To the Graduate Council:

I am submitting herewith a thesis written by Bethany Margaret Morris entitled “Re-envisioning Reclamation: A Strip Mine’s Biography.” I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Landscape Architecture, with a major in Landscape Architecture.

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RE-ENVISIONING RECLAMATION:

A STRIP MINE'S BIOGRAPHY

A Thesis Presented for the

Masters of Landscape Architecture

Degree

The University of Tennessee, Knoxville

Bethany Margaret Morris

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Thank you to my all of my professors, both graduate and undergraduate. You have brought me to the path I am on today and given me the tools to follow it. There are too many for a neat list, but I am indebted to each of you all the same.

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To my family, especially my husband Chris, thank you for your unending support.

“In sum, landscape is a historic document that tells a story – nay multiple stories – about the people who created the landscape and the cultural context in which that landscape was embedded.”

- *Pierce Lewis*

ABSTRACT

This proposal is a study of coal-mining in Southern West Virginia; its impact on the landscape; local economy and culture; and presents an alternative land use to address the loss of a major industry in a rural county.

The study began with understanding the process of mining; from the actual extraction to the end product, electricity. Looking at the past provided a historical metric for the Coal Company - Mine Worker dynamic. Case studies created benchmarks for both appreciating and improving upon the issue. Constructing a timeline that tracked political, social and natural occurrences gave scope to the interrelationships of government, industry and the working class. Current reclamation practices take into account the physical changes made to the land, but not the void the loss of industry will create in the local economy. Recognizing coal mining as an important part of Appalachian culture means reclamation is more than restructuring the land when a mine is closed.

Trees are planted as part of typical mine reclamation. The methods developed by the Appalachian Regional Reforestation Initiative can produce a forest. A forest can host wildlife and forest can support a community.

Coal mining reclamation has been studied by engineers, ecologists and political bodies more so than by the design community: architects, landscape architects and artists. However, the designer's training for not just research and analysis but synthesis of ideas and collaboration between disciplines that could provide the next step for a changing industry.

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PREFACE

Surface mining is a powerful industry in West Virginia. However, a single mine cannot exist indefinitely. The coal reserve is eventually exhausted and the mine is closed. Also the character of the mining company has changed. The Coal Company once had more influence on the culture and quality of life than the state government. In the absence of the Company, the citizens need to find new economic means and a new identity.

INTRODUCTION

The extraction of raw materials and energy generation are part of modern Man's existence. The burning of coal contributes fifty-seven percent of the nation's electric power (WV Office of Miner Health and Safety). Mining is prevalent throughout the Appalachian Region with heavy mining activity in Kentucky, Pennsylvania, and West Virginia. However, the mountain state, West Virginia, is most synonymous with mining in America. The only state entirely within the Appalachian Region, coal is found in fifty-three of West Virginia's fifty-five counties, and the state has four percent of the world's coal reserve (West Virginia Division of Natural Resources). It is a unique milieu of personal pride in performing a difficult, often dangerous job, self-reliance, mistrust of authority and love of homeplace. The coal miner is caught between the need to earn a wage to provide for his family, and the loyalty he feels for his native land.

Technology and methodologies for coal mining have changed in the last century, with some of the most radical coming in the past decade. Mining operations now require dozens instead of hundreds of laborers. Long standing reclamation practices are being re-evaluated and re-written. Nature, man and technology can be brought closer to harmony and the preservation of all.

Pressure and Time

Land measures time in millennia instead of years. What was yesterday the bottom of the sea is today a mountain peak. In the history of the Earth, man occupies the last 0.9%. In elementary school we are taught that plants and animals die and decay. Their bodies form fossil fuels; which we burn to 'keep the lights on' ('Coal Keeps the Lights On'). The stratigraphy between that moment and now are co-opted by the present's needs.

Six hundred eighty million years ago, the land that would become the eastern United States was a quiet continental shelf. Four hundred ninety-five million years ago, a neighboring oceanic plate, the Iapetus, collided with, and began sinking beneath, the North American continental crust. With the birth of this new subduction zone, the early Appalachians were born (Appalachian Mountains).

Surveyed Lines

The Appalachia Region, as defined by the U.S. federal government's Appalachian Regional Commission (ARC), is a section of four hundred and twenty counties from New York State to Alabama. The boundary was drawn by politicians and based more on economy than geographic or cultural similarities. The original ARC included three hundred and sixty counties. The broadening of the area obscures what 'Appalachia' is. With few constants along the ARC's 205,000 square miles, the public idea of 'Appalachia' becomes generic and placeless. The political boundary serves only as a means for elected officials to bring federal funds to their constituencies.

Geographers divide the land into four providences; Blue Ridge, Ridge and Valley, Allegheny Plateau and Cumberland Plateau (Rehder).

Regardless of who surveyed the boundary, West Virginia is the only state completely within the Appalachian Region. During the Civil War, West Virginia, the thirty-fifth state, was ratified into the Union. It is 24,244 square miles with 1,808,344 people and a population density at 75.1 people per square mile ('West Virginia'). West Virginia is a rural state. The largest city, Charleston, has 51,176 residents. Parkersburg and Huntington have 40,000 and 30,000 residents respectively. By comparison, Tennessee is 42,169 square miles, a population of 5,689,283, and population density of 138 people per square mile ('Tennessee'). West Virginia's total land area is 15,415,400 acres. Of this, approximately 77.9% (12,001,500 acres) is forestland and 22.1% (3,413,900 acres) is non-forestland including cropland, pasture, water and other. The total timberland is 11,791,700 acres. Only 12,400 acres classified as urban (Jenkins).

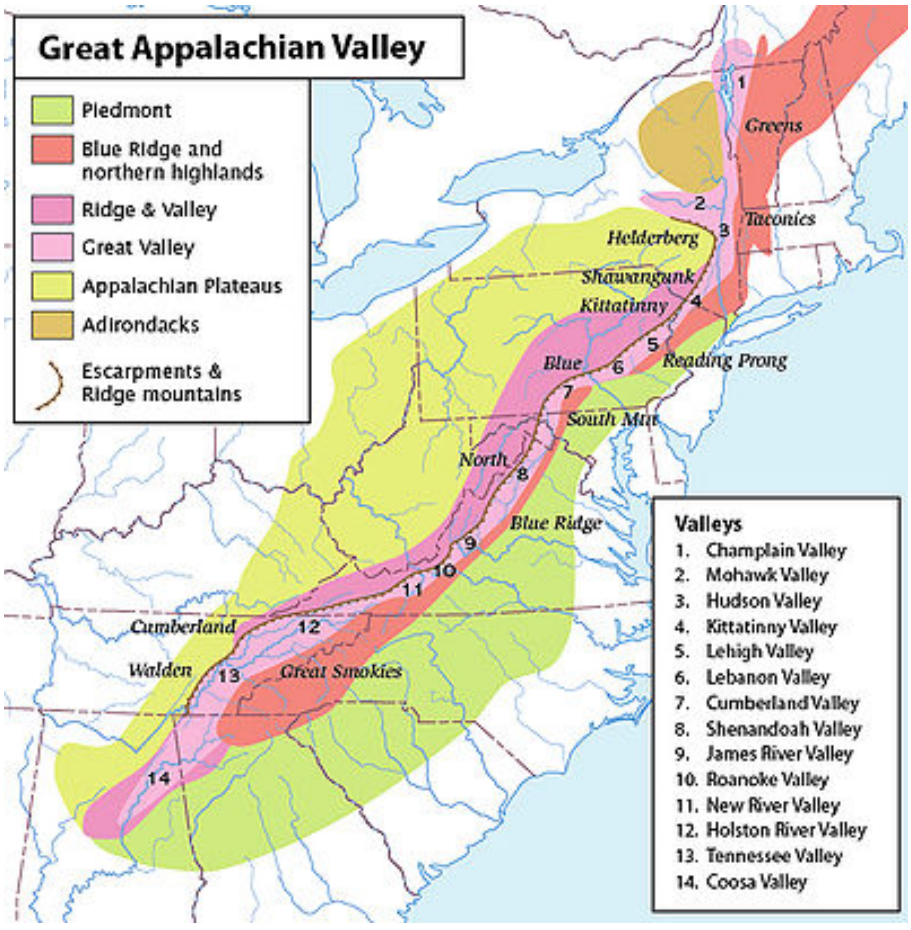


Figure 1: Appalachian Geological Providence Map
Source: Map USGS 2006

The state's topography is the cause for the territory's prevailing isolation. Only two million acres in the state have a slope of less than 12%. Forty percent of the state's hillsides slope at 24-40% (2001). Local residents boast that if the state were flattened it would be the size of Texas and that the valleys are so steep sunshine must be piped in. Early settlers chose to travel south through the open valleys of the Ridge and Valley Provence. Once that land was occupied, later colonists turned west and then north through the Cumberland Gap. The late-coming Scotch-Irish immigrants ventured into the Allegheny Plateau to clear out homesteads. After generations of isolation, the self-reliant woodsmen and subsistence farmers no longer identified with their European motherlands. On the 1910 census a majority of Appalachia residents identified themselves simply as 'American' (Rehder).

From its inception, the new state's leaders expected West Virginia to become an economic giant. Its proximity to the booming industrial cities of New England and its natural resources were seen as keys to establishing the infant state. However, the statesmen's ideal aspirations would not be realized. Fortunes were made, but a majority of the wealth left the state (Burns).

Before there was mining, the steep hillsides were timbered. Reconstruction, the ten years of rebuilding after the Civil War, provided the market for saw-milled lumber and the railroad provided the means. By 1842, the nation's first commercial railroad, the Baltimore and Ohio (B&O) had reached Cumberland, Kentucky effectively linking the source of raw materials to the industrial furnaces of the East (Buckley).

After the trees fell, mining began.

A Different CCC

In 1917, the Consolidated Coal Company operated 107 mines and controlled 303,000 acres of coal and timberlands in four states. By 1927, Consolidated was the largest commercial producer of bituminous coal in the United States. In the same year, 13 million tons of coal were mined from the company's principal properties, Elkhorn and Miller Creek, Division of Kentucky; Fairmont, Division of West Virginia; and George Creek, Division of Maryland (Burns).

The Appalachian mineral fields fueled America on its rise to industrial prominence, but the mechanisms reduced the region to economic colonies owned and governed for the profit of eastern banks, absentee owners, corporations and tax-exempt foundations (Buckley).

In *Bring Down the Mountains,* southern West Virginia was defined as a peripheral region, meaning it has a large spacial area but smaller population and smaller economic, political power. Core regions, like the eastern seaboard cities, have limited land areas and larger populations and a concentration of power (Burns).

For West Virginia, the shift in politics favoring industry over the individual occurred in 1889. The Supreme Court of Appeals granted preferential treatment to industry on the grounds of serving the public good. In the century since, West Virginia has become a coal-centered power. During the 1930's, at the time of peak manual labor demands, seventy-percent of the state's population lived in coal-company built and regulated housing (Burns).

The companies prided themselves on bringing modern infrastructure such as roads, plumbing, stores and schools to the remote valleys. However, housing was used as a control. If a worker threatened to strike or complained about working conditions, he and his family were evicted from the town (Lee).

There were four major mine wars in West Virginia between the coal companies and the miners. It is not for this narrative to elaborate on each event or declare a victor, but simply recognize their place on the continuum (Lee).

In April 1912, 7,500 miners at Paint Creek and Cabin Creek left the mine shafts in the first major labor strike in the state's history. The number of workers and their families of approximately 35,000 people living in squalid mining camps along the two creeks. Fifty men lost their lives to violence, while uncounted women and children perished due to malnutrition. Adjucent General Charles D. Elliot, Commander of the State's Military Forces sent to end the strike said: 'God is everywhere on land and sea, but He has not visited Paint Creek and Cabin Creek recently' (Lee).

The 'Armed March' in September 1921 was a revolt against county clerk Don Chafin. Chafin was the self-made boss of what he dubbed the 'Kingdom of Logan'. Federal troops were called to subdue the mob (Lee).

The 'Matewan Massacre' occurred on May 19, 1922, when twelve guards went to carry out eviction orders on strike leaders. A fire fight broke out on the main village street. Seven guards, two miners, the mayor and two others were killed (Lee).

The last conflict, in 1923, was in response to a series of tragic mine explosions in Barbour County. The fatal acts were deliberately arranged by the coal company and once again the miners responded with their own violence (Lee).

In 1933, the United States federal government unionized all coal miners in the nation under a Special Act of Congress to put an end to these bloody uprisings (Lee).

Machines for Men

Yet it was more than unionization that ended the feuds between the miner and the company. It was the machine.

Company towns ceased to exist in the 1950's, leaving scores of unincorporated little communities. With surface mining, companies no longer needed extensive work forces. Instead they needed the land where the people lived. Today, with a twenty story dragline (see figure 2), nine men can bring down a mountain (Burns).



Figure 2: Dragline
Source: ESCO Corporation 18 November 2010 <http://www.escocorp.com/markets/mining/draglines.html>

There is an inverse correlation between the number of mine workers and tons of coal extracted (see figure 3).

Production increases as the number of the miners required decreases.

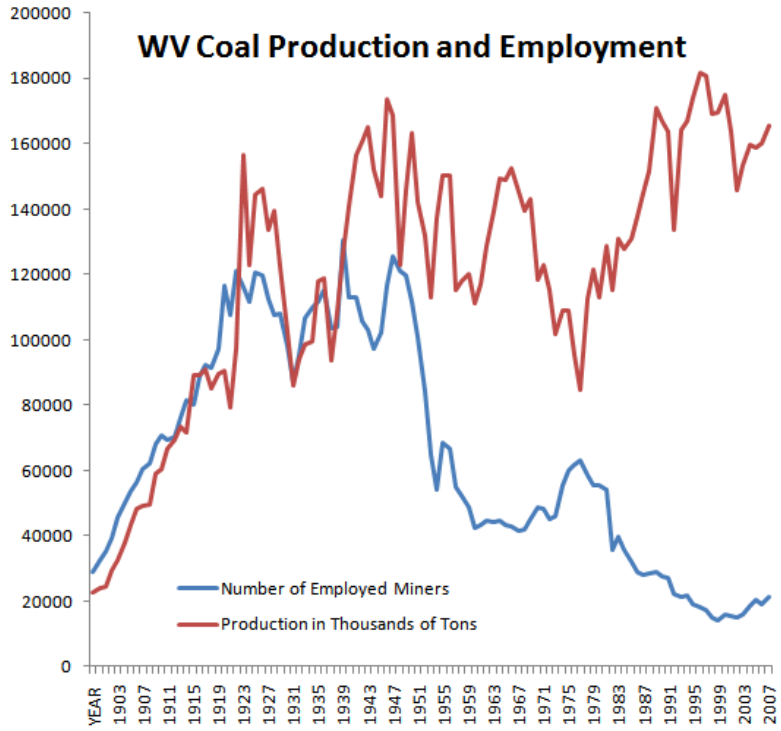


Figure 3: Inverse Correlation between WV Coal Production and Employment from 1903 to 2007
Source: WV Office of Miner Health and Safety Training

Of the two types of surface mining used in this area: strip mining (see figure 4) and mountain top removal (MTR), MTR is the more ecologically devastating (see figure 5).



