how they affected the residents participation in the community.

Coal mining families have mother-centered homes with the miner (father) separated from his family most of the time (Lantz, 1958). The mother-centered household was also found by Lewis (1970) in that the wife-mother carried out most of the family tasks; however, the final authority is carried out by the husband-father. Lewis (1970) found the coal mining communities less closed and isolated than previously reported by Kerr and Segel (1954). Miners are still marginal members of their town and local area (Lewis et al., 1969). However, they were not able to give a definite reason for this. Miners and their families were reported to be very congenial and out-going (Lewis, 1970; Lewis et al., 1969).

Knowledge of the local culture is essential in designing the questions and evaluating the answers of a given coal community (Knipe et al., 1968). This researcher found that having been a member of the town was most helpful in developing the questions for the survey and evaluating the results. Forced-choice questions were often difficult for the respondents who were not accustomed to inspecting

their attitudes (Knipe et al., 1968; Lewis, 1970). This did not seem to be a problem with the inhabitants of the town in this study. Perhaps the difference in locality and over-all education was of significance.

Some researchers speak of miners as being very independent especially when not in the mine (Goodrich, 1925; Gouldner, 1954). However, others have shown that certain types of mechanization tend to break down traditional cohesive work groups and miners would tend to socialize more outside the mine (Trist and Bamforth, 1951). Lewis et al. (1969) tend to support both of these theses.

When the recommendations of the President's Appalachian Regional Commission became law in 1964, people assumed that the problems of Appalachia had been met and were on the road to being resolved. However, Caudill (1967) stated that nothing could be farther from the truth. A major source of the problem is that Mountaineers look at governments as a dangerous tyrant, and because of this have kept their governments weak. These weak, under-financed governments have kept the people poor and ignorant. Various companies have taken advantage of this situation to plunder the land and as a result pollute the air and water in the areas. "Change cannot occur until the people are educated to comprehend what is happening to their land and environment" states Caudill (1967).

METHODS AND PROCEDURES

The methods and procedures used in this research concerned three areas: (1) Mine acid water; (2) Slag piles-slate dumps; and, (3) A survey of the inhabitants of the coal mining community.

Mine Acid Water

To substantiate the questions of the study dealing with mine acid water pollution and the development of an educational unit on the subject of mine acid water the information on mine acid water was needed.

The water sample data presented in the study was collected in April, 1974 by procedures outlined in the Hach Water Analysis Handbook. Samples were collected at the various sites and then transported home where they were analyzed. The temperature and pH of the water were checked and recorded while at that particular site. These data were analyzed for relavance to questions 2, 12, 23, and 28. The following tests were performed by the Hach Kit Method, Hach Chemical Company, Ames, Iowa: alkalinity, carbon dioxide, hardness (total), hardness (calcium), hardness (magnesium), nitrate, nitrite, phosphate, sulphate, copper, and temperature.

While collecting the water samples at the holding ponds this researcher had an opportunity to discuss the company's facility with an employee. He indicated that the company had a problem with sludge

accumulation in the ponds. At the time of collection he thought this researcher to be a state official and was worried that the water at the ponds might not pass state requirements that had been established. The water samples that were collected were in areas where the researcher was permitted to enter. There are a number of areas that are owned by the company that are off limits except to certain company employees.

Slag Piles-Slate Dumps

Slag piles-slate dumps are a dominant characteristic of any coal mining community and present an environmental as well as a health problem. Information on the slate dumps was obtained through field visits and a personal interview with a coal company engineer. No exact records have been kept of the mine dumps, therefore, it would be very difficult to obtain an accurate figure of how much waste was contained in any of the dumps. The field visits to the dumps confirmed reports that the company has done little in the past to reclaim the area. This researcher found the area surrounding the dump site to be very desolate and almost void of any type of vegetation.

Law suites were brought against the company because of the burning dumps. Local residents had very little to offer when questioned about the law suites, and the company was even less cooperative. These findings were used in conjunction with the company survey questions dealing with pollution resulting from slag piles-slate dumps.

Community Survey

A questionnaire to survey the inhabitants of the town was one of the basic tools for this study. In developing the questionnaire, the people and their culture had to be considered at all times. The town is a conservative community, approximately seventy-five miles southwest of Pittsburgh on West Virginia Route 26 and only nine miles from Fairmont, West Virginia, the county seat of Marion County (Figure 1). The questionnaire was developed so that the inhabitants would have a minimal amount of difficulty with the mechanics of the questionnaire for most of the inhabitants never had the opportunity to respond to a survey of this type.

A Likert-type format was decided upon with the majority of questions having a scale ranging from "strongly agree" to "strongly disagree". After much thought it was decided to incorporate a few open-ended questions into the questionnaire. According to Miller (1973) the general rule is to present closed rather than open-ended questions; however, it was decided to add the open-ended questions for they had the precise aims of the study in mind. The open-ended questions were placed after major sections of closed-end questions. This was done to prevent possible boredom of responding to forced choice questions and to give the respondent an opportunity to express himself on the particular group of questions he or she had just completed. Personal data questions were also asked.

The questions were re-written a number of times in an attempt to make them as concise as possible. Once the final draft of the questionnaire was completed it was field tested in May, 1974. The

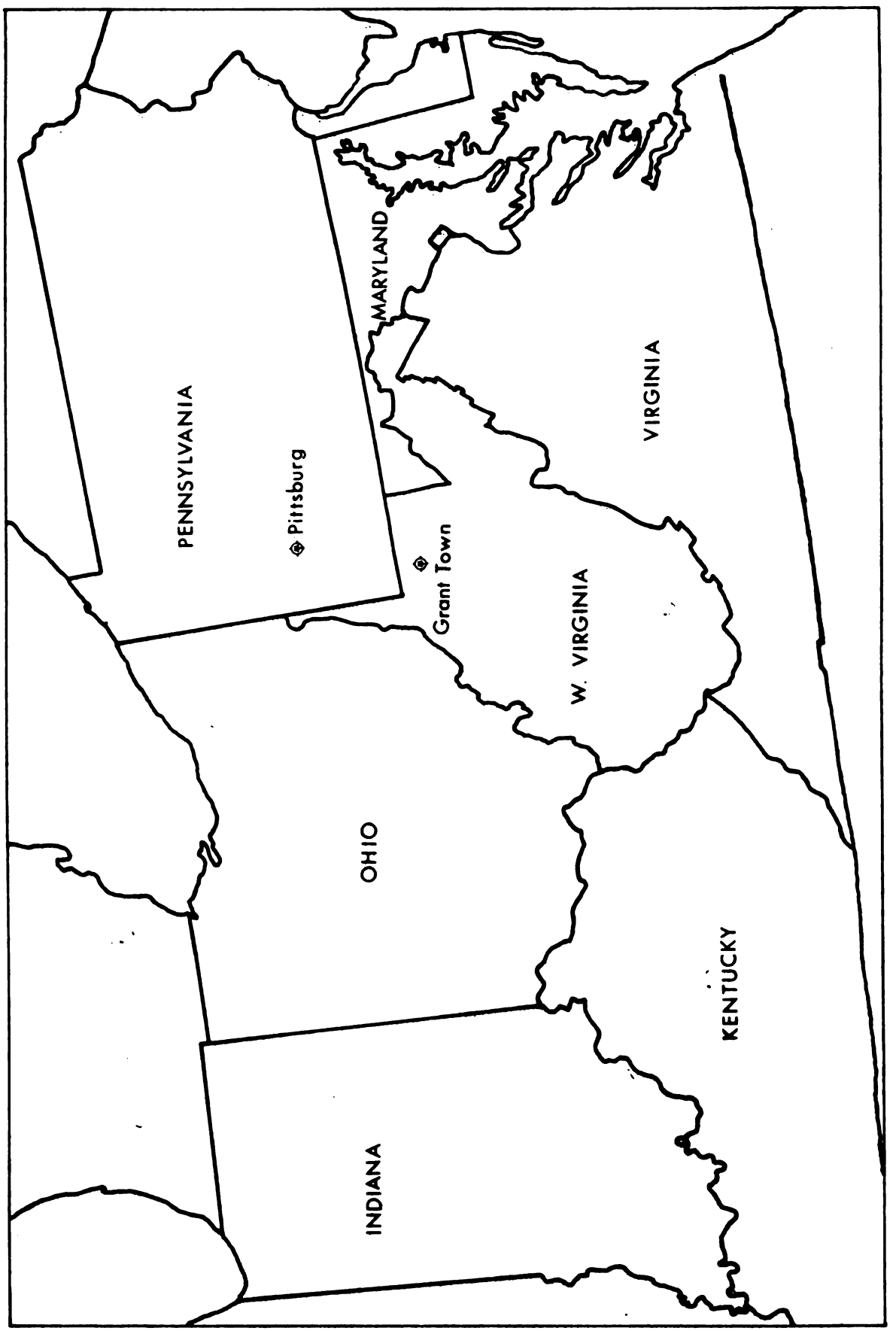

Figure 1. Location of Grant Town.

questionnaire was given to a few individuals in the town to test their individual responses and make any necessary changes in clarity of language. Upon completion of the pretest the final format was decided upon and the questionnaires were printed and readied for distribution.

Because the town is such a small community and most of the homes are in close proximity with one another it was decided to distribute the questionnaire by hand on a door to door basis rather than using the mail out mail back format. This method also afforded the opportunity to introduce myself and the study to each family. The addresses for the families in the town were obtained through the local water department mailing list. After sorting through the addresses and eliminating businesses and families who live outside the city limits a total of 232 families were left as possible recipients of the questionnaire. The number of families to receive the questionnaire was 186. Each family was asked to complete the questionnaire within three days. After three days had passed a return trip was made to each home to collect the questionnaire; if the questionnaire was not completed the family was asked to leave it at the local barber shop at their convenience.

In distributing the questionnaire, it was found that most of the inhabitants were very eager to be helpful, particularly those individuals that knew this researcher. This friendship, at times, lead to difficulty in distributing the questionnaire for the people wanted to reminisce and discuss their families. The problem was not as difficult as that mentioned by Lewis and Knipe (1969). The inhabitants of the town are usually apprehensive about giving out

information concerning themselves or the coal industry, therefore, the individual that tries to obtain such information would find it very difficult if he or she were not familiar with the town and its residents.

All the encounters with the families were not entirely pleasant. There were a few occasions in which the individual stated he would not answer such a questionnaire for he felt this research was for the company and that it was some type of conspiracy on their part. One of the drawbacks this researcher had in working with the residents of the town on this survey was that a relative was superintendent of the local mine for nine years; it was during this period (1957-1966) that the mine underwent great change. He was thought to be responsible for the large layoff that occurred during this period and because of this he was disliked by many of the residents. It seemed that he was held responsible for a number of things that occurred at the mine over which he had no control.

There were a few instances where a family refused to take a questionnaire. On one occasion an individual took a questionnaire but later indicated he had simply thrown it away. For the most part, the people of the town were easy to work with and in a few instances individual families filled out their questionnaires in a matter of a few hours and returned them.

The final cut off date for receiving questionnaires was set for August 1, 1974. At this time a return trip was made to the town to collect the remaining questionnaires.

As a result of the survey, questionnaires were completed by 112 families. The information obtained from the 112 completed forms was

coded on EMU EWGRAD Forms. Once the responses were coded a number of correlations of various questions were decided upon to test the thesis. This information was then computerized by the Statistical Package for Social Sciences to obtain the initial code book. After the initial code book was completed the data was cleaned by collapsing various categories where necessary, and recoding questions that were stated in the negative. The statistics were then run on the completed codebook and redied for interpretation and analysis.

The open-ended questions were not placed on computer sheets. These questions were totaled by hand and many of the responses for individual questions were placed into general categories to simplify the process of evaluation.

It should be noted that the researcher had difficulty in analyzing some of the data fairly. This problem arose for the researcher was a resident of the community for over 20 years and at times interjected too many personal opinions rather than simply adhering to the facts.

RESULTS AND DISCUSSION

The findings of this study reflect the results of the community survey as related to two environmental problems of the coal mining community: (1) mine acid water; and (2) slag piles-slate dumps.

Mine Acid Water

These results do not tell a complete story of the pollution problem with Paw Paw Creek for the stream receives raw sewage effluent in many locations. This problem is the direct result of homes allowing their waste to flow directly into the creek. The sites that were sampled (Figure 2) were selected to give the most representative picture of the pollution problem.

These data are not meant to be conclusive, for the water quality is constantly changing, particularly the water in the mine holding ponds. It is here that the water is being treated with lime by the company. The data, as a whole, presents no unexpected results in that most of the pH values are on the acidic side and the values for total hardness and sulfate level are somewhat elevated. This is characteristic of mine acid water (Table 1).

Site 1, located closest to the mine dump has the lowest over-all pH. Much of the water at site 1 has its origin above the stock pile near the slate dump. By flowing over and through the dump and near

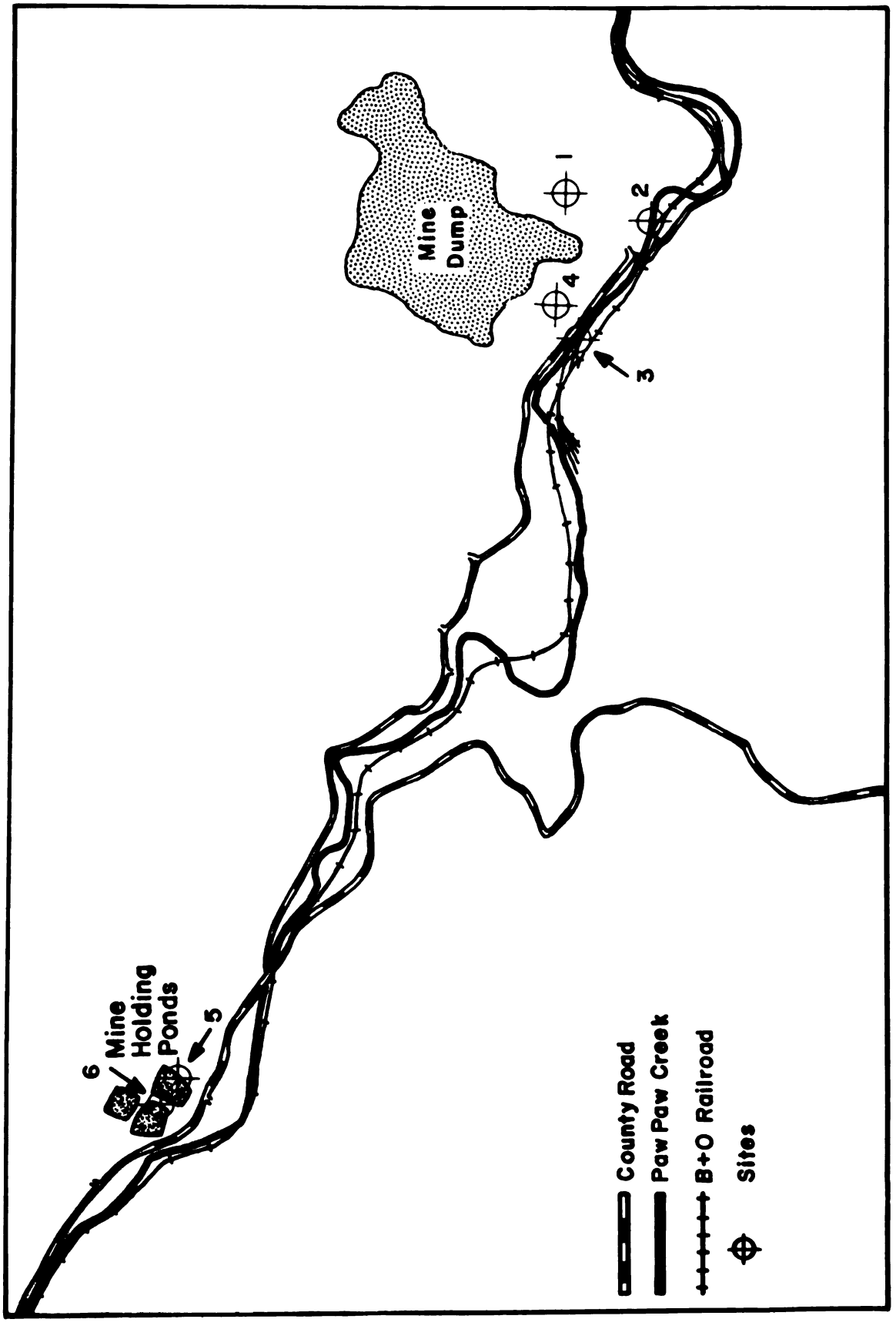

Figure 2. Location of water sample sites and holding ponds.

Table 1. Summary of water samples.

Site 1

Runoff from the coal stock pile which empties into the Paw Paw Creek just east of the bridge crossing the highway.

pH	3.5
alkalinity	20 ppm
carbon dioxide	10 ppm
hardness (total)	3400 ppm
hardness (calcium)	1600 ppm
hardness (magnesium)	1800 ppm
nitrate	14 ppm
nitrite	.12 ppm
phosphate	2.8 ppm
sulfate	1260 ppm
copper	2.1 ppm
temperature	8°C

Site 2

Located approximately 3 yards downstream from where the culvert leading from the stock pile empties into the stream.

pH	5.6
alkalinity	10 ppm
carbon dioxide	92 ppm
hardness (total)	360 ppm
hardness (calcium)	220 ppm
hardness (magnesium)	140 ppm
nitrate	16 ppm
nitrite	.02 ppm
phosphate	5.2 ppm
sulfate	330 ppm
copper	.65 ppm
temperature	7°C

Site 3

Located approximately 25 yards west of where the stock pile culvert empties into the stream.

pH	5.65
alkalinity	10 ppm
carbon dioxide	122 ppm
hardness (total)	370 ppm
hardness (calcium)	240 ppm
hardness (magnesium)	130 ppm
nitrate	11.2 ppm
nitrite	.005 ppm
phosphate	6.8 ppm
sulfate	800 ppm
copper	.25 ppm
temperature	6°C

Table 1 (cont'd)

Site 4

Small culvert located at the base of the coal stock pile nearest the highway.

pH	5
alkalinity	30 ppm
carbon dioxide	12 ppm
hardness (total)	2500 ppm
hardness (calcium)	1600 ppm
hardness (magnesium)	900 ppm
nitrate	22 ppm
nitrite	.18 ppm
phosphate	8.2 ppm
sulfate	5000 ppm
copper	3.1 ppm
temperature	14°C

Site 5

The last holding pond located at the Keystone Portal.

pH	6.7
alkalinity	5 ppm
carbon dioxide	32 ppm
hardness (total)	2500 ppm
hardness (calcium)	2100 ppm
hardness (magnesium)	400 ppm
nitrate	6 ppm
nitrite	.003 ppm
phosphate	7.5 ppm
sulfate	4500 ppm
copper	0.8 ppm
temperature	7°C

Site 6

Runoff that connects holding ponds 2 and 3 at the Keystone Portal.

pH	7.9
alkalinity	5 ppm
carbon dioxide	16 ppm
hardness (total)	2400 ppm
hardness (calcium)	2000 ppm
hardness (magnesium)	400 ppm
nitrate	7 ppm
nitrite	.25 ppm
phosphate	6.25 ppm
sulfate	7500 ppm
copper	2.5 ppm
temperature	12°C

the stock pile the water has a chance to pick up various metal ions which would lower the pH value.