Figure 4: Active Strip Mine
Source: CAT heavy equipment. 10 October 2010 <http://www.cat.com/mining>

Where strip mining follows the existing contours and scores the earth into a series of steps, MTR is a complete alteration of the landscape condensed into a neat seven step process (Burns). First the trees are timbered. The logs are either sold to a lumber company or a lumber company was contracted in the beginning to clear cut. Next, the top soil is removed and stored or used on another site. The site is pre-stripped to make the foundation for the dragline. The sub-soil and rock known as the overburden, are removed, revealing the coal seam. The coal is then blasted and hauled away. The substrate below, the underburden is compacted by heavy machinery. Excess underburden and overburden is moved into valley fills (Curry).



Figure 5: Mountain Top Removal and Dragline
Source: Jeremy Elton 22 October 2010. <http://ILOVEMOUNTAINS.ORG>

Industry and technology are moving toward renewable energy sources such as wind and solar. Sustainability is a popular topic in every discipline. In 1987, the United Nation's defined sustainability: 'Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' An ironic consequence of the 1990 Clean Air Act was the increase in demand for bituminous coal (see figures 6 and 7). The increased demand aided in popularizing surface mining as a quicker, cheaper way to mine coal. The low-sulfur coal was an inexpensive, quick way to reduce air emissions (Burns). Utility companies like the Tennessee Valley Authority are pursuing renewable sources, but the United States infrastructure was built on burning fossil fuel (Green Power Switch). According to the American Coal Foundation, nine out of every ten tons of coal mined in the United States today are used to generate electricity, and more than half of the electricity used in this country is coal-generated. A frank assessment suggests that while alternative energy sources are a probable future, coal mining is the inescapable present.

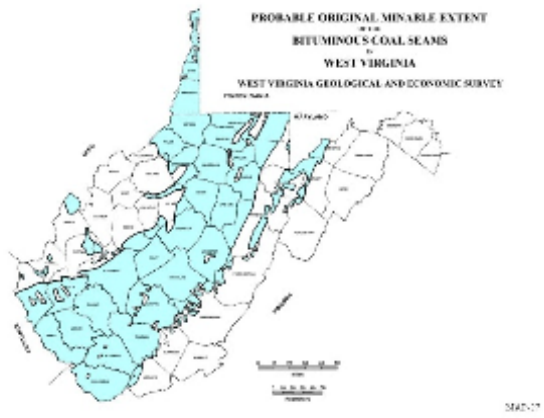


Figure 6: Probable Original Minable Extent of Bituminous Coal Seams
Source: WV Geological Survey

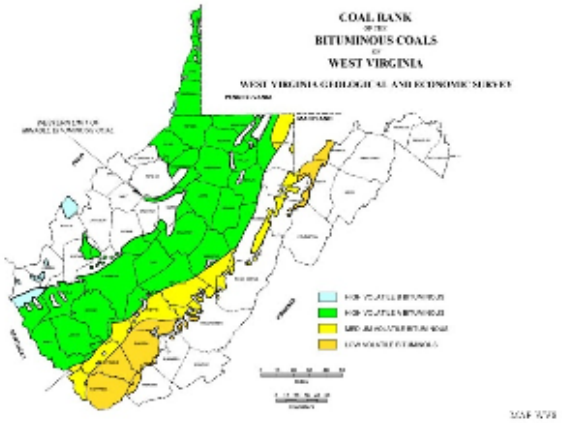


Figure 7: Coal Rank of Bituminous Coals
Source: WV Geological Survey

RESTORATION/RECLAMATION

Restoration

Noun. *Putting back to a former position or dignity.*

Reclamation

Noun. *The conversion of desert, marsh or other waste land into land suitable for cultivation*

The process of industry of deriving usable materials for waste, by products

Neither is an ecological term. The former, restoration comes to the forebrain as an approach for exhausted coalfields. The laws, ideally, are written to require the coal company to restore the land to its previous condition. Yet, the natural environment is neither fixed nor pristine. The surrounding environment did not pause for mining activity. Restoration implies returning to a certain point, to recreate a chosen situation and not progress. Reclamation is industrial in origin and application. The West Virginia Department of Environmental Protection viewed the state's ruined hillsides through its lens. However, the Society for Ecological Restoration defines 'ecological restoration': as the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. An ecosystem has recovered - and is restored - when it contains sufficient biotic and abiotic resources to continue its development without further assistance or subsidy.

West Virginia was the first state to pass surface mining regulations in 1939, but this was at the behest of deep mine lobbyists instead of conservationlists. The Surface Mining Control and Reclamation Act (SMCRA) of 1977 is the primary federal law that regulates the environmental effects of coal mining in the United States. The SMCRA created two programs: one for regulating active coal mines, and one to reclaim abandoned mine lands. After 1977, the Coal Company was now required to pay a bond before mining, which is returned five years after the successful completion of reclamation. Bankrupt or foreclosed mines were taken over by the state government for special reclamation (State of West Virginia).

The SMCRA requires leaving flat or gently rolling land that the post-mining use could be industrial, commercial, agricultural, residential or a public facility; that the goal be equal or better economic or public use than before mining; and that assurances be made that the post-mining use will be compatible with adjacent land uses. West Virginia DEP regulations state that commercial forestry and forestry may be approved as post-mining land uses on Approximate Original Contour (AOC) variance permits or portions, but one or the other has to be established on all portions of the permit area. A planting plan and a long term forest management plan have to be developed by a registered professional forester. These become a part of the surface mine permit application submitted to WV DEP (Goroncy).

The WV DEP Office of Surface Mining could easily enforce the technical regulations because physical quantities of plants, mine drainage and minerals could be counted and measured, but it is difficult to hold mining companies to the written narrative portion of the regulations. Unfortunately, the subjective language of the narrative holds the most binding regulations over the coal company to restore the place it mined (Curry).

A popular method of reclamation, written by engineers rather than biologists, consisted of grading the subsoil to compaction and planting fescue and black locusts (*Robinia pseudoacacia)*. The plant material was fast emerging and could survive six to eight years, long enough for release of the company's bond. The state's regulations require Coal Companies re-grade the site to the 'approximate original contour' (see figure 8). The results are not as natural as the regulation implies. Backfills are graded in flat sloping planes instead of gentle curves. The landscape is transformed into a geometric interpretation of the original (2002).

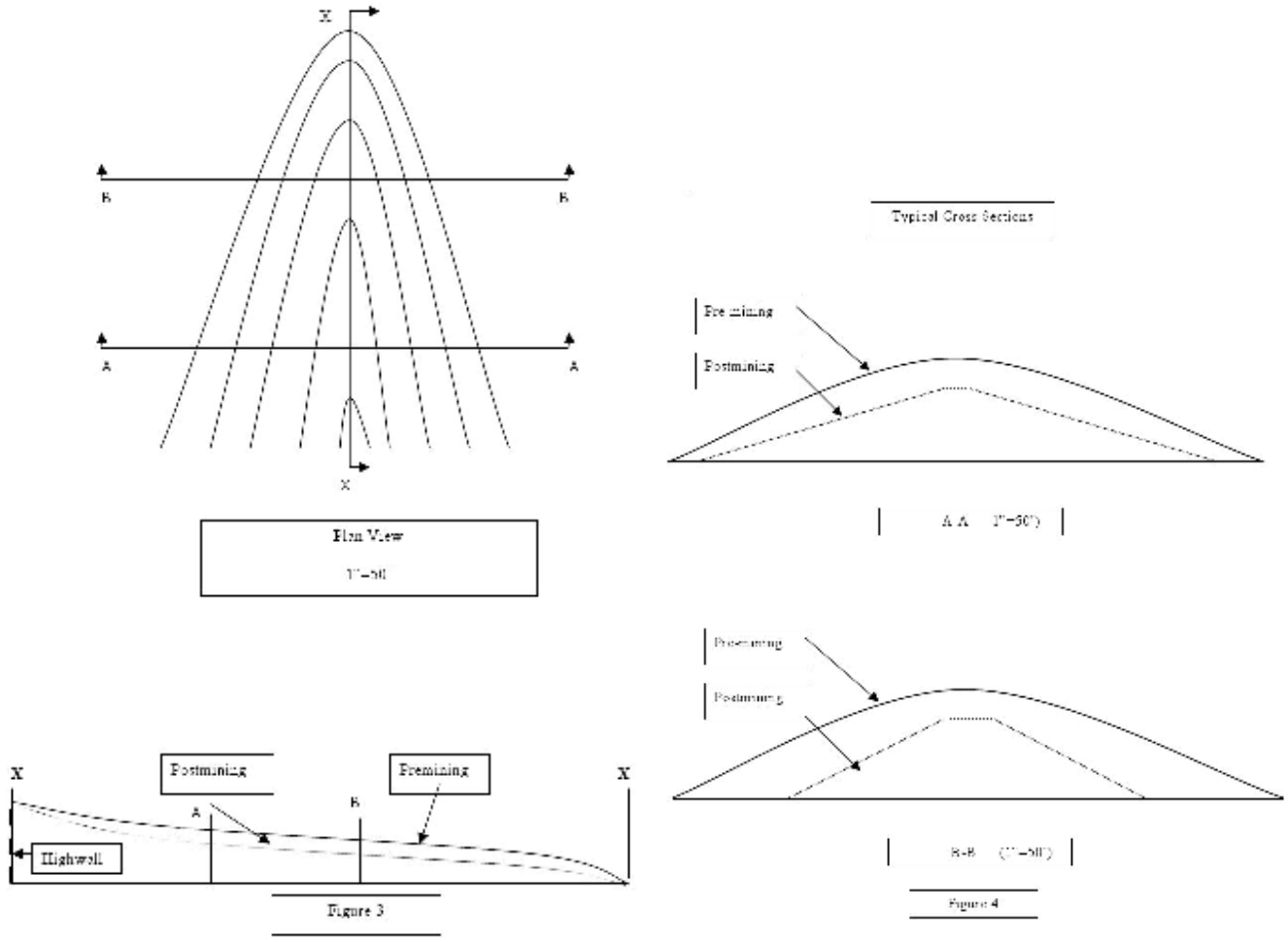


Figure 8: Approximate Original Contour Guidelines
Source: Virginia Department of Mines, Minerals and Energy Guidance Memorandum. 22 March 2002

The decision to grade the site so severely was based on the need to control erosion (Curry). Washed out gulfs in the hillside and muddy streams are unsightly and attract the public's attention (Rehder).

In the past year, a state wide shift has occurred in the DEP. Instead of lone inspectors being responsible for a certain county's mining activity, the DEP has organized teams of biologists to better understand what was occurring before, during and after mining. The teams would look beyond mitigation in which a 'forest' was a simply considered 'forest' without regard to whether it was a stand of pines, or an oak-hickory plant community.

For example, the teams would study the Indiana Bat, its habitat and impact on insect swarms. The presence of the bat could limit or halt mine activity (State of West Virginia).

The language 'Reclamation' is still off-point. Ecology does not exist in a vacuum. After an ecological disturbance (i.e. fire, volcanic eruption) natural succession begins. The pioneer communities, typically grasses and forbs, have low gross primary productivity - the production of organic components from atmospheric carbon dioxide, or simply the generation of biomass. The intermediate communities have high gross primary productivity due to increased photosynthesis and larger individual organism size. The climax community is a biological community of plants and animals at the mature stage of succession. It is also the most exclusive. The greatest diversity of species can be seen in the intermediate communities with the highest gross primary production rates (Carey).

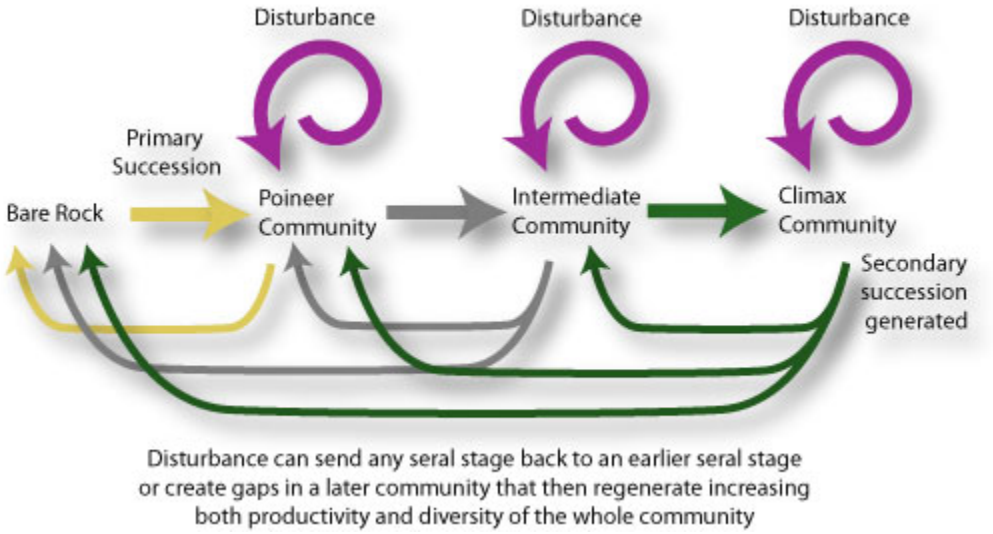


Figure 9: Disturbance Ecology
Source: 'Effect of Community of Assembly and Primary Succession on Species-Area Relationship in Disturbed Systems' (Carey)

In the winter of 2000, I witnessed the transformation of an old-growth forest the spring after an ice storm. The storm tore holes in the canopy and let sunlight reach the forest duff below. New growth emerged in splashes of

yellow and green. The tender buds fed wildlife and provided cover for prey. It is the dynamic, not the stable, community that is the most diverse.

The Red County

The Appalachian Regional Commission (ARC) defines itself as a 'federal-state partnership that works for sustainable community and economic development in Appalachia'.[2] The ARC works within 420 counties, measuring over 205,000 square miles. Forty-two percent of the Region's population is rural, compared to twenty percent of the nation's population. The Commission compiles reports on topics from economic impact studies, to natural disasters, mental health and substance abuse. The ARC funds projects that address four goals identified in the Commission's strategic plan:

1. Increase job opportunities and per capita income in Appalachia to reach parity with the nation.
2. Strengthen the capacity of the people of Appalachia to compete in the global economy.
3. Develop and improve Appalachian infrastructure to make the Region economically competitive.
4. Build the Appalachian Development Highway system to reduce Appalachian isolation.

The ARC's Economic Status Classification System has five levels: Distressed, At-Risk, Transitional, Competitive and Attainment. A 'Distressed' county, color-coded red, is the most economically depressed and ranks in the worst 10% of the nation's counties (Appalachian Regional Commission).