Sites 2 and 3 have similar pH values. The tested levels for hardness, sulfate, and copper are much lower than site 1, possibly attributed to the diluting affect of the Paw Paw Creek. The pH value of sites 2 and 3 has also been raised due to the buffering action of the stream.

Site 4 has a lower pH value than sites 2 and 3, however, the sulfate and hardness levels are very high. This sample site was a culvert which was stagnant and very orange in appearance. This would indicate a large presence of sulfur and copper thus contributing to these high values.

Sites 5 and 6 have the highest pH values as well as the highest level of sulfate. The increased pH values are probably due to the addition of lime at the first holding pond. The sulfate levels are relatively high due in part to the sediment and the lack of any diluting or flowing within the ponds. The ponds are rather shallow and there is very little chance for aeration or mixing in the ponds.

Although these values may seem alarming to some, it must be made clear that prior to government regulations many mines including the local one pumped mine acid water directly into the local streams. Pumping stations were usually located on or near the stream edge and the mine acid water which entered the stream completely decimated the stream for miles. The Paw Paw Creek had at least two of these pumping stations located on its banks. When this untreated water was pumped into the creek the water would be orange in appearance due to the high concentration of sulfur and iron.

This condition, though greatly improved by treatment at the holding ponds, has had a lingering affect due to the deposits of sulfur, iron, and other sediments on the stream bed. Many of the streams in the area including the Paw Paw Creek have very low fish populations with water quality unfit for most human needs.

The holding ponds and treatment facility which the company operates for their mine are located at the Keystone Portal (Figure 2). The company uses lime as their buffering agent for it is less expensive than other buffering agents and it has the quality of reacting very quickly with the mine acid water. The system is slurry fed with lime being added just before the water begins its fall down the trough into the first holding pond. The company has a problem with sludge build up which is compounded by the fact that the company does not drain the ponds at the necessary intervals and remove the sludge and dispose of it in an accepted manner. This researcher learned that on occasion the company pumped the mine acid water directly into the stream. This is in direct violation of state laws.

Despite such violations by coal companies the situation is improving and the water in the local stream has improved in the past few years. The improving conditions suffered one very serious set back when the mine was reopened after the mine fire. At this time, all the water that accumulated in the mine over a period of approximately one year was pumped directly into the creek and the fish population as well as other aquatic life was greatly reduced. However, the company received permission to do this from the state for it was deemed in the best interest of the community that the mine be opened.

In 1963 the Paw Paw Creek was reported to have a pH of 5.0 and three miles was polluted by mine acid water (Kinney, 1963). (This seems to be a conservative figure for there were no treatment facilities at this time).

The above data on the water samples tends to support the theory that mine acid water will eliminate or diminish aquatic life in water having an acidity below a pH of 5.0. Several species of fish exhibit some tolerance for mine acid water ranging from a pH of 4.6 to 5.5. These being the white sucker, brown bullhead, chain pickerel, creek chubsucker, creek chub, and yellow perch. At a pH of 5.5-6.0, which is characteristic of mine acid water, the growth rate of carp is reduced, spawning of the fathead minnow is significantly reduced and mollusks are rare. With a pH of 5.0-5.5, which is common for the Paw Paw Creek, the fish population is very restricted and some invertebrates are affected. If the mine were not polluting the local stream and the pH of streams in other areas could be maintained at 5.5 the coal communities could be assured of having a diverse and productive fish population.

The Federal Water Pollution Control Administration estimated that $7.5 million in recreational value alone is lost annually in Appalachia, due in part to mine acid water. Thus, many of the communities are losing potential recreational dollars. The problem of mine acid water are particularly damaging in areas where streams lack effective buffering capacities.

Mine acid water and sediment from coal mining operations also impose hidden costs on industrial and municipal water users. Water which is acidic causes corrosion of equipment, boats, and barges and in many areas of West Virginia numerous water suppliers spend approximately

33 percent of their budget removing acid from the water. It is estimated that a 90 percent reduction in mine acid drainage would save $962,000 per year for Appalachian municipal water users (Kaufman, 1972). The residents in the town and others like them throughout Appalachia are presently paying for the cost of the coal industry's pollution.

Other characteristic elements of mine acid water, such as iron, copper, and hardness, expressed as the equivalent quantity of calcium carbonate ($CaCO_3$), present problems for the various users of such water. Iron is objectionable in public water supplies because of its effect on taste and the red stains it can cause. Copper is frequently found in surface waters and in some ground waters in low concentrations (less than 1 mg/l). It is an essential and beneficial element in human metabolism and small amounts are generally regarded as nontoxic; but large doses may produce emesis, and prolonged oral administration may result in liver damage. Because of the adverse affects that some of these elements might have on various life forms it is important for residents of mining communities to be aware of the possible dangers of mine acid water

Sewage disposal also contributes heavily to the pollution of Paw Paw Creek. There are a number of locations where raw sewage seeps into the creek due to the lack of septic tanks or other satisfactory disposal methods. The town council has discussed the possibility of building a sewage treatment facility on numerous occasions and the people have indicated that there is a need for a facility. However, when the town council called a meeting to discuss the possibility of building a treatment facility the response from the inhabitants was

very poor. The conflict seems to arise over who should pay for the system; the last thing the people of the community want is an increase in taxes. A typical statement by a resident of the town is "why should we have a sewage treatment facility when Fairview, a town located approximately six miles away does not". This seems to be the general attitude of the people in the town. They say they want to do something for the good of the town but no one ever takes the initiative in such a program.

Slag Piles-Slate Dumps

Slag piles are a product of coal mining and have a direct affect upon the environment of coal mining communities. Burning slag piles were once considered to be an inevitable side effect of mining coal. Lack of concern about ways of preventing or extinguishing these fires has resulted in approximately 290 burning piles in the United States (McNay, 1970).

The likelihood that a coal slag pile will catch fire, as did the one in the town, depends upon the nature of the refuse composing it and the measures taken to prevent it from occurring. Modern mining methods have produced a smaller ratio of combustible substances but such items as discarded containers, rags and worn equipment still find their way into refuse piles. The percentage of combustible material in a slag pile varies with each pile. When coal was separated by hand the percentage of coal that reached the slag pile was much higher. In some cases, over 30 percent.

Ignition of coal piles has mainly been attributed to spontaneous combustion; it is believed to be the cause of two-thirds of the fires

now burning. Proper layering and compaction could make coal refuse fires the unusual rather than the usual occurrence.

The most harmful and unacceptable result of coal slag piles found in the coal mining communities scattered throughout Appalachia is the gaseous and particulate matter it contributes to the atmosphere. Smoke, small dust particles, poisonous and noxious gases are all released during combustion of a pile. Since 90 percent of the coal refuse banks are located in seven Appalachian states and approximately 90,200 people live within three miles of a burning West Virginia slag pile, the hazards are very near and very real for thousands of Appalachian residents (McNay, 1970).

Although it is difficult with present information to specifically list the damage done to humans, vegetation, and structures, case studies show that all three are adversely affected by burning refuse piles. Other damage caused by burning refuse piles includes discoloration of paint, corrosion of metal surfaces and creation of traffic hampering smog.

With the pile located in the town some form of water pollution arises anytime water comes into contact with the material found within the pile. Direct rainfall, storm runoff, placement of refuse piles near streams and preparation plant water discharge, all result in contamination of adjacent waterways. Regardless of its source, water which penetrates or flows through a slag pile will pick up fine refuse particles, dissolved gases, iron pyrites and other sulfuritic materials. The type of coal mined in the community, low or high sulfur, determines the character of stream pollution, while average rainfall and slope characteristics of the land largely control the extent.

Through a personal interview with an engineer with the local coal company the data on the slag piles was obtained (Table 2). This information shows the size of the dumps and the approximate tons of material contained within them. A field trip to the dump sites indicated that the company had done little to reclaim the area (Figures 3 and 4). This is a great contrast to the slag pile located in Idamay, West Virginia. Instead of maintaining an eroding eyesore the company that operates the mine there has stabilized the pile with grass and trees.

The dumps that the company own are located east of the town (Figure 5) and do not pose any immediate danger to the town in the way of flooding or sliding. There are a few small ponds in the valley beyond the dump which are a menace to the surrounding environment for the water in them is very acidic. Prior to the late 1950's the dumps which the company owns smouldered and emitted noxious smoke, dust and gases which were deleterious and destructive to plant and animal life in the immediate area.