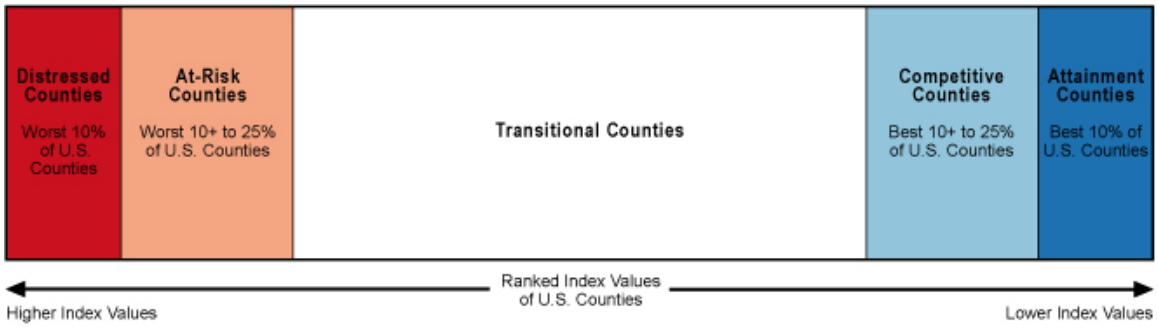


Figure 10: Distressed Counties Ranking System
Source: Appalachian Regional Commission

Results presented (in figure 11) by the ARC typically focus on poverty rates, population change, per capita income, economic status, high school completion rates and unemployment. Those factors help determine which projects are funded and where.

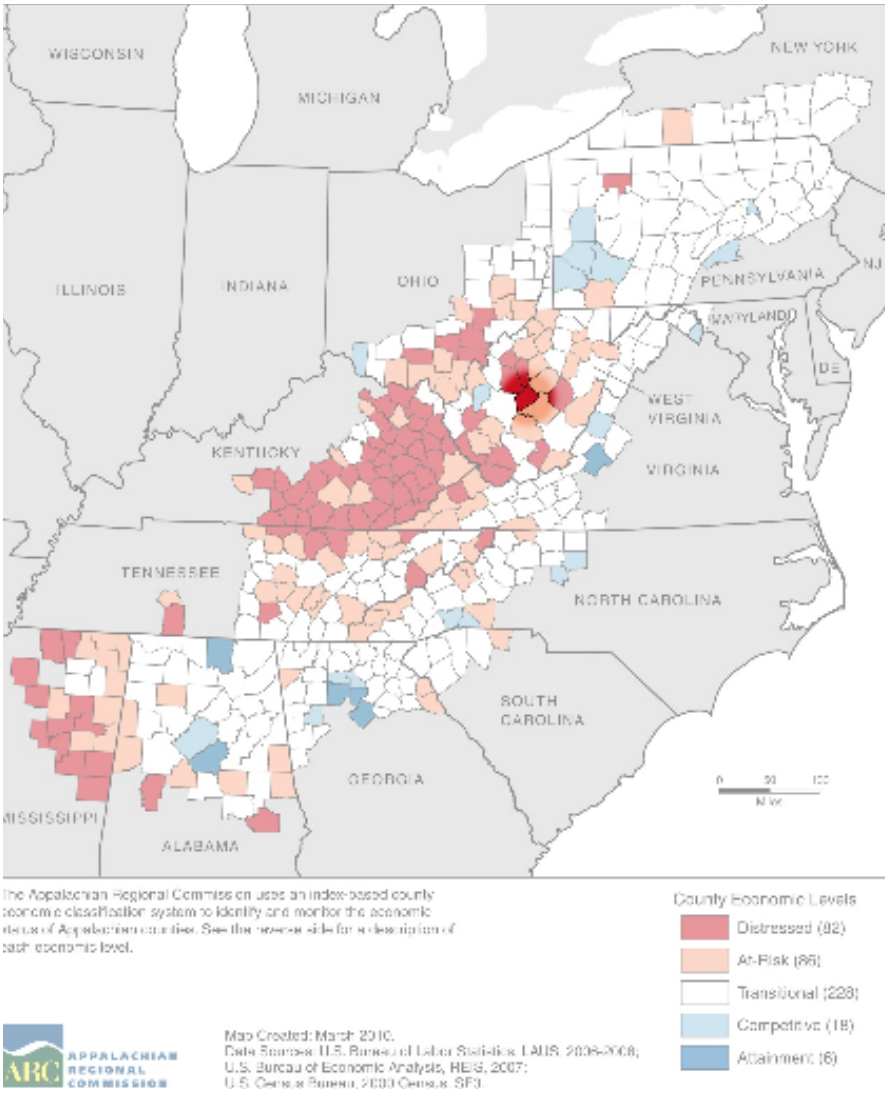


Figure 11: County Economic Status in Appalachia, Fiscal Year 2011
Source: Appalachian Regional Commission

The thesis study area is sited in Clay County, West Virginia. It is a 'Distressed' county with no population change in the past ten years. The county has a relatively fair high school completion rate but also a high unemployment rate.

Its population is 10,330 with a population density of 31 people per square mile. There are 4,020 households and 2,942 families. Males have a median income of $30,161/year versus $16,642/year for females. The per capita

income for the county is $12,021 with 27% of the population below the poverty line. Of the households reported 33.50% have children under the age of 18 living with them, 58.20% were married couples living together and only 10.40% had a female householder with no husband present. 11.40% had someone living alone who was 65 years of age or older. The average household size was 2.55 and the average family size was 3.01 (2010 Census Data).

In a 1967 ARC report of Appalachian social traits, Thomas Ford identified: individualism, self-reliance, traditionalism, fatalism and religious fundamentalism. Professor of History at University of Kentucky, Ron Eller compared social traits of traditional Appalachian communities and modern American communities (see table 1).

Table 1: Eller's Identification of Social Traits

Traditional	Modern
Family and Kin	Individual
Fatalism (Faith)	Rational (Science)
Person Oriented	Object Oriented
Time as Cyclical	Time as Linear
Soft Technology	High Technology
Stability	Growth
Continuity	Change
Local Politics	National Politics
Internal	External

Source: *Appalachian Folkways*. John Rehder

Eller's comparison went beyond economics to deeper issues of faith and family and tried to determine what type of individuals such a culture would produce (Rehder).

Field and Stream

Clay County was formed in 1858 from Braxton, Kanawha and Nicholas Counties. The county area is 346 square miles (Appalachian Regional Commission). Clay County is in two major land resource areas - the Central Allegheny Plateau and the Cumberland Plateau and Mountains. The Central Allegheny Plateau Major Land Resource Area is in the northern portion of Clay County. It is characterized by “bench-break” topography, or moderately steep ridgetops and very steep side slopes that are broken by narrow bench areas. The flood plains are narrow but widen out along Elk River and major streams. The Cumberland Plateau and Mountains Major Land Resource Area is in the southern portion of Clay County (see figure 12). It is dominated by very steep, rugged side slopes that are broken by strongly sloping to steep ridgetops, and nearly level bottoms along streams (Jenkins).

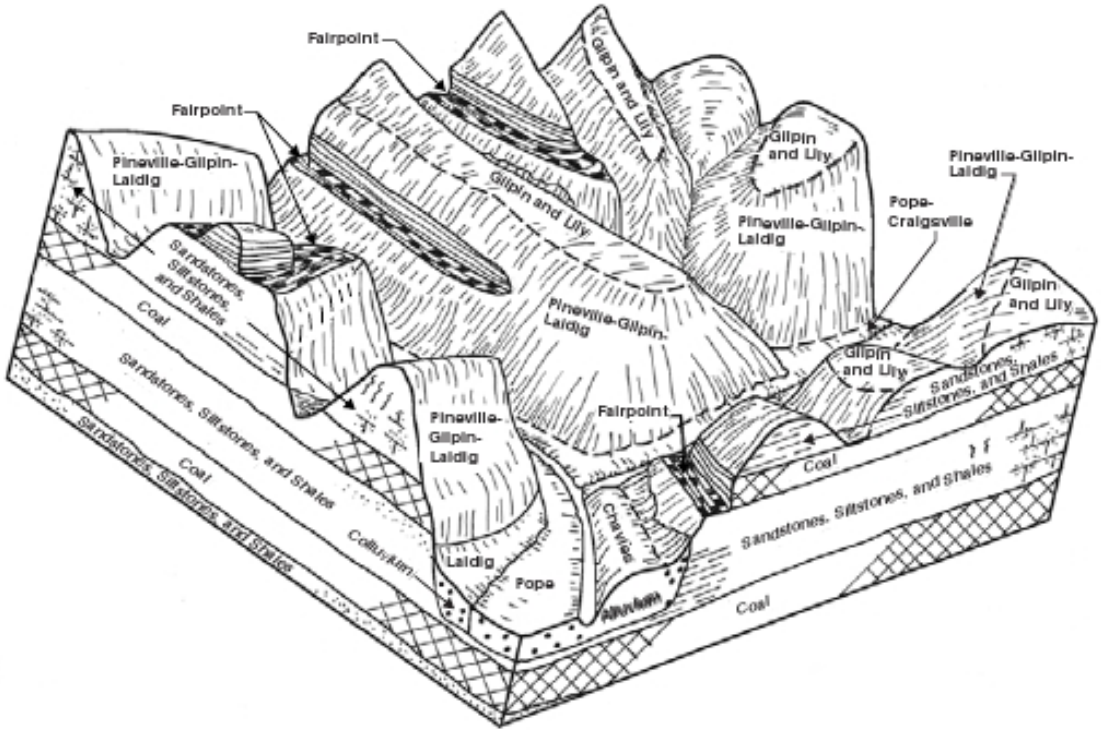


Figure12: The Typical Pattern of Soils and Parent Material in the Southern Region of Clay County, WV
Source: USDA County Soil Survey

The transportation needs of Clay County are served by Interstate 79; State Routes 4, 16, and 36; and numerous county routes. A railroad line runs along the Elk River. The major enterprises in the county are timber and sawmill operations, coal mining, gas and oil production, and farming. The main agricultural enterprises are raising beef cattle, sheep, and hogs, in conjunction with the production of hay and pasture. Some small acreages are planted to corn or used as orchards or vineyards. Most farms are operated on a part-time basis (Jenkins).

Wildlife habitat in Clay County is best suited to the needs of woodland wildlife species since ninety percent of the area is forested. Woodland species include: whitetail deer, wild turkey, and gray and fox squirrels. Ruffed grouse populations are generally low throughout the county; however, areas that are in the early stages of succession or re-growth areas from timber harvests typically provide habitat for larger populations of grouse. The population of black bear is significant and increasing. The population of openland wildlife species, such as bobwhite quail, dove, and meadowlark, is low because the acreage of cultivated farmland is limited. Cottontail rabbits inhabit brushy areas and border areas between woodland and open fields. The populations of fox, muskrat, skunks, and opossums are large, as are those of groundhogs, crows, small mammals, and songbirds. The beaver population is growing, and river otters have been reintroduced to the Elk River valley. Water birds, such as the great blue heron, sandpipers, and kingfishers, can be found along streams and waterways throughout the county (Jenkins).

Local rivers, streams, and ponds support various species of warm-water fish. Common game species include smallmouth bass, largemouth bass, channel catfish, crappie, muskie, and assorted sunfish. Trout have been stocked in several streams in the county. Most streams also support numerous nongame species (Jenkins).

Narrowing the Scope



Figure 13:Billboard seen from Interstate 79
Source: 19 October 2010. politicalclimate.wordpress.com

On December 8, 2009, Consol Energy laid-off 500 employees from its Fola Coal Complex. The Fola Coal Complex is a 9,182.7 acre active strip mine on the Clay-Nicholas County Line. The company cited a lawsuit brought on by environmental activists for shutting down mine production, and therefore the lay-offs (WV Office of Miner Health and Safety).

The miner is placed in a difficult position. Billboards on the interstate proclaim 'Clean Carbon-Neutral Coal'. All male members of entire families work for the Coal Company. Facebook causes like 'Coal Keeps the Lights On' have 49,900 followers. He is torn between employment to support his family or being an advocate for his homeland.

A year later the surface mine is active again.

SITE

Permit number S2012-98 is a 385 acre surface mine in the Fola Coal Complex. Established deciduous forest currently exists in the proposed permit area as well as on the surrounding adjacent areas. The hills and valleys are covered by mixed deciduous forest dominated by oaks (*Quercs* spp), hickories (*Carya* spp.), and maples (*Acer* spp.) of several species. Yellow poplar (*Liriodendron tulipiera)* is common in more protected areas, while pines (*Pinus* spp.) and other conifers are common along the ridge crests. Understory species include may apple (*Podophyllum peltatum*), trillium (*Trillium* spp.), and ferns.

The land's current capability is limited due to the steepness of the ground, shallow depth to bedrock, low natural fertility, and stoniness of the existing soils. In general, the soils within the permit area are unsuitable for agriculture with only the small areas near the foot of slopes being suited for pasture. Urban development is also not considered a viable land use. The land's capability after mining is therefore restricted to forestry and/or wildlife habitat. The ground slopes within the permit areas will be returned to approximate original contour thus restricting high-level management required of a Commercial Woodland (Fola Coal Complex).

Historic Land Use

The following images are from Google Earth 2010.

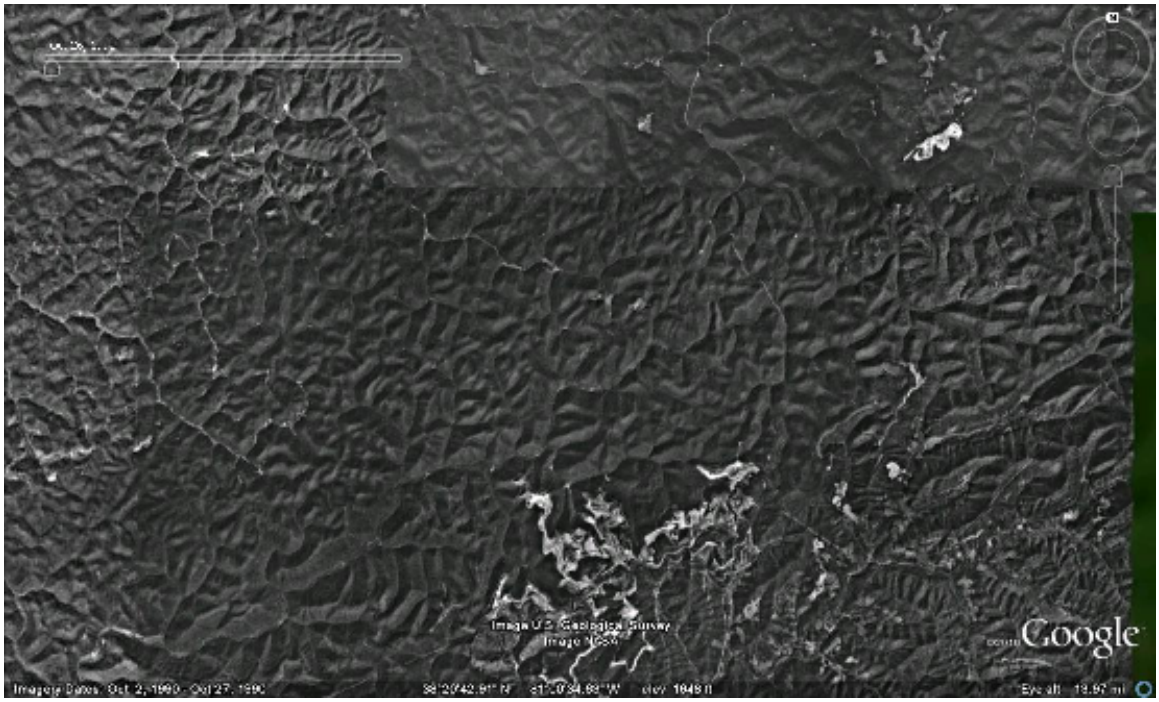


Figure 14: Satellite Image October 1990
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 1990. March 2, 2011.

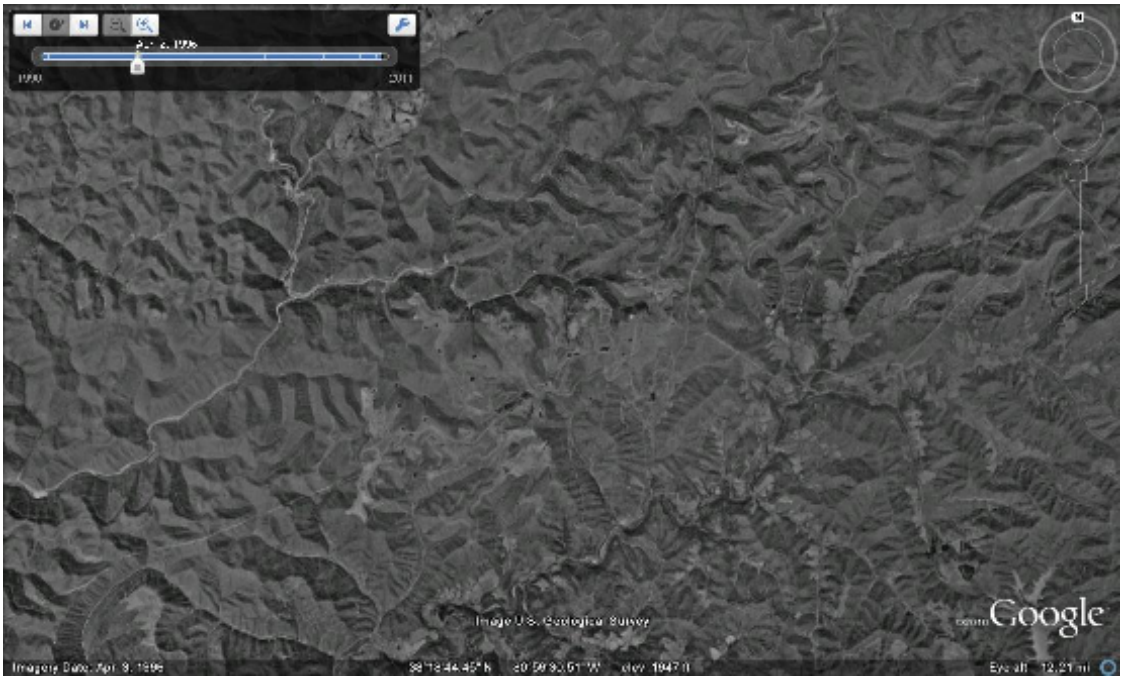


Figure 15: Satellite Image October 1996
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 1996. March 2, 2011

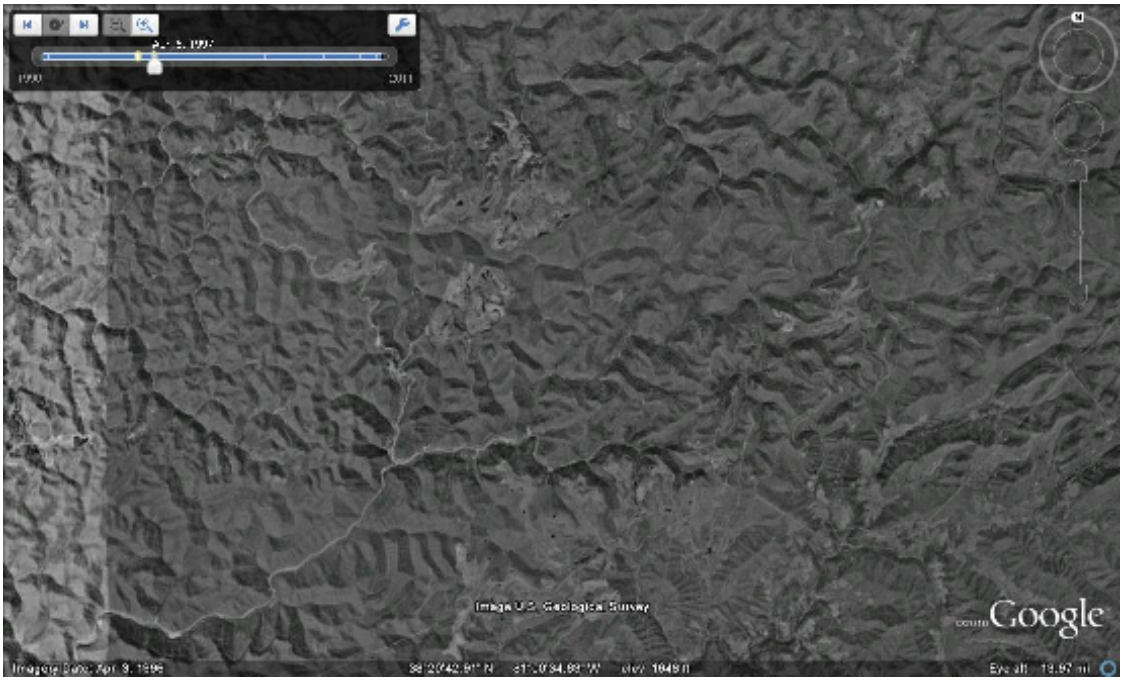


Figure 16: Satellite Image April 1997
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. April 1997. March 2, 2011



Figure 17: Satellite Image December 2003
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. December 2003. March 2, 2011



Figure 18: Satellite Image April 2007
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. April 2007. March 2, 2011

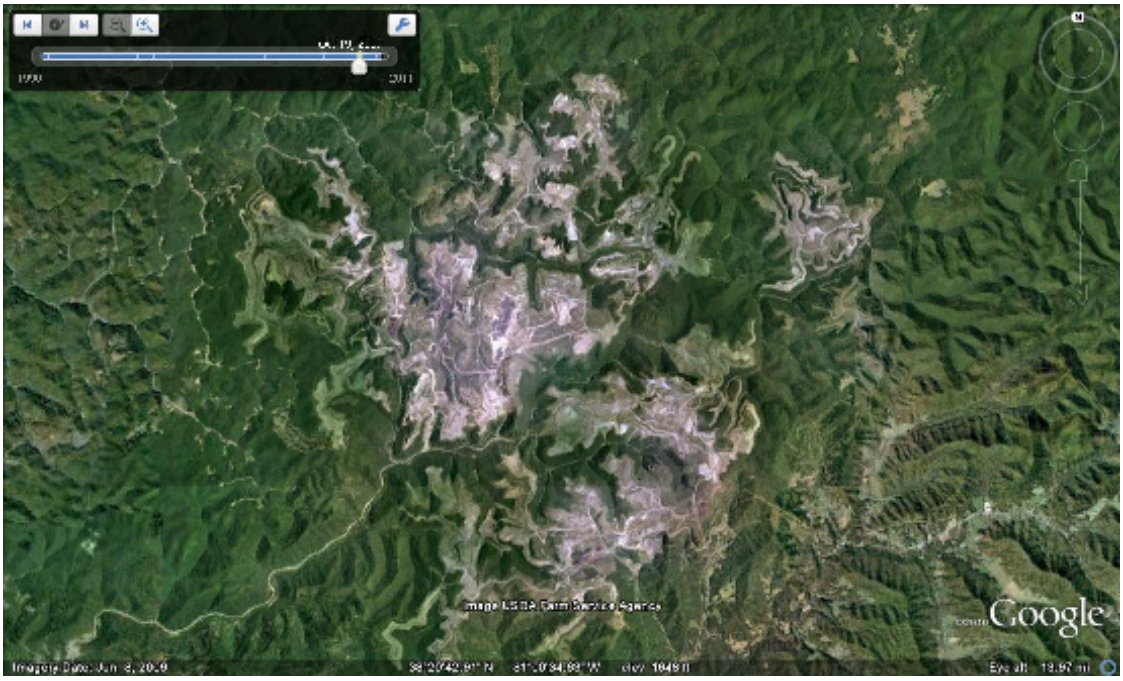


Figure 19: Satellite Image October 2009
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 2009. March 2, 2011

Current Mine Activity

The following images are from WV DEP geospatial systems information data base viewed in Google Earth. The shape file, SDE.perbd is downloadable and available for public use.



Figure 20: Active Mine Sites – 6,245 acres
Source: "Fola, West Virginia". 38˚ 20' 18.2"N and 80˚ 57' 41.34" W. Google Earth. October 21, 2010. March 2, 2011



Figure 21: Active Mine (No Coal Removed) – 338 acres
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 21, 2010. March 2, 2011.

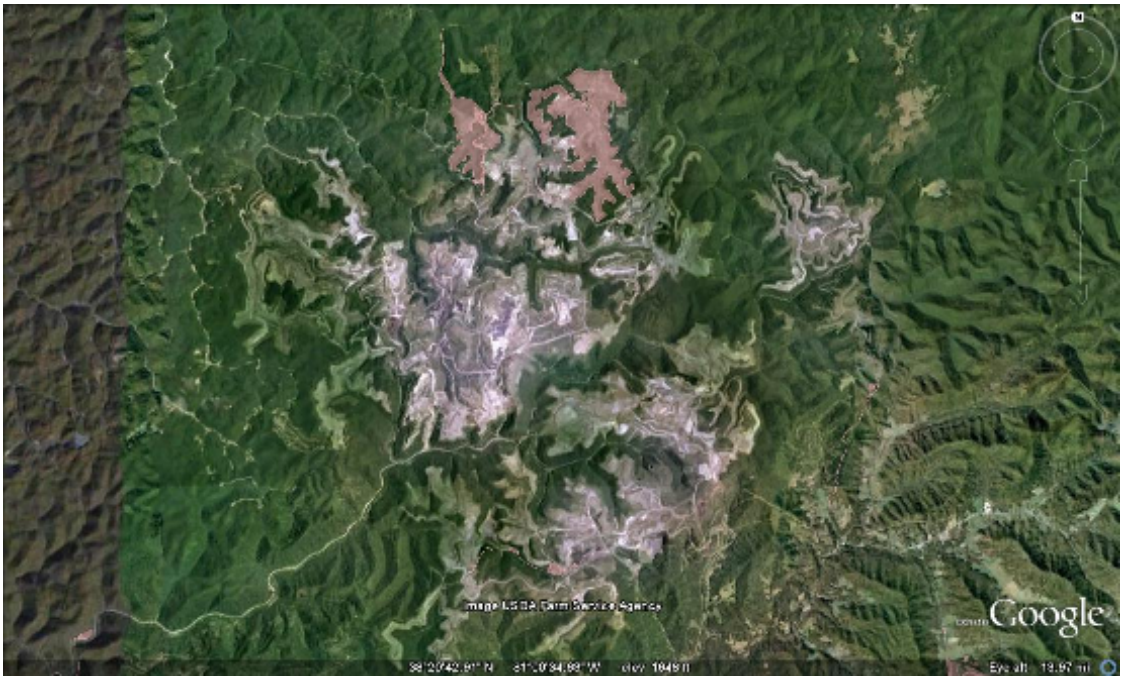


Figure 22: Inactive Mines – 1,291 acres
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 21, 2010. March 2, 2011



Figure 23: Reclaimed Mine Land – 3,424 acres
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 21, 2010. March 2, 2011

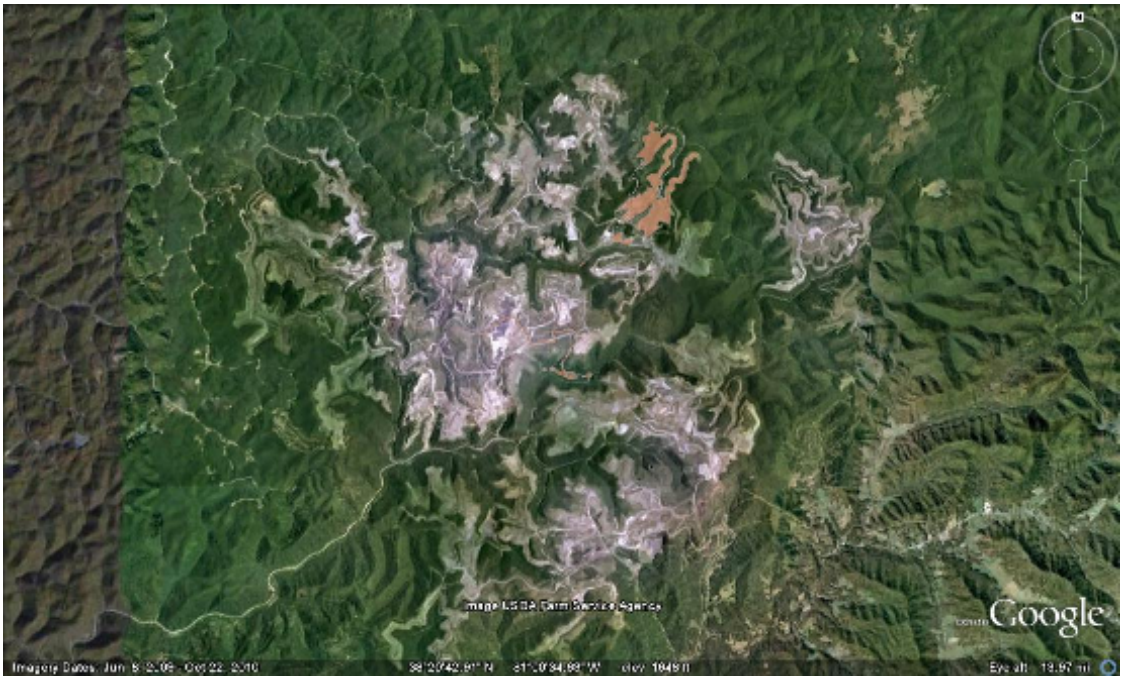


Figure 24: Future Mine Lands – 375 acres
Source: “Fola, West Virginia”. 38˚ 20’ 18.2”N and 80˚ 57’ 41.34” W. Google Earth. October 21, 2010. March 2, 2011

Site Documentation

Fola Coal tries to maintain an operational balance of 60% direct-ship coal, with the remaining 40% going to a 550-ton per hour preparation plant. Clean coal is transported from the plant directly to the train by an overland belt that is approximately 6,500 feet in length and drops over 500 feet in elevation to a batch load-out. Loading time for a unit train of 115 cars of 100-ton capacity averages three hours (Goroncy).