During the period (1950-1959), there were at least 15 law suites brought against the local coal company because of the burning dumps. The suites were filed by various residents in and around the community. These individuals claimed that their land and/or themselves had been harmed by the emanating poisonous gases and acid fumes from the dumps. The damage done to the surrounding environment by the dumps is quite evident, especially the area down wind from the dumps. However, this researcher can not document the fact that the people were harmed by the smouldering dumps. But fumes emitted from burning piles located near Triadelphia, West Virginia, was, by several doctors' testimonies,

Table 2. Dimensions of the two slate dumps located in Grant Town.

Slate Dump 1 (sometimes referred to as "the old slate dump")

Height: 140 feet

Width: 375 feet

Length: 1175 feet

Tons of solid waste: 347,000 (stopped dumping on this pile in 1943)

Slate Dump 2

Height: 120 feet

Width: 330 feet

Length: 1750 feet

Tons of solid waste: 2,000,000

Note: These figures are approximate. Exact figures of dimensions and tons of solid waste contained in the piles would be difficult to obtain for the company does not keep these records.

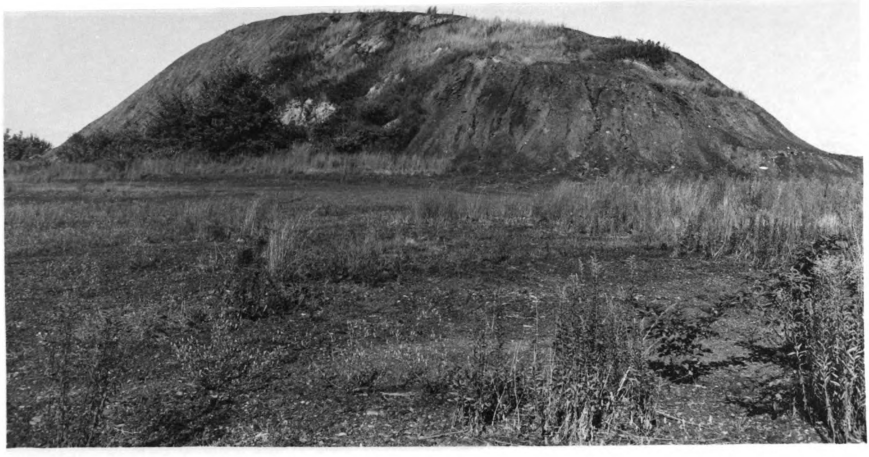

Figure 3. "Old slag pile" owned by Eastern Associated Coal Corporation.

Figure 4. Present dumping site of the Federal No. I Mine.

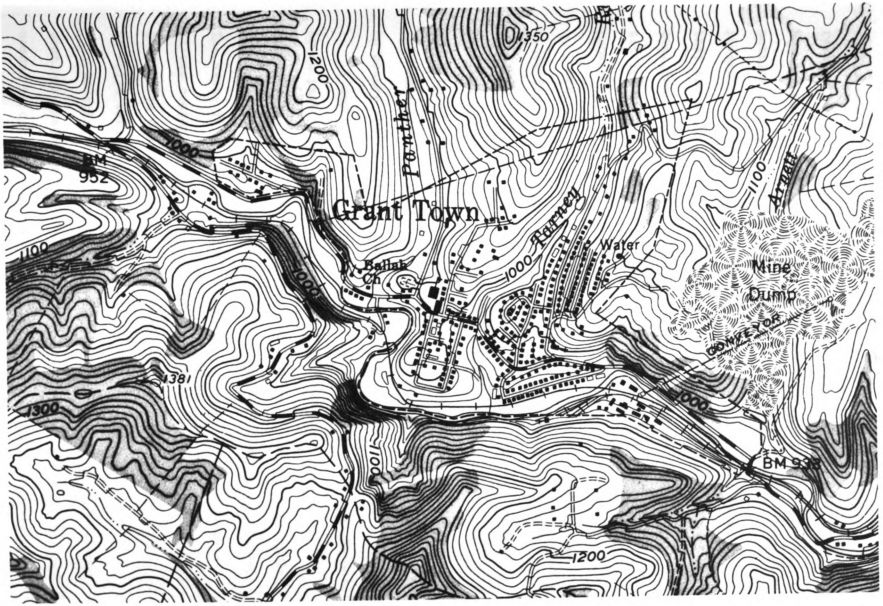

Figure 5. Map of mine dump area and Grant Town.

sufficient to cause severe respiratory problems to the town's residents. In a study by Stuhl, it was found that residents of Boone County, West Virginia complained that acrid fumes often settled over their homes for days after rains or temperature inversions. The records at the Marion County Court House indicate that the majority of law suites involving the residents and local coal company were dismissed. There were a few cases that were settled out of court but what the individuals settled for is not known.

Pressure by the town's inhabitants and new government regulations forced the company to begin to extinguish the smouldering dumps in 1954. The company eliminated the smouldering and burning but left a greater area distrubed for they built small holding ponds to have needed water to pump on the piles. They also bulldozed the surrounding area to obtain needed soil to place on the dumps to assure that spontaneous combustion would not occur again.

Today the company disposes of its solid waste in the same manner as in past years. The waste is carried to the dump site via a conveyor belt, this system is common and is found in many coal mining communities. The waste material is then spread around by bulldozer. The waste is compacted by the weight of the dozers; this procedure allows companies to dispose of much more waste in a given area. This particular operation costs the company approximately $.10 per ton of solid waste.

Covering the slate dumps in this way has eliminated many of the problems associated with the mine dump in the town, however, the area needed to carry out an operation such as this is quite large and a

greater area is now ecologically disturbed. There are still hundreds of burning dumps scattered throughout Appalachia which are potentially dangerous; moreover, additional accumulation of coal refuse amounts to approximately 70 million tons. The local mine accounts for approximately 22,000 tons of solid waste a month which has to be disposed of in some manner thus one can see what a large problem of reclamation faces the company and community.

In a personal communication with a conservationist for Monongalia County, it was pointed out that the coal company did some reclamation work on their slate dumps. According to the conservationist the job proved successful in the sense of holding down fires and reducing siltation. An interesting observation concerning this project is brought out by the question concerning reclamation work. Only 35 percent of the people answering the question knew of the reclamation work. There is still considerable progress to be made by the local company and other companies in communities located in Appalachia for the accumulation of mine waste on land is incompatible with any useful purpose.

The coal stock pile located at the edge of the town (Figure 6) causes severe dust problems particularly during a dry windy period. This dust adds to the already existing air pollution from the preparation facility. Water that runs off the pile during rainy periods is very dirty and contributes to the silt problem of the Paw Paw Creek which is approximately 50 yards away. There is very little care given to the coal pile by the company and this compounds the problem.

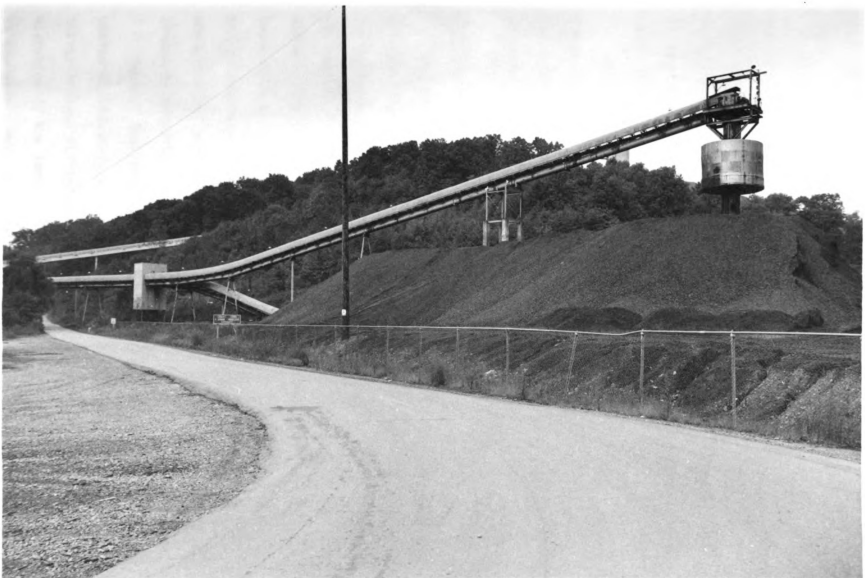

Figure 6. Coal stock pile owned by Eastern Associated Coal Corporation.

Community Survey

A questionnaire was developed for this study to see how the residents of the town saw their local environmental problems and other social problems that are typical of coal mining communities. Information on the residents backgrounds was also obtained to see if this type of information affected the residents viewpoint of their community.

Although the questionnaire does have limitations and various items were omitted, it provided a general profile of the town and information on how the people felt about certain issues that were relative to their community.

Profile of the Residents

The questionnaire was completed by 78 men and 34 women, the men accounted for 69 percent of the total whereas the 34 women accounted for approximately 31 percent of the 112 respondents. This proportion was unexpected when one considers the coal mining family to be mother-centered. However, it is important to note that it is impossible to say how many wives completed the questionnaire as though they were the husbands. Thus, the proportion of females answering the questionnaire may actually be higher than the acknowledged 31 percent.

Table 3 indicates that the age structure of the town has an uneven distribution with the majority of the inhabitants being under thirty or over fifty-five. This is probably due in part to an outmigration of the labor force due to economic change that had occurred in the past. This outmigration of young people in the 1950's and 60's

has slowed and now that coal mining is flourishing the trend has shifted since prosperity has returned to the town.

The marital status of the residents is indicated in Table 4. Most of the people in the community are married. They usually marry after graduating from high school or shortly thereafter. Very few individuals in the town remain single.

The family income levels for the town are seen in Table 5. Coal miners are unionized and the town's miners wages are typical for the area. The economy in the area has received a boost the past few years with many of the miners receiving Black Lung Benefits. These additional benefits have added to the economy of coal mining communities.

The response to the questions concerning the town indicated that the inhabitants like the community. However, the residents did indicate concern for such problems as sewage disposal and the quality of education. The residents seemed to be satisfied with such things as the fire department and road conditions but there was a definite lack of interest in town activities. The activists' guide could be helpful in getting the residents interested in town activities and possibly help solve some of the indicated concerns of the residents. If the residents of the town and other coal mining communities could gain confidence in how to approach and solve their community problems the areas would be much more pleasant for living.

The opinions of the residents concerning the town were also obtained through the use of open-ended questions. The results that were obtained by this method for question (A) were categorized in three general groups: schools, services, and safety. Schools is used in reference to any positive statement about the elementary

Table 3. Age distribution of residents.

Age	N	%
18-25	15	12
26-35	23	21
36-45	14	13
46-55	29	26
56 and over	31	28

Table 4. Marital status of the residents.

Marital Status	N	%
Single	17	15
Married	84	75
Divorced or Separated	3	3
Widowed	8	7

Table 5. Family income of the residents.

Income	N	%
Under $4,000	8	7
$4,000-7,900	24	21
$8,000-9,900	23	20
$10,000-11,900	26	23
$12,000-15,900	19	17
$16,000 and over	12	11

school, services refers to any positive statement about the police, fire department, or water department, and safety refers to statements concerning burglary and child safety. It does not refer to safety within the local mine.

Some of the more common statements regarding open-ended question (A), what are some of the things you like about the town, were as follows:

"The town is a safe place to live".

"The fire department does a very good job".

"It is a nice quiet town".

"You do not have to worry about being robbed when living in the town".

"The people in the town are helpful".

In regard to race, there were fifteen Blacks who responded to the questionnaire which accounted for 14 percent of the total. The responses indicated ninety-seven Whites, 86 percent of the total.

The profile of the residents of the town indicates that the model individual is White, over fifty-five years of age, is married, has less than a high school education, makes over $10,000 a year and has lived in the town for over thirty years.

Attitudes About the Town

The following section deals with the responses of the inhabitants concerning their community. The questions concerning the town are important for it is helpful to know just how the residence of our coal mining towns feel about their respective community. The questions deal with environmental as well as social issues.

In regard to the town being a growing thriving community 37 percent agreed, 31 percent disagreed, and 32 percent were uncertain. In relating these responses with sex, it was found that 45 percent of the men agreed with the statement while only 18 percent of the women agreed.

Approximately 96 percent of the residents agreed that raw sewage was dumped into the local stream which facilitated a need for a treatment plant.

In regard to the quality of life improving in the town, 46 percent agreed, 30 percent were uncertain, and 24 percent disagreed. The crosstabulation by level of income indicated that those making under $4,000 were more negative than the other income groups, 88 percent disagreeing as compared to an average of 55 percent for the other groups.

Fifty-five percent of the residents agreed that there is no future for children in the town, 19 percent were uncertain and 26 percent disagreed. In the crosstabulation by sex, 73 percent of the women agreed while only 43 percent of the men agreed with the question.

While 80 percent of the residents agreed that the people in the town are friendly and helpful there were 82 percent who indicated there is little interest in town activities. However, in relation to participation 98 percent of the residents agreed that the Volunteer Fire Department does a good job and many of the men in the town take an active part in its activities. Other local fire departments in the area are also well supported.

In regard to the statement there are few racial problems in the town, 90 percent of the Whites agreed while only 41 percent of the Blacks

agreed. Although there have been no outward signs of racial problems in the town there seemed to be an undercurrent of uneasyness between Blacks and Whites.

Fifty-nine percent of the residents agreed that the quality of education in the local elementary school is poor but neither the town or the county ever pass bond issues to provide better schooling and teachers. When an issue concerning schools comes up for voting in the area there is always strong opposition by people who do not have children of school age. Consequently the bond issues are usually defeated.

The results for level of education are represented in Table 6 and indicate that a majority of the residents have less than a high school diploma. It was common practice in the 1930's and 40's, especially for men, to quit school and begin to work in the coal mine to help with family expenses. From previous experience the researcher knows this to be true of many individuals who live in the town. Of the twenty-seven individuals who indicated they attended college, only ten actually graduated.

Most of the people, as indicated by the response to length of residence, have made the town their life-long residence (Table 7).

The response to previous residence, would certainly indicate that the town is not transient with most of the people having lived in the town most of their lives (Table 8).

Sixty-five percent of those responding mentioned safety, 27 percent mentioned services while only 8 percent mentioned education. There were no notable differences among the variables of age, sex, or level of education.

Table 6. Level of education of the residents.

Education	N	%
Less than high school diploma	48	43
High school graduate	36	32
Attended college	27	24
No response	1	1

Table 7. Length of residence.

Residence	N	%
0-10 years	12	10
11-20 years	16	14
21-30 years	27	23
Over 30 years	55	52
No response	2	1

Table 8. Previous residence.

Residence	N	%
Town less than 500	23	20
Town of 500-1,900	22	20
Town of 2,000-9,900	13	12
City of 10,000-49,000	12	11
City of 50,000 or more	5	4
Always lived in Grant Town	37	33

The categorized groups for open-ended question (B), things you dislike about the town, are sewage, sidewalks, recreation and pollution. Sewage refers to the lack of treatment facilities, sidewalks refers to a need for them for safety reasons, recreation refers to lack of facilities in the community and pollution refers to any type of pollution mentioned other than sewage. Some of the more common dislikes mentioned were:

"The pollution caused by the cleaning facility is very bad".

"The town needs a sewage treatment plant".

"The slate dumps are ugly and dirty".

"There is no place for the children to play".

"The town needs sidewalks, especially for the safety of the children".

Table 9 is a summary of open-ended question (B), dislikes about the town. There were no notable results obtained from the cross-tabulation for the question.

Table 9. Dislikes about the town.

Dislikes	N	%
Sewage	21	24
Sidewalks	9	11
Recreation	38	44
Pollution	18	21
Total	86	100

The open-ended questions concerning the town indicated that the residents are mainly concerned about pollution resulting from the mine, sewage, and the lack of recreational facilities. They seemed to be

satisfied with the services and safety of the town. This pattern would probably hold true for most coal mining communities for they are nice quiet communities but generally lack recreation and suffer from mining pollution. This type of response by the residents indicates a need for working with the people on their pollution problems.

Attitudes Toward the Coal Company

The following questions deal with the attitudes and opinions of the inhabitants in regard to the company. The questions are important for the company is such an integral part of the community and actually dominates the lives of some of the residents. This is true of many coal mining communities that are centered around one particular mining operation.

Over 86 percent of the residents agreed that the company provides jobs for the people in the area; however, they were somewhat indecisive about the company being a major pollutor of the stream. Fifty-five percent agreed the company was a major pollutor of the stream, 21 percent were uncertain and 24 percent disagreed. Cross-tabulation by place of employment showed company employees disagreed with the statement by a two to one margin over union employees and those that did not work for the local company.

Approximately 36 percent of the respondents agreed that the company tried to reclaim the area around the slate dump, 33 percent were uncertain and 31 percent disagreed. The indecision and disagreement may have resulted from a lack of publicity by the company about their reclamation efforts. This researcher was unaware of these efforts until interviewing a local conservation officer.

While 86 percent of the residents agreed that the slate dumps are a source of pollution, only 57 percent thought that the building of the coal stock pile on the old ball diamond site was in poor judgement by the company; despite the fact the stock pile contributes to the air pollution of the community.

There were 63 percent of the residents to agree that the company sold the "company houses" for a fair price. The houses sold for $2,000 to $3,000 and most of the people got a bargain at that price. Many of the homes in the town have since been renovated by the families and are now worth substantially more. This type of trend is true in most of the coal mining towns where houses were once owned by the local coal company.

Seventy-six percent of the residents agreed that the company built the cleaning and drying facility to make themselves more competitive. At the same time 86 percent of the residents agreed that the cleaning and drying facility is a source of pollution, 8 percent were uncertain, and 6 percent disagreed. Air pollution resulting from the facility has long been a center of controversy in the community. The initial reaction of the residents was protest. There were numerous letters to the local newspaper in protest of the pollution and the women of the town demonstrated and kept the men from working. The protesting continued for a few weeks but then dminished. The company eventually made an effort to eliminate some of the problem by installing a filtering system to remove dust particles. However, according to the residents this system has proved to be only marginal in success. "Although the facility does contribute to air pollution of the surrounding area it is one of the necessary evils of the industry", say some of the residents.

The results for the statement, residents were justified in suing the coal company, were probably due in part to a lack of knowledge on the subject. However, there was no indication from the cross-tabulation by age that the older residents were more knowledgeable on the subject (Table 10). The general concensus from talking with the inhabitants of the town about the law suites was that the residents were justified in suing the company over damage done by the burning dumps. The majority of residents found it regretable that more of the poeple did not win their cases.