The site photographs were taken during a site tour with Office of Surface Mining inspector Barry K. Curry on March 28, 2011.



Figure 25: Site Photo A - Grey highwall above that is a cut-through the ridge. This ridge was added after the original permit was issued (Curry).



Figure 26: Site Photo B - Rock (spoil) material is being hauled from the left side of the photo to a reclamation site located on the right of the photo (Curry).



Figure 27: Site Photo C - This section of wall will be left open (not backfilled). CONSOL (Fola) is going to put in a deep mine face-up here (Curry).



Figure 28: Site Photo D - Brown ground between them is original ground, not disturbed/mined. There is a small sump at the Toe of VF 3, not required or on the map, done as a sediment trap. Pond 2 is lower on right. The trees from the clear-cutting are windrowed along the lower edge of the permit boundary. The jumbled/piled material on the top of the valley fill (above the trucks on the left) is the reclamation of the cross hatched area on the ridge between valley fill 2 & 3. The structure in the foreground is a constructed sediment ditch on the Clarion level. The valley fills are benched off at 100' levels both have 3 benches. They also have their center drains constructed and rip-rapped (Curry).



Figure 29: Site Photo E - The trucks are Caterpillar 777's, the tires are 20' tall. The black pile on upper left is a coal stockpile (Curry).



Figure 30: Site Photo F - A Hoe (Excavator) doing "Self-Recovery" with a thrown track. The right side track came off and the operator is carrying the track and traversing the cab/boom to crawl back up the ditch on the good track to some level ground (Curry).



Figure 31: Site Photo G - Shows highwall development along the Lower Kittanning level which will become a contour cut around the ridge. This contour cut will become a buffer and will temporarily divert water back toward head of the hollow during the mining (Curry).



Figure 32: Site Photo H - Highwall at the permit boundary across the bridge between VF 2 & 3. The spoil is coming from the mining in previous pictures. This wall is on the black line at the SE end of the cross hatched ridge between the VF's. The material is being dumped by truck and gets ramped up to the top of the highwall. This minimizes the amount of shoving by bulldozer (Curry).



Figure 33: Site Photo I - The spoil piled up in the background was generated when the ridge was mined and will stay there until later. The trucks are hauling from active mine sites and reclaiming the highwall and this ridge. After the other sites are mined (no more spoil) or if the other sites continue and this site is near reclaimed, then the prepositioned spoil will be moved back to finish the reclamation. The piles of brown are topsoil stockpiles (Curry).

Inventory and Analysis

The following maps were generating in ArcGIS, a geospatial information systems software. The raw data was gathered by the WV Department of Environmental Protection. The data files were open sources file available for public download and use. The data was loaded into the software and then the files were layered onto one another. By comparing the data sets based on user parameters, the software was able to generate the following studies: aspect, slope and hill shade.

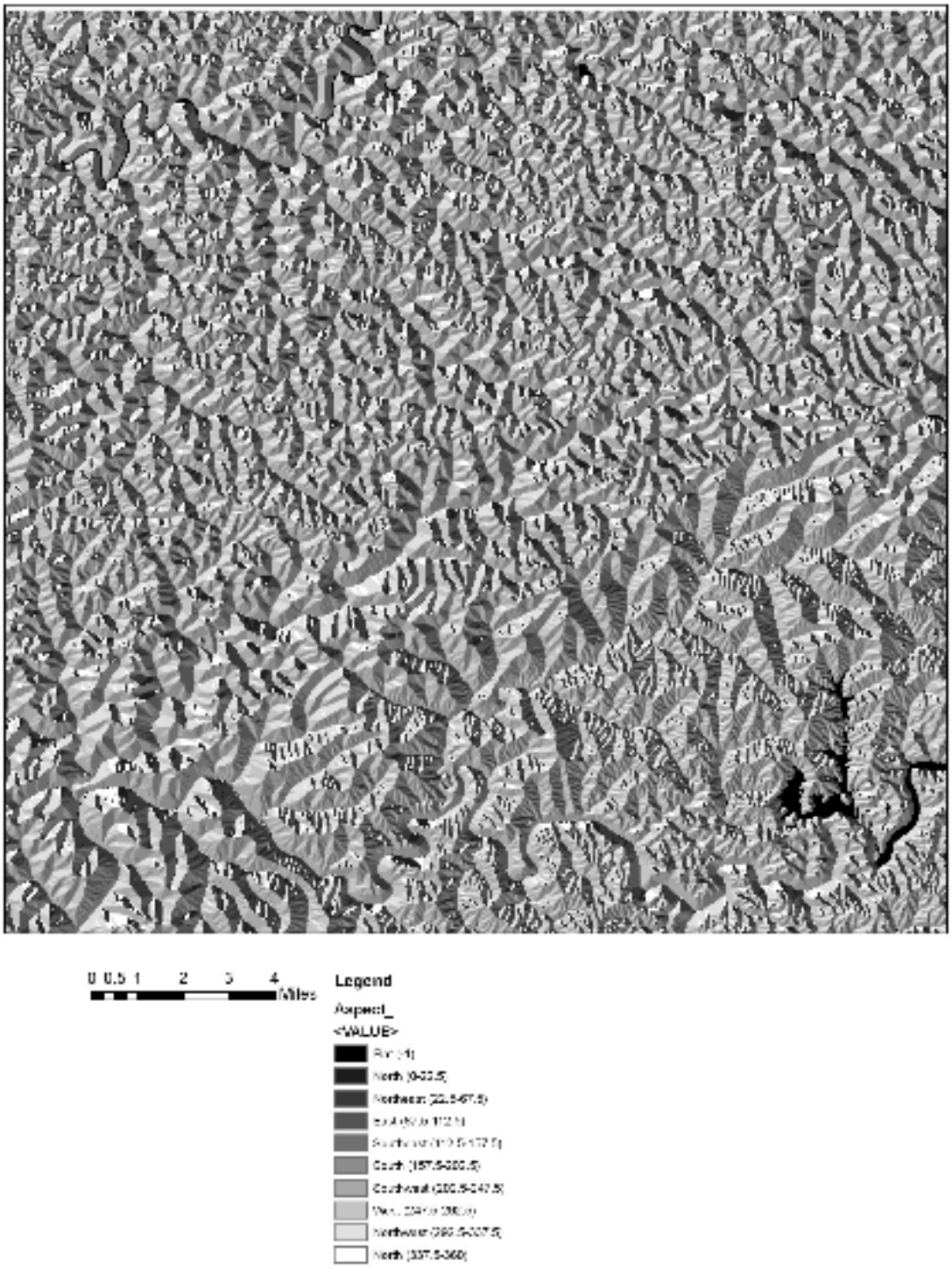


Figure 34: Aspect Map (Morris)

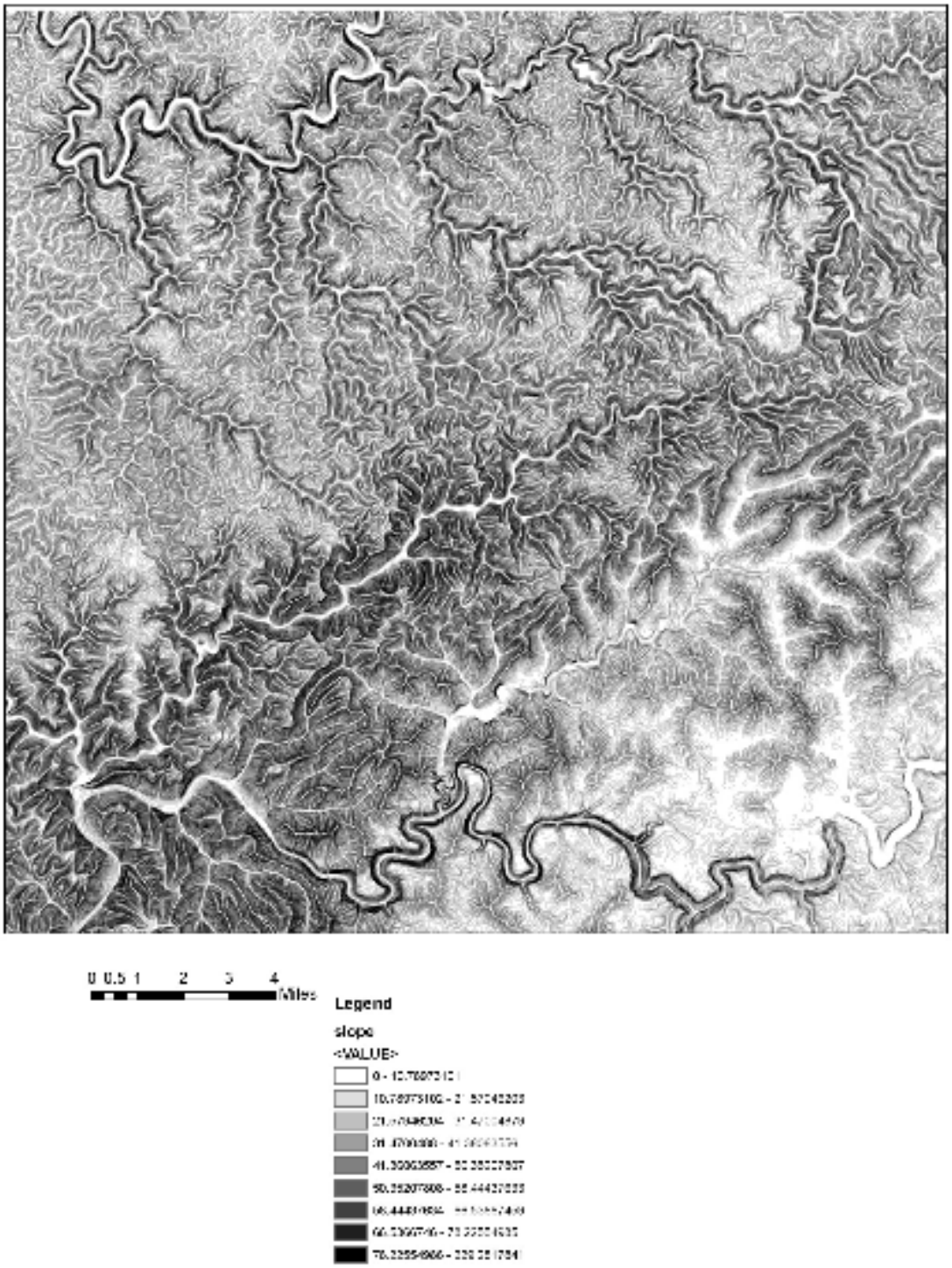


Figure 35: Slope Analysis Map, legend in degrees (Morris)

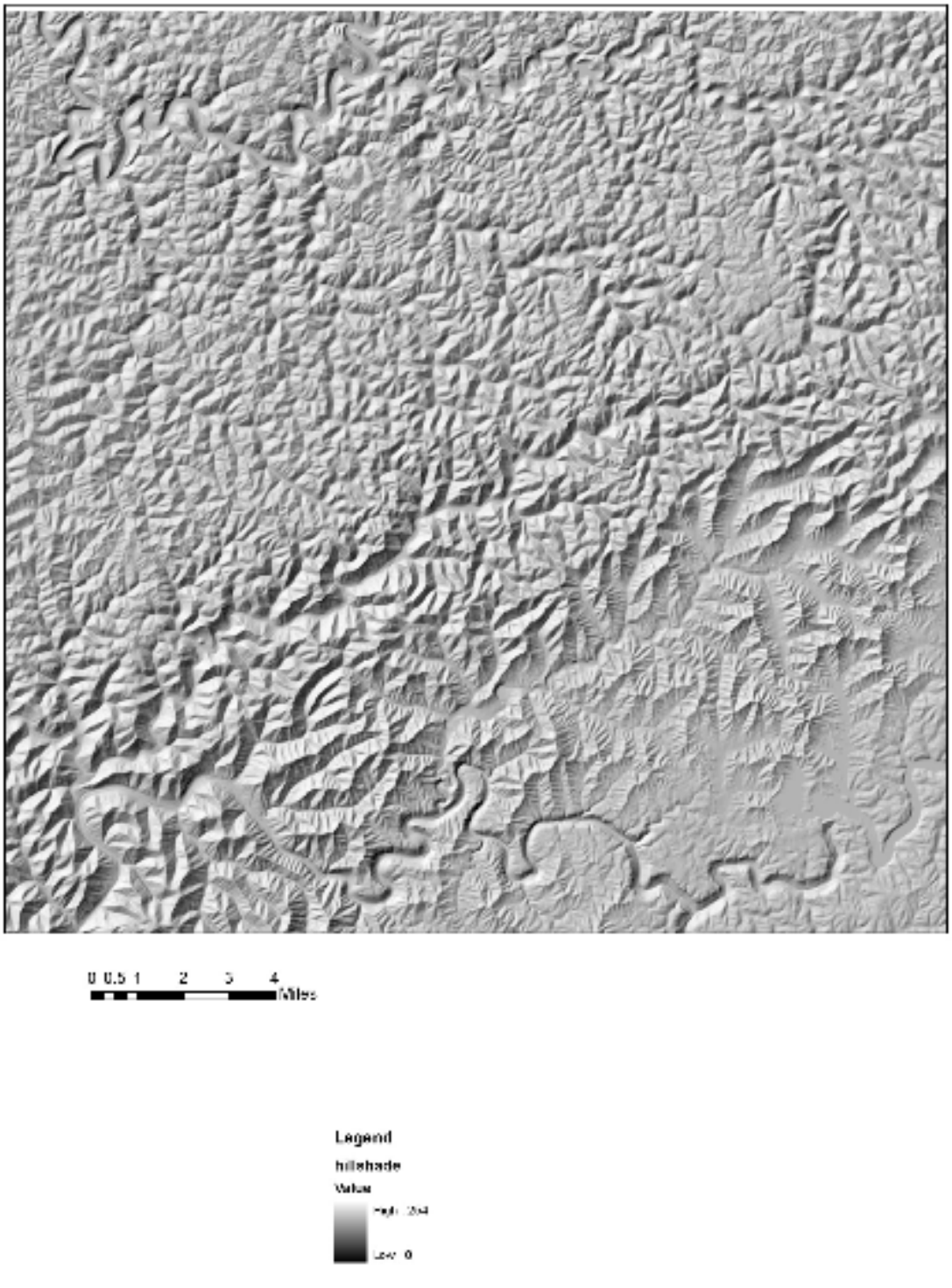


Figure 36: Hill Shade (Morris)

PROJECT PROGRAM

Sister Industry

Timbering and coal mining have co-existed in West Virginia since the 1800's. Land was clear-cut before surface mining and trees are planted to reclaim the land after mining is done. Timber is the only manufacturing industry in which employment has increased over the last decade. There are 3,000 more people working in timber than in the mid-1980's, but the amount of timber cut annually in West Virginia has doubled since the mid-1980s, to more than 1 billion board feet. The number of people working in the timber industry has increased by half that rate, to about 10,000. The West Virginia timber industry consists primarily of loggers and sawmill workers. West Virginia ranked 25th among all states in volume of timber harvested, but only 39th in the amount of value added through wood products manufacturing. (Ward).