The previous question concerning the company indicated that the residents, as a majority, approve of the company's operation. The residents again indicated a concern for the problems of pollution resulting from the mining operation but this concern was not as strong as that for the pollution of the streams by sewage. The residents indicated that the company did not take part in helping the town with its problems, only 24 percent of the residents agreed that the company showed interest in town projects. On the other hand the people thought the company sold the houses for a fair price.

The following two open-ended questions are concerned with the residents positive and negative attitudes of the company. The responses for the open-ended question, what has the company done that has helped the residents, were grouped into three categories: civic improvements, nothing, and jobs. Civic improvements refer to any money, time or materials the company donated to the town. The group nothing indicates that some residents think the coal company has done absolutely nothing for the town. A summary of the responses appears in Table 11. Some of the more common statements made by the residents regarding the

Table 10. Local residents were justified in suing the coal company over the dumps by age distribution.

Age	N	%
18-30	17	57
31-45	17	77
46-55	22	58
56 and over	22	54

Table 11. What helpful things has the company done for the town?

Helpful Things	N	%
Civic improvements	31	38
Nothing	13	16
Provided jobs	38	46
TOTAL	82	100

question were:

"The company provides jobs for the men of the area".

"The company donated materials and money for town projects".

"The company provides the children with a summer camp".

Only sixty-four residents responded to the open-ended question, what has the company done that has not been helpful for the town? Most of the responses were directly related to the company's pollution of the environment. Some of the more common responses were:

"The cleaning and drying facility creates air pollution".

"The company dumps mine acid water into the creek".

"The company is guilty of a certain amount of pollution".

Of the sixty-four residents responding to the question, 31 percent mentioned air pollution, 26 percent water pollution, and the remainder were divided among layoffs and not providing the town with recreational facilities. Both of these questions indicated that the people were mainly concerned with the pollution of the environment by the company. The residents did not mention the operation of the local mine by the company as a problem or any safety problems resulting because of neglect. This would again indicate that the company and the town should begin to work together to solve some of the problems of pollution.

Attitudes Concerning the Possibility of the Mine Closing

The following questions are concerned with the local mine and its affect on the community if it were to close. These questions were thought to be important for so many of the coal mining communities in Southern Appalachia have become ghost towns or very nearly so as

soon as the local coal company would stop production. When this happens the area soon becomes economically depressed and many of the pollution problems are simply left behind by the company.

The response to the open-ended question, will the local mine close, was 89 percent of the residents answering yes. The only possible way the local mine will remain in operation much beyond 1985 is to begin mining the Swickley Coal Seam which is located above the Fairmont seam and generally of poorer quality. This would extend the life of the mine measurably. There has been talk of this by the company. While most of the residents thought the mine would close only 6 percent of the respondents said they would move if the mine were to close, 24 percent said they would stay in town, 22 percent said the community would become a ghose town and 14 percent said nothing would happen to the town. A majority of the respondents thought the mine would be worked out in fifteen to twenty years.

Residents Attitudes Concerning Environmental Problems

The following group of questions concern some of the environmental problems facing the town and other similar coal mining communities. These problems are important for it would be very difficult for a coal mining community to attract new industry if the area is plagued with mine acid water, slag piles, and other sources of pollution resulting from mining. This situation occurred in a number of Pennsylvania communities in which the mine closed. The company would leave town after the mine were closed and the people were left with the problems of pollution. This would not have been the case had the people worked to keep the pollution at a minimum. If they had the communities could have attracted new industry much faster.

The response to the question, are you aware of the slate dumps, was 73 percent very much aware, 20 percent vaguely aware and only 7 percent not aware. The crosstabulation by length of residence indicated that those individuals who lived in the town the least number of years were the least aware.

Seventy-two percent of the residents agreed that the slate dumps should be reclaimed, 19 percent said probably while 9 percent had no opinion. It was of interest to note that the inhabitants think the dumps should be reclaimed by the company and that none of the residents disagreed with the reclamation of slag piles. This showed ecological awareness on the part of the residents.

Are you aware that at one time the slate dumps smouldered, an environmental issue, indicated that the residents were aware of the problem. Seventy-seven percent answered very much aware, 17 percent vaguely aware, and only 6 percent not aware. There was a noticeable difference in the percentage of residents answering very much aware when length of residence was crosstabulated with the question. Those with less than ten years of residence had only 41 percent aware. The other three categories of length of residence had at least 25 percent more of the residents answering very much aware.

Most of the residents, 77 percent, were aware that the local company along with other companies pump their mine acid water into holding ponds for treatment. The residents also seemed to be in favor of stronger environmental laws to regulate slag piles and the pollution of streams. Seventy-seven percent said there was a need for stronger laws, 13 percent answered no and 10 percent had no opinion.

The overall trend for the questions concerning environmental problems was one of awareness and concern on the part of the residents for their environment. However, when asked if they would favor a National Severance Tax on coal which would be used to reclaim areas that were disturbed only 58 percent of the residents were in favor of such a tax. Some of the people indicated their concern by stating such a tax could possibly hamper the coal industry in West Virginia. This researcher does not think this is likely for other states have similar taxes and these areas are not significant coal producing states. There is also the strong possibility that some of the residents did not know what a National Severance Tax was and therefore responded negatively.

In light of the national energy "crisis" most of the residents viewed the coal industry as getting much better (Table 12). However, the residents did not think that their own particular job at the mine would be more secure or meaningful. Because of the increased role coal will have in meeting future energy requirements the coal mining communities that face similar social and environmental problems will take on a greater importance for the remainder of the people. It will be essential to help the people of those communities deal with their problems as a greater demand is placed on them, their problems will probably increase, particularly the environmental ones.

Table 12. In light of the national energy "crisis" how do you view the future of the coal industry?

Future of Coal Industry	N	%
Getting much better	77	69
Staying about the same	16	14
Getting worse	6	5
No opinion	13	12

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study enabled the researcher to gain a better understanding of a coal mining community and its inhabitants through an inter-disciplinary approach using environmental as well as data obtained through the use of a community survey. The attitudes and opinions of the respondents concerning most issues were very homogeneous; particularly those relating to mine acid water and slag piles.

Despite the limited number of studies of coal mining communities, especially those dealing with envirnomental issues, this research indicated that mine acid water and slag piles are two of the primary characteristics of coal mining communities and the inhabitants are aware of the environmental problems they cause. The residents of the community depend upon the company operating the coal mine and this could be a reason for them not being critical of the company's actions causing the environmental problems.

The residents of the town have little interest in community activities or citizen action groups as indicated by their responses to the questionnaire. There is no interest or action taken by the inhabitants to solve environmental problems as well as such community problems as the lack of recreational facilities. The quality and level of education may be a primary factor in determining the way in which the residents view their future and the future of their

community. A majority of the respondents have less than a high school education which may limit their understanding of some of the environmental issues facing the town.

Slag pile runoff and mine water drainage in various locations along the Paw Paw Creek has contributed to the pollution of the local stream and has indirectly affected the lives of the people in the community as well as others living in communities downstream. This pollution has caused higher water rates for the residents in the area for mine acid water causes water mains to rust faster and is more expensive to treat. The pollution has also caused the stream to have lesser recreational value in terms of fishing. This is to say nothing of the aesthetic value that has been lost due to smouldering dumps in the community as well as the mine acid water pollution that has plagued the town.

Aesthetic value is something hard to put a price tag on but to "out-siders" slag-piles are ugly eyesores which detract from the overall appearance of the community. This type of environmental and aesthetic problem is one that coal mining communities will have to solve if they are to grow and possibly attract new industry.

Despite the coal company's treatment facility located at the Keystone Portal a noticeable amount of mine acid water still reaches the Paw Paw Creek on occasion; similar problems can be found scattered throughout coal mining communities of Appalachia. From field observations and discussions with employees of the mine it seems that the company does not maintain the treatment facility as well as they should. Many people are unaware that the treatment facility is inadequate at times and because of this do not question the operation of the facility.

If the company were to improve the treatment facility at the Keystone Portal and stop polluting the stream with mine acid water from other sites the water quality of the area would be greatly improved and the stream would have greater potential. This type of action by the coal company would also make the treatment of the water for domestic use less expensive too. The idea of converting mine acid water into every day needs is very possible and is now being done on a small scale in the Philipsburg area of Central Pennsylvania. Ion exchange plates based on the model at Philipsburg may well be used in mining communities all over the country that face mine acid water pollution. This type of positive action by the company would be very helpful in establishing better relations with the residents of the community.

The survey showed that a majority of the residents saw the pollution of the stream by sewage as being as bad as the pollution resulting from the mine acid water drainage. This observation by the residents is probably due in part from where they observe the stream. Most of the mine acid water pollution is concentrated upstream and downstream from the community. While the pollution from the sewage is concentrated in the stream where it is easily seen by the residents. Despite this concern by the residents little interest has been generated in the community for the building of a treatment facility which correlates with the relative low interest in community activities and problems. There seems to be little the community will gain from waiting to build the much needed sewage treatment facility. A member of the town council indicated that the town will eventually have to comply with government regulations and build the facility.