The Land

According to the permit, Surface Mine S-2012-98 is to be reclaimed as forest land. The plant selection was determined largely by emersion rate. The Coal Company chooses plants that sprout quickly to prevent erosion. Temporary erosion control in the form of vegetative cover would be established as contemporaneously as practical, after backfilling and grading until a permanent tree cover can be established. This cover would consist of a combination of native and domesticated non-competitive and non-invasive cool and warm species of grasses and other herbaceous vine or shrub species including legumes (Goroncy).

The use of non-competitive grass mixtures is critical to prevent an imbalance between ground cover and tree requirements for growth materials. Ground cover would be plants tolerant of a range of pH, easily established in mineral soil and that are initially slow growing. The use of such materials allows woody plant seedlings to rise above the ground cover while providing short-term and long-term erosion control and encourage native tree invasion of the stand.

The tree-compatible ground cover seed mixture would be hydro-seeded on all disturbed areas, including areas not supporting final drainage ditches, waterways and access roads as contemporaneously as practicable with backfilling and grading. Heavily compacted areas would be ripped as deeply as is practical before seeding, but no less than two feet. The legumes will be inoculated with the appropriate specific inoculum (bacteria) before seeding. The overall stocking density of woody plants is at least 500 plants per acre (Curry). The stocking density for trees is at least 350 plants per acre. A minimum of five species of trees, to include at least three higher value hardwood species (white oak (*Quercus alba)*, northern red oak (*Quercus rubra*), black oak *(Quercus velutina)*, chestnut oak (*Qercus prinus*), white ash *(Fraxinus Americana)*, sugar maple (*Acer saccharum)*, black cherry (*Prunus serotina)* and yellow poplar *(Liriodendron tulipifera)*) and at least two lower value hardwoods or softwoods species (hickories *(Carva* spp.), red maple *(Acer rubrum)*, basswood *(Tilia Americana)*, cucumber magnolia *(Magnolia acuminate)*, sycamore *(Piatanus occidentalis)*, white pine*(Pinus strobes)*, Virginia pine *(Pinus virginiana)*, and pitch and loblolly hybrid pine (*Pinus taeda x)*) will be planted (Goroncy).

The Appalachian Regional Reforestation Initiative method promotes quick forest recovery. By keeping soil loose instead of grading it to compaction and by planting saplings in addition to seeds, the forest can reach harvest sizes in fifteen years instead of thirty (Davis). To perpetuate a sustainable industry, the trees can be harvestable using a selection system. This system favors, trees that grow well in the shade. Examples are sugar maple, American beech *(Fagus grandifolia)* and hemlock (*Tsuaga Canadensis)* and, to a lesser extent, wild black cherry,

red oak and yellow birch *(Betula glleghaniensis)*. Trees can be selected as single individuals or in small groups. Single trees are selected and cut and the subsequent regeneration that occupies the growing space is thinned over time to produce another single mature tree. In a group selection, trees are selected and removed in small groups that result in even age patches within an uneven aged stand. Group selection is mostly used for trees of intermediate shade tolerance as red oak, white ash, yellow birch and black cherry. Considerable skill is required to select the trees to cut to form the group openings (Gillispie).

Wildlife habitat in Clay County is best suited to the needs of woodland wildlife species since ninety percent of the area is forested. Habitat for woodland wildlife consists of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Examples of wild herbaceous plants are bluestem (*Andropogon* spp.), goldenrod *(Solidago spp.)*, beggarticks *(Bidens spp.)*, and ragweed *(Ambrosia spp.)* (Jenkins).

The People

The Fola Coal Complex employs on average, 800 people. The gap between a mine worker and the next pay grade is from $75,000 a year to $34,000 a year (‘Clay County, WV’). Each individual employee represents a single family. In the typical family, the man is the primary earner. The women work in the home and raise children. Only six percent of the county residents have post-secondary education. Entry-level positions in the service or hospitality industries are available but with a commute time of forty-five minutes. The positions do not pay enough to make them practical (Burns). Yet when the mine closes and the jobs are gone, the people will stay.

Families in Appalachia have lived in the same hollows for generations. Grown siblings, marry, and build their homes beside their parents (see figure 37). Extended families support one another. To leave their homes would mean to leave their entire family and their way of life.

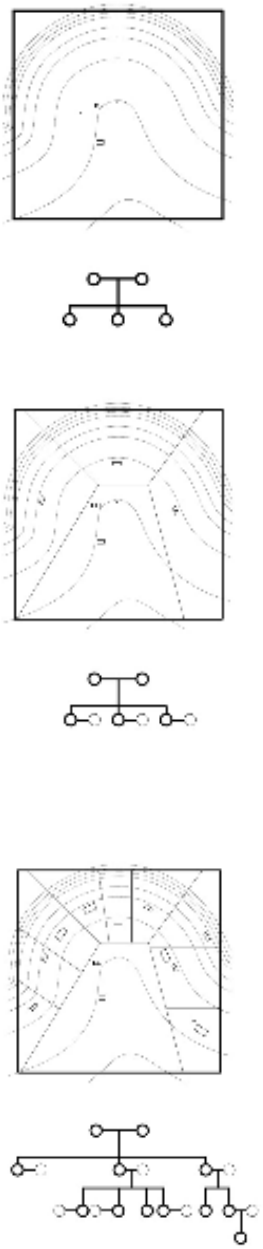


Figure 37: First, Second and Third Generation Settlements (Morris)

Global

Ereen Mine, Mongolia

United States' Peabody Energy completed Mongolia's first coal mine restoration project at the former Ereen Mine near the city of Bulgan in northern Mongolia. The project restored forty acres to hardy pastureland with native forage species, and developed a new community well and a surface pond for livestock.

It was designed in collaboration with the Mongolian government and developed by an international team of environmental scientists and engineers, the Mongolian Agricultural University and the Mongolian Forage Seed Producers Association. Restoration activities were carried out by a local Mongolian workforce.



Figure 38: Ereen Mine, Mongolia
Source: Peabody Energy. 4 February 2011 , http://www.bcmongolia.org/news/535-peabody-energy-completes-mongolias-first-coal-mine-restoration-project>

National

Antelope Mine, Wyoming

Antelope Mine is an active surface mine located north of Douglas, Wyoming. Rio Tinto Energy America acquired the mine in 1993 from Northern Energy Resource Company, a mining and natural resource company of PacifiCorp. Antelope Mine is now owned and operated by Cloud Peak Energy.

Antelope Mine is located at the south end of the Wyodak seam, the principal economic coal seam in the Wyoming portion of the Powder River Basin. The seam's typical average quality is 8,850 Btu sub-bituminous thermal coal.

The Antelope Mine employee total was approximately 500 at year-end 2009. Antelope's annual production rate has increased each year for the past twenty-four years. The mine is permitted for production of 42 million tons of coal annually. Coal mined from Antelope is shipped primarily to electric utility power plants to serve customers in Illinois, Oklahoma, Michigan and Texas.

In 2003, 2009 and 2010 the Antelope Mine won awards from state and national organizations recognizing excellence in mine reclamation and wildlife stewardship ("Coal Mining Reclamation Awards").

Bee Hollow, Missouri

The Bee Hollow Reclamation Project reclaimed approximately ten acres of land that had been surface mined prior to the 1950's. In 1986, the area was part of a land transfer between the Farmers Home Administration and the Missouri Department of Conservation. The total 271-acres contained one hundred seventy-one acres of forest, fifty-two acres of cropland, twenty-two acres of wetlands, and thirteen acres of old fields. One mile of

stream frontage lies along the western boundary of the area. The eastern half of the area was spoil ridges left by coal mining.

The Missouri Department of Natural Resources and the Land Reclamation Commission awarded a $212,000 construction contract to BRS Construction for removing, grading and vegetating approximately eight acres of dangerous piles, embankments and spoil piles. A guardrail was installed to address a dangerous highwall located adjacent to a county road. Additionally, the reclamation improved water quality by reducing the amount of acid-forming sediments that washed into nearby streams. The wetland pools and oxbow sloughs on the western half of the area attract a variety of nesting and migrating waterfowl. Management of the area includes farming, moist soil wetland management, timber harvest, and controlled burns to improve wildlife habitat and increase species diversity. The conservation area is managed primarily for waterfowl, deer, and turkey. The wetland pools are managed to provide fall and spring migration habitat while providing habitat for reptiles and amphibians. Recreation activities include camping, hiking, fishing and hunting ("Coal Mine Reclamation Awards").

Regional

Copper Basin Mining District, Tennessee and Georgia

An area rich in mining history, the Copper Basin Mining District is located in Polk County in southeastern Tennessee and in Fannin County in northern Georgia near the North Carolina border. Mining of copper and sulfur began at the Copper Basin site soon after copper was discovered in 1843 in Ducktown, Tennessee. The only deep shaft mines east of the Mississippi River, mining and processing of copper occurred at the site until

1987, with sulfuric acid production continuing until 2000. During the more than 150 years of mining and processing activities conducted at Copper Basin, a total of more than 95 million tons of ore were mined (Carr).

As a result of mining activities, degradation of the site and surrounding area was so catastrophic that the Copper Basin was once considered the largest manmade biological desert in the nation. The activities of the site impacted an area of more than 35 square miles, including the Davis Mill Creek Watershed, the North Potato Creek Watershed, and sections of the Ocoee River (Carr).

In 1998, Glenn Springs Holdings, Inc. (GSHI) began installing a two-acre demonstration passive wetland system in conjunction with limestone dissolution and bacteria sulfate treatment. The anaerobic cell was completed in 1998, with two additional aerobic cells completed in 2003 (see figure 39). The demonstration wetland system captured base flow water from McPherson Branch with average influent flows of 291 gallons per minute (gpm). The McPherson Branch flow concentrations of iron, copper, zinc, and aluminum were reduced by an order of magnitude and acidity was reduced by 100 percent after flowing through the demonstrative wetland. The alkalinity was increased from 0 milligrams per liter (mg/L) to an average of approximately 160 mg/L. The pH of the treated water increased from 3.82 to 6.50. Flow capacity is limited, with treatment of only the base flow of the McPherson Branch through the wetland — higher flows bypass the passive treatment system. While diverting the base flow and improving water quality, GSHI completed construction of a 65-meter “restored stream segment” in 2003 to improve habitat and aquatic life of McPherson Branch (Carr).



Figure 39: Demonstration Wetland Cells
Source: Carr

Hatfield and McCoy Trail, West Virginia

The Hatfield-McCoy Trail System is a statutory corporation created by the West Virginia Legislature to generate economic development through tourism in nine southern West Virginia counties. By mid-2009, the Hatfield-McCoy Trail System covered more than 500 miles of off-road trails in five of its nine project counties. The six Hatfield-McCoy trail systems are Rockhouse, Buffalo Mountain, Bearwallow, Indian Ridge, Little Coal, and Pinnacle Creek (see figures 40 and 41). Trail visitors have a choice of a variety of trails ranging from easiest to most difficult. Each of its six trail systems is open 365 days a year to ATVs, dirt bikes, and utility vehicles. Many of the trail systems also offer community connecting trails that allow visitors to access "ATV-friendly towns" to experience the charm of southern West Virginia and so the town may benefit from the increase in tourism. Total

retail sales have grown by 12 percent and sales per establishment by 25 percent. For the State of West Virginia the total economic impact of the Hatfield-McCoy Trail System was an increase in output of $7,776,116, an increase in income of $2,789,036 and the generation of 146 new jobs (Center for Business and Education Research).

Since the first trails were opened, users have increased by more than six fold to 24,285 people per year in 2005. Despite its short lifespan, the Hatfield-McCoy Trail System has received several national recognitions for excellence in its facilities and activities. This includes being chosen as one of the very few National Recreation Trails designated by the U.S. Department of the Interior (Center for Business and Education Research).

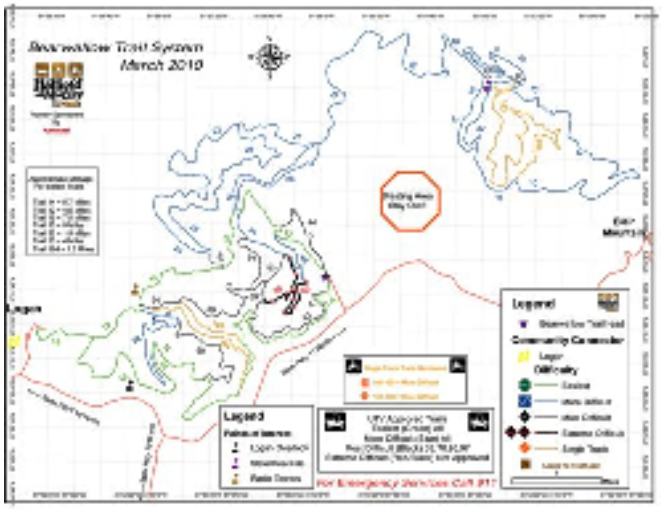


Figure 40: Bearwallow Trail Map
Source: (“Hatfield-McCoy Regional Trail Authority”)



Figure 41: ATV on Bearwallow Trail
Source: (“Hatfield-McCoy Regional Trail Authority”)

Local

Widen, West Virginia

As the coal industry grew in the mid eighteenth century, small coal towns began springing up along the landscape of Appalachia. Early towns were wild, lawless settlements that came and went with the discovery and depletion of a supply of coal. Still, because of the seemingly limitless supply of some coal deposits, many of these remote settlements evolved into towns, eventually supporting large populations. The birth of a coal town usually followed the rail lines. Operators opened drift mouth mines along the railroad as they made their way into the heart of Appalachia. After the supply of coal was depleted, coal operators would pack up and leave the town and its residents behind with no means of employment. The result has been poverty and deprivation in many of these dead coal towns of Appalachia (Burns).

Located between high, rugged mountains, most coal towns began with a mine opening and a tipple. Soon after establishment of a mine, a coal operator would begin to build homes to house the rising number of miners entering the settlement looking for work. These early settlements usually featured a large number of male occupants and did not offer a sense of community or safety in which a miner would chose to raise a family. Once a mine proved its worth and an operator believed he would mine coal for a substantial period of time, he would begin to develop the settlement around the mine. Soon, coal operators began the process of “cleaning up” their rugged coal settlements and more homes would be built as well as stores and entertainment facilities.

In the rapid maturation of the coal town, operators developed paternalistic intentions and began to assume the role of the benevolent provider of the town and its miners. In line with the Old South model of the paternalistic slave plantation, the company usually built the superintendents’ and operators’ homes on a hill overlooking the

town, establishing their dominance over the working class miners. Because of their ensuing dominance, most coal operators became synonymous with their coal towns. J.G. Bradley and his town of Widen are no different (Buckley).

Bradley came to Clay County in 1904 as a right-of-way agent for the Buffalo Creek and Gauley Railroad and soon moved up in the ranks of the company. He became President of the railroad, General Manager of Elk River Coal and Lumber Company, and eventually President of the company. Over his fifty years connected with the company, Bradley sought the role of provider and benevolent dictator of the town (Griffith).

Bradley wanted to put forth the image that he was the same as the miners in order for them to remain loyal to him. For example, if he had lived in Massachusetts while operating a mine in West Virginia, the men would not have felt as connected to him and would not have been as adamant in keeping the United Mine Workers of America out of Widen. As a result of his pretense of nativity, Bradley successfully operated his large non-union company for fifty years with only one major industrial conflict (Griffith).

From its inception the new mine proved successful, more and more men traveled to Widen for work. As a result, the once isolated area in the northeast corner of Clay County became a culturally diverse settlement, filled with new inhabitants all of different races and ethnicities. Faced with a rising population, Bradley began building a town around his mine that could support his rising workforce numbers. By the 1920s, the town had grown into a true coal community, hardly resembling the coal settlement of the early 1900s. With the development of the coal community came the ever-present control of the company. The freedom once experienced by the isolated settlers in early county history was replaced with J.G. Bradley's iron fist that completely ruled the town from mine to man.

After WWI, as production rose in the Rich Run mine, so did the population of Widen. Citizens began taking an active part in the development of the "community" of the town. Social organizations began to develop in Widen in the 1920s. That decade saw the organization of the Women's Club and the Rotary Club. Still endeavoring to make his town a respectable place, Bradley began to develop amenities that would provide entertainment for his miners that could deter the illegal consumption of alcohol on the weekends and the problems it created, such as violence and illness. ELRICO built the first and only Young Men's Christian Association building in Clay County. The first building housing the Y.M.C.A. burned down 1920, but was rebuilt that same year. The building had a soda fountain, skating rink, bowling alley, beauty and barbershops, poolroom, and an auditorium. The Y.M.C.A. also supported a Hi-Y club that organized rummage sales, plays, and a Boys' Week. The *Widen News*, which announced events and featured local interest stories, began publishing monthly in 1921. ELRICO later took over publication, increasing the circulation to include news from Dundon, Swandale, and Cressmont. Through this company publication, Bradley had a vehicle to promote company policy and standards.

Hard times fell on the coal company as well during the Depression. Many of the investments made by the Philadelphia Bank and the other stockholders of the Elk River Coal and Lumber Company were losing money. Also, trustees for their heirs of the original stockholders of ELRICO raided the trust and took the profits made by the mines in Widen and by Widen miners, in order to maintain the lavish lifestyles in New England to which they had grown accustomed. Despite previously stated problems, the company continued operations as normal during the 1930s. As a result, profits fell significantly, and the company even saw large deficits accrue during the Depression years (Griffith).

Miners in Widen walked out on strike in September of 1952, complaining of an unfair welfare program, poor medical programs, and the lack of an injured worker's compensation plan. Widen miners felt the company

controlled the union and wanted representation that specifically looked out for the welfare of miners, not the company (Buckley).

The strike of 1952-53 marked the climax in the story of Widen. Because striking miners would not be rehired to work in Widen, many were forced to move out of Widen to find work. This first wave of migration out of Widen would not be the last. After Bradley sold his mine, and the subsequent closing of the mine five years later by the Clinchfield Coal Company, Widen began to decline. The company rapidly dismantled the mining equipment, leaving the town without a means of support and caused more miners to move away in search of work. Those that stayed resided in a town that little resembled the Widen of the past. At the beginning of the twenty-first century, Widen can be officially declared a dead town. The only remnants of the once booming coal town are several company houses still standing in rows (Griffith).



Figure 42: Nolli Diagram of Widen, 1925 (Morris)

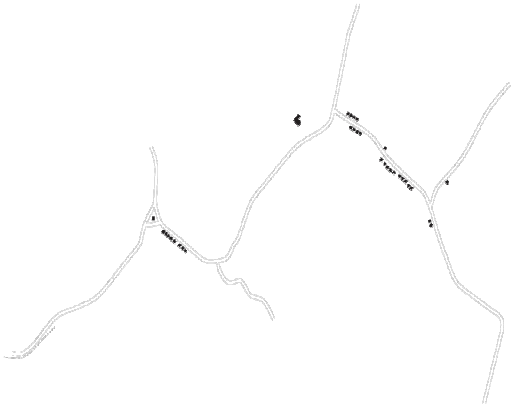


Figure 43: Nolli Diagram of Widen, 2010 (Morris)

LITERATURE OVERVIEW

Bridging Reclamation, Science and the Community

2010 Joint Mining Reclamation Conference

The proceedings from the 2010 joint meeting of the American Society of Mining and Reclamation, Pennsylvania Abandoned Mine Reclamation Conference and Appalachian Regional Reforestation Initiative Mined Land Reforestation Conference were collected and published on CD-ROM. The papers presented at the twelve day conference covered topics such as: Acid Mine Drainage Treatment Costs, ARRI Forestation Reclamation Approach, Biological and Biochemical Reactors, Metal Removal from Mine Drainage, International Policy, Soil and Vegetative Covers, Geomorphology and Passive Mine Treatments.

Bringing Down the Mountains

Shirley S. Burns

Written by southern West Virginia native, Shirley Burns, the book examines the complex issues between the residents, mining and the impact mining has on the landscape. The book is not an objective account. Burns uses accusatory language to describe the coal companies and their activity. Her argument is based on the environmental damage done to the land and the health consequences felt by the miners and the residents of West Virginia. She holds the state government accountable for allowing the coal companies to exploit the residents and allowing a majority of the revenue generated by mining to leave the state.

Images of West Virginia Coalfields

Builder Levy, photographer

For fifty years Levy has photographed Appalachian coalfields. The book contains ninety-three duotone photographs dating to the mid-1950's. His collection is part of the Appalachian Photographers Project, an organization that exhibits portfolios by both established and emerging photographers who live or work in Alabama, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

Trends in National and Regional Economic Distress: 1960 – 2000

Lawrence E. Wood

The report was prepared by Lawrence E. Wood, assistant professor at Ohio University, for the Appalachian Regional Commission (ARC) in 2005. Since, 1965, the ARC has been concerned with the social and economic needs of historically lagging regions in the US. The report examines patterns of economic distress in Appalachia since 1960. The analysis points to clear pockets of distress in the Mississippi Delta and Central Appalachia, that are consistent regardless of indicator used.

CONCLUSIONS AND RECOMMENDATIONS

Master Plan

In conclusion, I propose a post-mining master plan for the Fola Coal Complex. The design solution included prescribed land use, a combination of woodland and openspace; industrial sector; single family housing; and vehicular circulation (see figure 44).

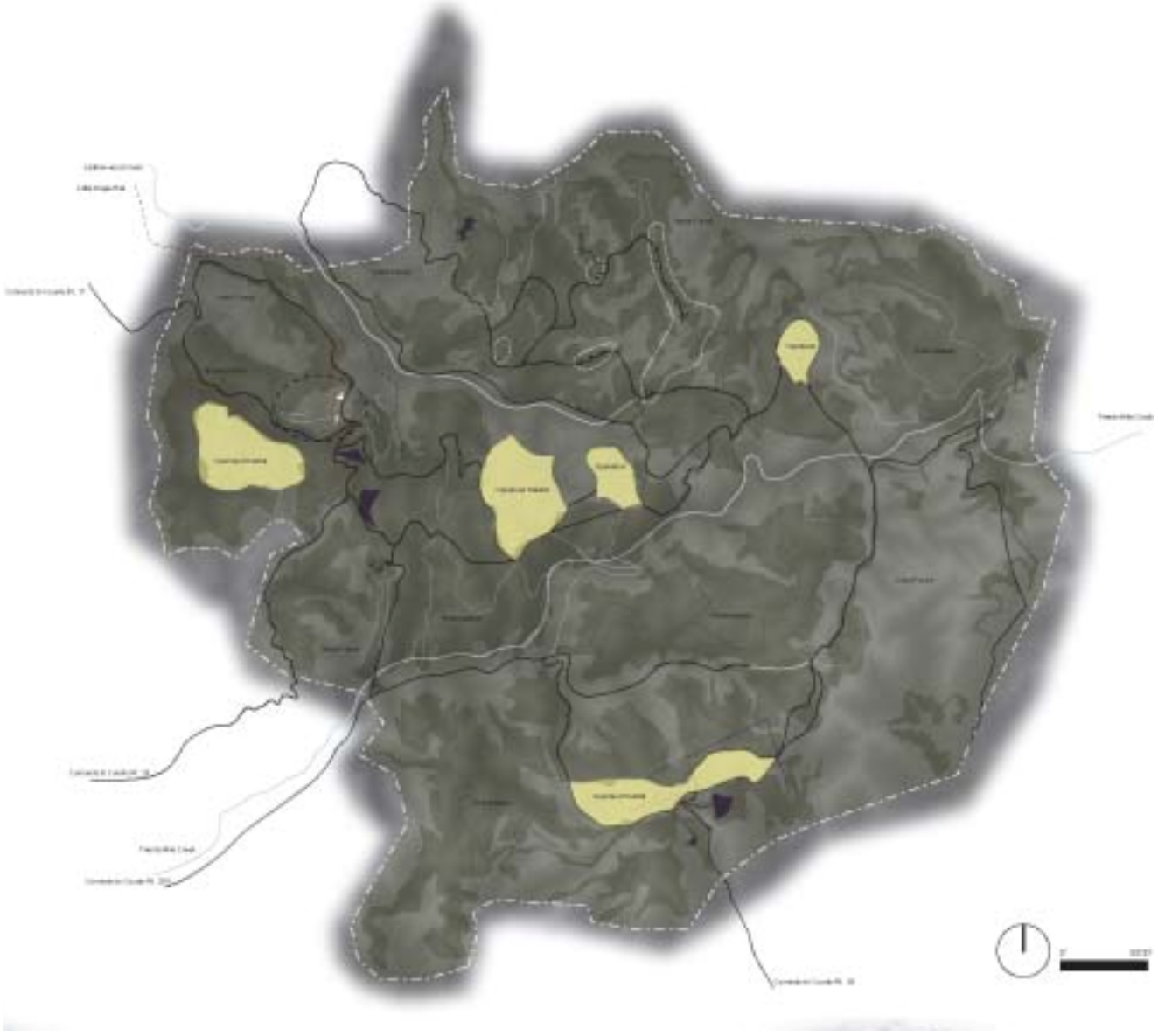


Figure 44: Master Plan (Morris)

It utilized the traditional reclamation practices combined with planting methods promoted by the Appalachian Region Reforestation Initiative. The forest is a great resource to rural communities in Appalachia. Hunting activity provide a food for residents and revenue from hunting license sales. Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife potentially attracted to these areas include: wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer. Ruffed grouse populations are generally low throughout the county; however, areas that are in the early stages of succession or re-growth areas from timber harvests typically provide habitat for larger populations of grouse. Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Examples of these plants are oak, birch, cherry, maple, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated good are gray dogwood, sumac, native plum and crabapple (see figure 45). Coniferous plants furnish browse and seeds. Examples of coniferous plants are pine, spruce, yew, cedar, and hemlock (Jenkins).



Figure 45: Photo Montage Woodland Habitat (Morris)

In addition to forest land, the master plan designated maintained openspace to increase biodiversity on the site. Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include: meadow vole, meadowlark, field sparrow, cottontail, and red fox. The population of openland wildlife species, such as bobwhite quail, dove, and meadowlark, is low because the acreage of cultivated farmland is limited. Cottontail rabbits inhabit brushy areas and border areas between woodland and open fields. Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Examples of grain and seed crops are corn, wheat, oats, and barley. Grasses and legumes are domestic perennial grasses and herbaceous legumes (see figure 46). Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope.



Figure 46: Photo Montage of Openland Habitat (Morris)

Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa (Jenkins). Bi-annual prescribed burnings are necessary for maintaining openspace (see figure 47).



Figure 47: Photo Montage of Prescribed Burn (Morris)

A lasting mark of the mine activity is the creation of roads on a previously remote area. Seventeen miles of access roads are kept as trails and log roads. Twenty-three roads are designated paved to provide vehicular access through the site. A one-hundred foot buffer zone was designated along the Twenty-mile Creek and Leatherwood Creek.

To counteract the loss of employment a sawmill, an engineered joist factory, and a cabinet factory are included in the reclamation program (see table 2). Harvested timber would stay on-site to be processed into wood products. The positions created match the physically demanding vocations similar to the current mine workers, but also include administrative/secretarial positions and positions requiring additional education (Milauskas).

Table 2

Employment

Tree Fellers	30 positions
Planters	10 positions
Sawmill Workers	50 positions
Kiln Workers	15 positions
Cabinet Makers	20 positions
Engineered Truss/Joists	40 positions
Truck Drivers	30 positions
Rail loaders	12 positions
Habitat Monitoring	4 positions
Designers	10 positions
Engineers	5 positions
Administration	20 positions
Secretary/Janitorial	4 positions

The size and number of facilities is comparable to facilities located in communities of similar size and demographics (see figure 48). The sawmill and factories were located on the site used by the Fola Coal Company for heavy equipment storage and maintenance because the soil compaction from parked heavy equipment inhibits reforestation. The harvested logs and wood products can then be loaded onto the existing railroad for transport and sale (see figure 49).