The community survey indicated that the residents liked the town, indicating that it was quiet and safe. However, they showed concern for such problems as environmental pollution and the future of their children if they remained in the town. The open-ended questions also indicated that the residents like the town but it lacked recreational facilities. Perhaps their like for the town can be exemplified by the fact that over 50 percent of the respondents have lived in the town all their lives. The lack of recreational facilities is due in part to the residents lack of participation in community affairs and the poor relationship that exists between the company and town.

The residents of Grant Town exhibited a homogeneous response to the parameters, which may influence the way in which they respond to various environmental issues. The level of education, age, sex, and level of income did not seemingly affect the residents attitudes on certain chosen issues. Upon examination of the level of education for the residents it can be seen that 43 percent have less than a high school education and for those with a diploma the education received was probably lower in quality when compared to other states. (This could have been an important factor in the residents approach to environmental problems). The respondents recognized the environmental problems but did not attempt to try and solve them. It would appear that the homogeneous attitude of the residents is due in part to the fact that coal mining communities are very "closed communities" and the inhabitants of these communities have very little social mobility outside their town.

Today's energy "crisis" has given coal mining communities a new lease of life; the people now realize that: (1) the coal industry is important; (2) their communities will survive and not become ghost towns as some thought; and, (3) their communities will prosper. Because of the renewed interest in coal there is a new interest in environmental problems of these communities and new demands are being made on the coal mining industry. Thus, additional funds are possibly available for improving the quality of education in coal mining communities, particularly in the area of environmental education and as the community survey showed people in a "typical coal mining community" are and/or can be encouraged to be interested in the quality of their environment. It can be concluded that the people of the town like their community but are concerned for the environment. However, they lack the necessary background and motivation to cope with such problems. Therefore, the following recommendations are made in an attempt to help the residents of coal mining communities solve their environmental problems and at the same time get them involved in community affairs.

Recommendations

1) An outline for an environmental education unit dealing with mine acid water and slag piles, 2) A brief guide for mobilizing the residents of the town to accomplish specific goals, 3) Further detailed studies of coal mining communities.

The outline for the teaching unit is intended to serve as a guide for use in a high school classroom situation or as an outline for a

discussion with the residents of the community (see Appendix B). Some of the major principles to be considered in structuring an educational outline of this type are as follows: 1) the program should be flexible enough to span the curriculum, kindergarten through the twelfth grade, so the environmental concepts can be developed for each level, 2) subject areas should be linked so that both the social and scientific concepts that are important to the problem are developed, 3) the program should try to be correlated with an existing curriculum to enhance the goals of the school system, 4) the unit should focus on local problems but not neglect problems of a larger scope, 5) positive attitudes and problem solving should be stressed, and, 6) the learner should play an active role through as many personal experiences as possible.

The following outline for mobilizing the residents of the town is based upon an article by Donald I. Warren and Rachelle Warren. This researcher feels that the town is a small enough community that it fits some of their descriptions of neighborhood characteristics that are typical for organization and change.

This type of guide would be useful in the town for the community survey showed that the residents are not active in community projects and need some type of guide for effective action. This guide would be a useful tool in motivating the residents to have a sewage treatment facility built for the community or possibly getting recreational facilities expanded.

The strategies are listed in probable order of effectiveness as seen by the researcher. Those strategies which would be too costly

in time or money that it would not make sense to use them are indicated by (no).

To use the guide an individual would choose the community characteristic(s) and then look across the list of strategies to find which action would be the best first step, which ones would be the best follow-up action, and which ones would be too costly to use.

Community Characteristics	Taking Action						
	Publish Newsletter	Conduct Door-to-Door Campaign	Advertise in Mass Media	Contact Key Neighbors	Use Organization Lists	Form Grass-Roots Group	Set Up Pipeline to City Hall
Heterogeneity. Many people of different backgrounds, lifestyles, or social levels who live in the neighborhood.	4	1	No	2	3	No	No
Identity. People in the neighborhood feel they have a great deal in common.	1	2	6	No	3	4	5
Insulation. If a bill collector came around asking about a neighbor in the community, people would refuse to give out information.	4	1	No	2	No	3	No
Interaction. People in the community get together quite often.	5	No	No	1	4	2	3

(Adapted from: "Different Strokes for Different Neighborhoods. A Community Leader's Handbook", Psychology Today, June, 1975).

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APPENDIX

APPENDIX A

GRANT TOWN COMMUNITY SURVEY

Hello! My name is Ronald Kolbash. I am currently a student at Michigan State University working on research for my Doctorate Thesis. I would appreciate it very much if you would take a few minutes of your time to tell me how you feel about Grant Town and Eastern Associated Coal Corporation (hereafter EACC). Your answers are very important to me as well as to others working in solving community problems. Please feel free to answer all questions openly for your name and address will not be recorded or connected with the data in any way.

The following are a number of questions and statements about Grant Town. Please read each question and/or statement carefully and respond to it by circling your answer or writing your comments in the space provided.

A. What are some of the things you like about Grant Town?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

B. What are some of the things you dislike about Grant Town?

1. _____
2. _____

3. _____

4. _____

5. _____

6. _____

1. Grant Town is a growing thriving community.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

2. Grant Town has no sewage treatment facilities which in some cases results in raw sewage being dumped in local streams.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

3. The quality of life in Grant Town is improving.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

4. There is no future for children in Grant Town.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

5. The people of Grant Town are friendly and helpful.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

6. There is little interest in town activities.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

7. The Volunteer Fire Department of Grant Town does a good job.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

8. There are few racial problems in Grant Town.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

9. The quality of education at the elementary school is very poor.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

10. The streets in Grant Town are well maintained.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The following are a number of questions and statements about EACC. Please read each question and/or statement carefully and respond to it by circling your answer or writing your response in the space provided.

C. In the past what has EACC done that has helped the people of Grant Town?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

D. In the past, what has EACC done that has not been helpful for the town?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

11. EACC provides jobs for many families here in Grant Town.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

12. EACC is a major pollutor of streams in the Grant Town area.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

13. EACC in cooperation with the Marion County Soil Conservation District tried to reclaim the area around the slate dump.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

14. Building a dam on the old baseball diamond site was a wise decision on the part of EACC.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

15. EACC has shown interest in town projects.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

16. The cleaning and drying facility at Federal No. 1 Mine is a source of air pollution.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

17. When selling the "Company Houses" EACC asked a fair price.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

18. The slate dumps are a source of pollution.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

19. EACC built the cleaning and drying facility to make the company more competitive.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

20. Local residents were justified in suing EACC over the slate dumps.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The following are a number of general questions and statements. Please reach each question and/or statement carefully and respond to it by circling your answer or writing your comments in the space provided.

E. Do you think the Federal No. 1 Mine will ever close? _____

If yes, when do you think that might happen?

F. What do you think would happen to Grant Town if the Federal No. 1 Mine were closed?

21. How long has the Federal No. 1 Mine been in operation?

0. 30-39 years
1. 40-49 years
2. 50-59 years
3. 60-69 years
4. Over 70 years
9. No opinion

22. How long has the cleaning and drying facility been in operation at the Federal No. 1 Mine?

0. 0-2 years
1. 3-5 years
2. 6-8 years
3. 9-10 years
4. 11-12 years
5. Over 12 years
9. No opinion

23. Are you aware of the slate dumps located East of Grant Town?

0. Very much aware
1. Vaguely aware
2. Not aware
9. No opinion

24. Do you think slate dumps and the area surrounding them should be reclaimed by the coal companies responsible?

0. Definitely not
1. Probably
2. Definitely so
9. No opinion

25. Are you aware that at one time the slate dumps in Grant Town smouldered?

0. Very much aware
1. Vaguely aware
2. Not aware
9. No opinion

26. When did the majority of law suites involving EACC and the people of Grant Town occur?

0. 1940-1949
1. 1950-1959
2. 1960-1969
9. No opinion

27. EACC along with most other companies pump their mine water into holding ponds.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

28. Do you feel we should have stronger environmental laws to regulate slate dumps and the pollution of streams by mining companies?

0. Definitely not
1. Probably
2. Definitely so
9. No opinion

29. Does EACC contribute to town projects, etc.

0. No
1. Yes
9. No opinion

30. Do you feel your children would have greater opportunities if they lived in a different town?

0. No
1. Probably
2. Doubtful
3. Yes
9. No opinion

31. Do you serve on any committee which works to improve life in Grant Town?

0. Never
1. Seldom
2. Sometimes
3. Most of the time
4. All of the time
9. No opinion

32. EACC is concerned about what happens to Grant Town and its residents.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

33. Would you approve of your son or daughter working for a coal company?

0. No
1. Yes
2. Uncertain
9. No opinion

34. Would you be in favor of a National Severance Tax on Coal with the receipts specifically earmarked for environmental reclamation in coal producing areas?