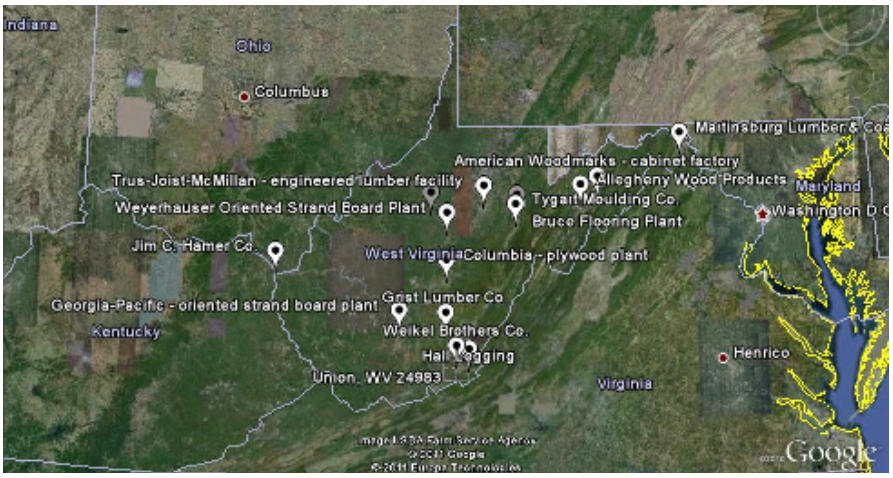


Figure 48: West Virginia Timber Industry. Locations of sawmills and wood product manufacturing within the state.
Source: “West Virginia”. 38˚ 45’ 47” N and 80˚ 39’ 92” W. Google Earth. October 21, 2010. March 22, 2011

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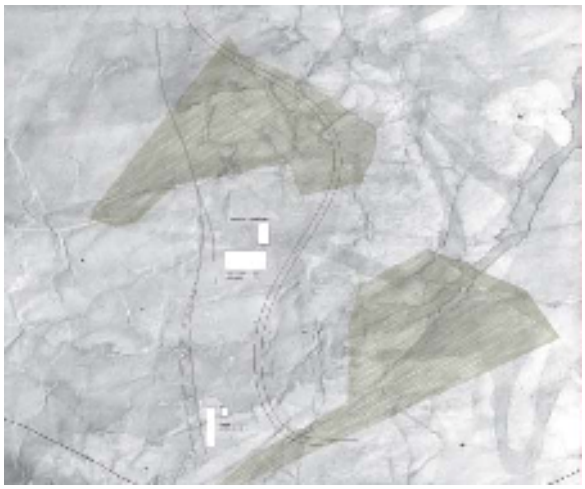


Figure 49: Industrial Sector. Manufacturing located on vehicular access road and existing railroad (Morris).

The recommendation is a design solution that considers the land and the people (see appendix). By providing areas of protection for wildlife, controlled industry and homesteads for people the land is not just one resource to be exploited. It is a new landscape that recognizes the past and protects the future.

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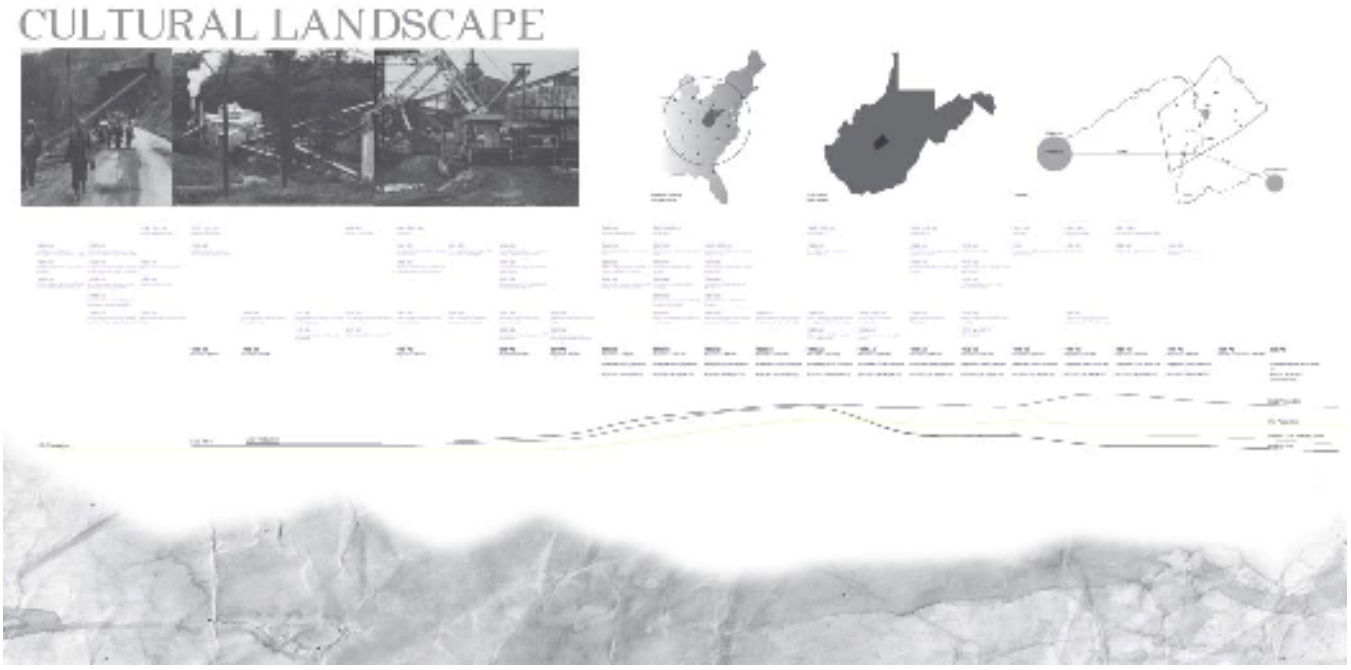
APPENDIX

1	2	3
4	5	6

Final Board Display Order

Boards measure 3’x6’ at actual size.

Board 1



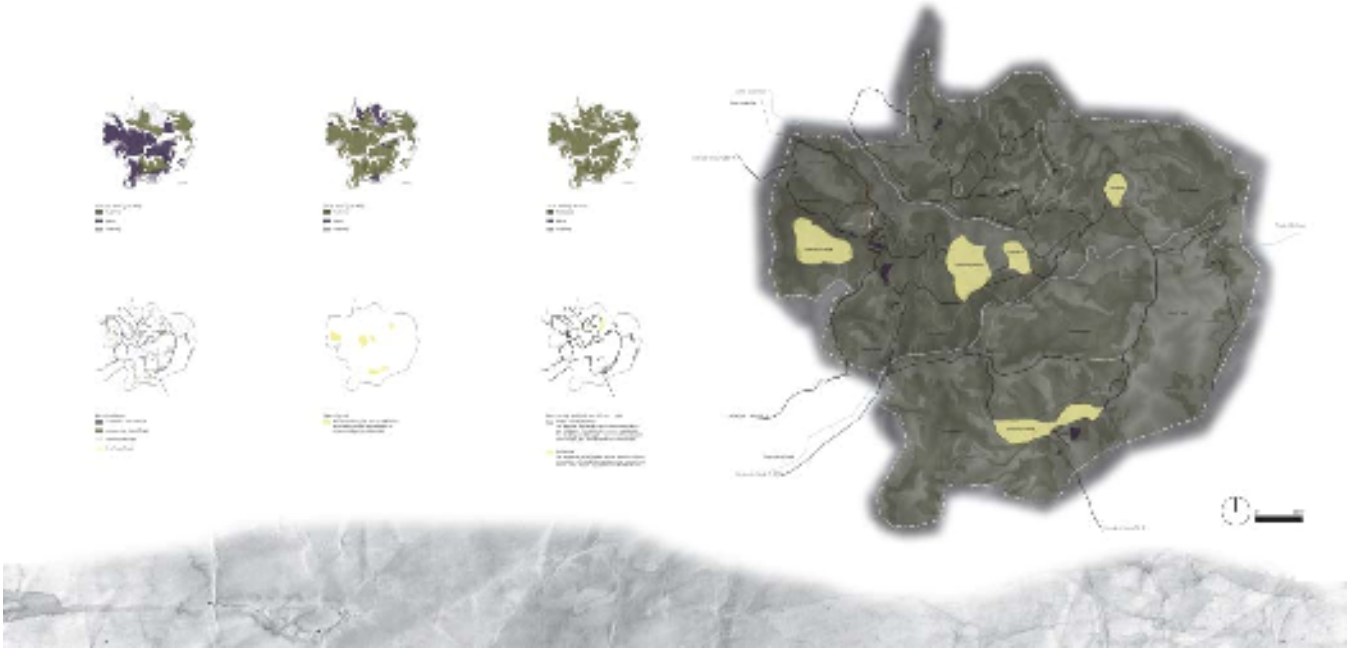
This board summarized the history of the Appalachia region highlighting geographical isolation and coal production.

Board 2



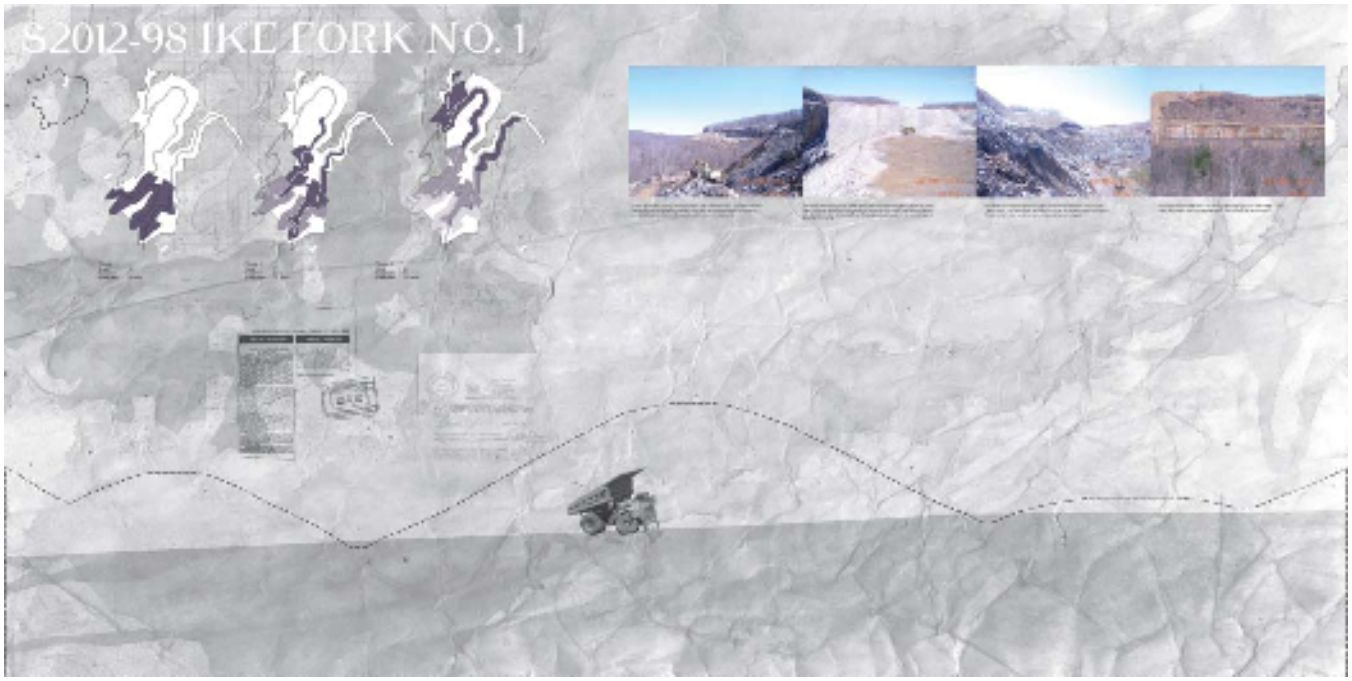
This board presented the site context information and the social impact of the mining industry.

Board 3



The phases of the mine activity slow-down and master plan are show on board 3.

Board 4



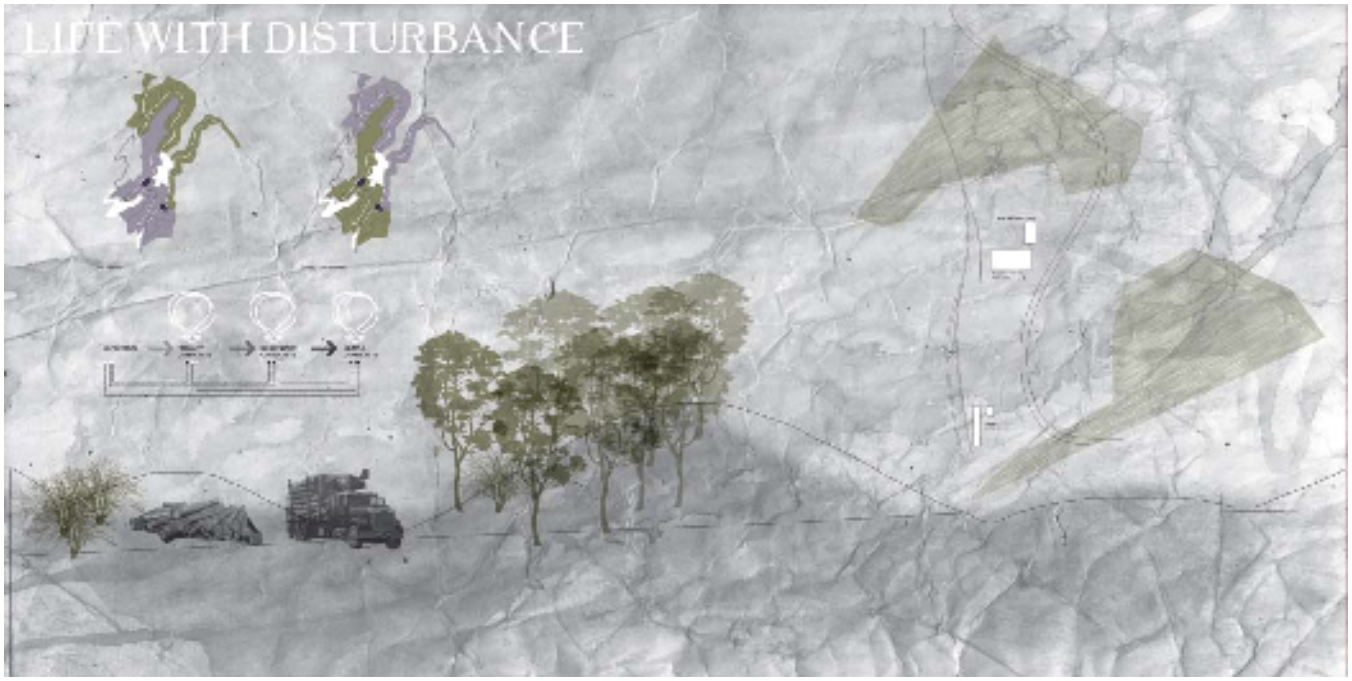
The smaller scale Ike Fork Mining activity is summarized on board 4.

Board 5



Typical reclamation practices and Appalachian Regional Reforestation Initiative methods are compared and contrasted on the fifth board.

Board 6



Plan showing placement of wood processing manufacturing.



Additional photo montages representing timber harvesting and exporting.

VITA

Bethany Margaret Morris was born in Fairmont, West Virginia, on July 9th, 1985. After graduating from the University of Tennessee, College of Architecture and Design with Bachelors in Architecture in May 2008, she remained at the university to pursue a Masters in Landscape Architecture. Upon graduation she will pursue an internship at a multi-discipline design firm.