0. No
1. Yes
2. Uncertain
9. No opinion

35. In light of our national energy crisis how do you view the future of the coal industry?

0. Getting much better
1. Getting slightly better
2. Staying about the same
3. Getting worse
9. No opinion

36. In regard to the above question, 35, how do you feel about your own particular job at the mine?

0. More secure
1. Same
2. Less secure
9. No opinion

37. Does your job seem more important now that coal will be used by more electrical companies?

0. Much more important
1. Slightly more important
2. Same
3. Less important
9. No opinion

38. Most of the coal you help produce goes to other states to be used by industry.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

39. When did the Federal No. 1 Mine fire occur?

0. Dec. 26, 1962
1. Dec. 25, 1961
2. Dec. 25, 1962
3. Dec. 24, 1962
9. No opinion

40. Were you working at the Federal No. 1 Mine when it was idled by the fire?

0. No
1. Yes
9. No opinion

41. Did you receive unemployment compensation during the period Federal No. 1 was idled by fire?

0. No
1. Yes
9. No opinion

42. Were you able to find other employment while the Federal No. 1 Mine was idled by the fire?

0. No
1. Yes
9. No opinion

43. When was the Federal No. 1 Mine re-opened for production?

0. April, 1963
1. August, 1962
2. September, 1963
3. September, 1962
9. No opinion

44. How do you think EACC handled the recovery operation of the Federal No. 1 Mine after the fire was extinguished?

0. Very good
1. Good
2. Poor
3. Very poor
9. No opinion

45. Did you know that the use of rock wool by EACC to seal the burning section of the mine was a "first" in the annals of mining?

0. No
1. Yes
9. No opinion

46. Black Lung Benefits have had little affect on miners' lives.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

The following are a number of questions and statements which deal with personal characteristics. Please read each question and/or statement carefully and respond to it by circling your answer or writing your comments in the space provided.

G. The Federal Government has passed numerous safety regulations that have hampered coal production. Are you in favor of such regulations?

47. 0. Male
    1. Female

48. What is your age?

    0. 18-25
    1. 26-30
    2. 31-35
    3. 36-40
    4. 41-45
    5. 46-50
    6. 51-55
    7. 56 and over

49. What is your marital status?

    0. Single
    1. Married
    2. Divorced or separated
    4. Widowed

50. In which of the following income ranges would your total family income be classified?

    0. Under $ 4,000
    1. $ 4,000-8,000
    2. $ 8,000-10,000
    3. $ 10,000-12,000
    4. $ 12,000-16,000
    5. $ 16,000-20,000
    6. $ 20,000 and over

51. What is your level of education?

    0. Less than 4 years
    1. 4-8 years
    2. 9-11 years
    3. High school graduate
    4. Attended college
    5. College graduate
    6. Advanced graduate study
    7. Graduate degree

52. How long have you lived in Grant Town?

    0. 0-3 years
    1. 4-6 years
    2. 7-10 years
    3. 11-15 years
    4. 16-20 years
    5. 21-25 years
    6. 26-30 years
    7. More than 30 years

53. Where did you live before moving to Grant Town?

    0. Rural area
    1. Town of less than 500
    2. Town of 500-1,900
    3. Town of 2,000-9,900
    4. City of 10,000-49,000
    5. City of 50,000-99,900
    6. City of 100,000-499,900
    7. Cith of 500,000 or more

54. How many wage earners are in your household?

    0. None
    1. One
    2. Two
    3. Three
    4. Four
    5. More than four

55. Does anyone in your household work for EACC?

    0. No
    1. Yes
    8. Not applicable

56. If yes, how long have you worked for EACC?

0. 0-1 year
1. 1-5 years
2. 5-10 years
3. 10-15 years
4. 15-20 years
5. 20-30 years
6. 25-30 years
7. More than 30 years

57. Did anyone in your household work for a different coal company before beginning work for EACC?

0. No
1. Yes

58. Did anyone in your household work for EACC prior to their present job?

0. No
1. Yes

59. Is anyone in your household retired?

0. No
1. Yes

60. If you answered yes to question 59, did you retire while working for EACC?

0. No
1. Yes
8. Not applicable

61. If you do not work for EACC, who do you work for?

0. Different coal company
1. Westinghouse
2. Owens Illinois
3. Board of Education
4. Fairmont State College
5. City of Grant Town
6. Self employed
7. Other
8. Not applicable

62. In what capacity are you employed by EACC?

0. As a union employee
1. As a company employee
8. Not applicable

63. Has anyone in your household ever been injured while working for EACC?

0. No
1. Yes

64. Have you ever been "layed-off" from work while with EACC?

0. No
1. Yes
8. Not applicable

65. Do you own your own home?

0. No
1. Yes

66. Was your home ever owned by EACC?

0. No
1. Yes

67. What is your religious affilitation?

0. None
1. Jewish
2. Baptist
3. Methodist
4. Presbyterian
5. Catholic
6. Congregational
7. Other

68. Does anyone in your household receive Black Lung Benefits?

0. No
1. Yes

69. What is your race?

0. Black
1. White
2. American Indian
3. Other

How do you view the present day social and economic conditions of your household as compared to the following periods of time?

70. Present day conditions compared to the conditions of 5 years ago.

0. Much better
1. Slightly better
2. About the same
3. Slightly worse
4. Much worse
8. Not applicable
9. No opinion

71. Present day conditions compared to the conditions of 10 years ago.

0. Much better
1. Slightly better
2. About the same
3. Slightly worse
4. Much worse
8. Not applicable
9. No opinion

72. Present day conditions compared to the conditions of 15 years ago.

0. Much better
1. Slightly better
2. About the same
3. Slighly worse
4. Much worse
8. Not applicable
9. No opinion

73. Present day conditions compared to the conditions of 20 years ago.

0. Much better
1. Slightly better
2. About the same
3. Slightly worse
4. Much worse
8. Not applicable
9. No opinion

74. Present day conditions compared to the conditions of 30 years ago.

0. Much better
1. Slightly better
2. About the same
3. Slightly worse
4. Much worse
8. Not applicable
9. No opinion

75. Present day conditions compared to the conditions of 35 years ago.

0. Much better
1. Slightly better
2. About the same
3. Slightly worse
4. Much worse
8. Not applicable
9. No opinion

APPENDIX B

PROPOSED EDUCATIONAL UNIT ON MINE ACID WATER AND SLAG PILES-SLATE DUMPS AS RELATED TO THE COAL MINING COMMUNITY

CONCEPT: Residents of coal mining communities are affected by mine acid water and slag piles-slate dumps. An important aspect of this concept is developing an awareness of the environmental problems in coal mining communities.

PURPOSE OF UNIT: To show the students/residents the results of mine acid water and slag piles-slate dumps on the environment and possible avenues of action open to anyone who wishes to work for environmental protection.

INTRODUCING THE CONCEPT: Handout a questionnaire to each student/resident asking them to respond to the following:

1. Mine Acid Water
   a. What is mine acid water?
   b. How is it formed?
   c. Does it cause any health problems?
   d. Does it raise the price of your water bill?
   e. Would there be any possible side affects if the company used money to establish a better treatment program?
   f. How does it affect recreation potential in the area?
   g. How can it be treated?

2. Slag Piles-Slate Dumps
   a. What is found in them?
   b. Are they harmful to the environment?
   c. Are they a safe place for children to play?
   d. Are they a health hazard?
   e. Do they contribute to the pollution of the local stream?

DEVELOPING THE CONCEPT:

1. Discuss the response to the questionnaire.

2. What were the streams in the area like years ago?
   a. Better (why)?
   b. Worse (why)?

3. What was the slag pile-slate dump like years ago?
   a. Better (why)?
   b. Worse (why)?

4. Have various articles on mine acid water and slag piles-slate dumps for the students/residents to read, such as:
   a. "Extent of Acid Mine Pollution in the United States Affecting Fish and Wildlife", Edward C. Kinney.

b. "Utilization of Coal Mine Refuse," Frank Doyle and C. Y. Chen.
c. "Checking the Impact of Mining," United States Department of Agriculture.
d. "Soil Development on Mine Spoil," West Virginia University - Agriculture Experiment Station.

FIXING THE CONCEPT:

1. Mine Acid Water
   a. Conduct a field trip to the local stream. Have an on-site discussion of the observed affects of mine drainage.
   b. Have the students/residents collect water samples from the polluted sites as well as from sites above and below the source of pollution.
   c. Return to the classroom and perform various tests to determine water quality, examples: pH, hardness, copper, sulfur, hardness and iron. Easy methods are recommended such as those designed by the Hach Chemical Company.
   d. Compare results of the various sites and try to determine the extent of the pollution.
   e. Set up different programs for informing the rest of the students/residents of your results.
   f. Try to establish a monitoring system for water quality which would involve the local company.

2. Slag Pile-Slate Dump
   a. Plan a field trip to a slag pile-slate dump and observe the surrounding area for environmental damage.
   b. If possible, take a field trip to a slag pile-slate dump that has been reclaimed.
   c. Compare the two sites and discuss possible ways of making slag piles-slate dumps more aesthetically pleasing and less of an environmental problem.
   d. If necessary, discuss possible ways of preventing children from playing on or near dump sites.

MATERIALS: Previously listed articles or similar articles that are available, Hack Kit for water analysis, slides or pictures that might be appropriate.

REFERENCES:

1. "Control of Mine Drainage from Coal Mine Mineral Wastes", EPA-R273230.

2. "Reclamation of Coal Mine Wastes and Strip Spoil With Fly Ash", John P. Capp and Lester M. Adams.

3. "Disposing of the Coal Waste Disposal Problem", Appalachian Research and Defense Fund.

4. "Neutralization of High Ferric Iron Acid Mine Drainage", Roger C. Wilmoth and Ronald D. Hill.

5. "Treatment of Acid Mine Drainage", Federal Water Quality Administration - 14010DEE.

6. "Water Quality Criteria, 1972", EPA-R373033.

7. "Acid Strip Mine Lake Recovery", Darrell King, et al.

8. "Soil Development on Mine Spoil", West Virginia University, Bulletin 604T.