Reinforcing Appalachia

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Reinforcing Appalachia
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Latin Honors Project

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I dedicate this project to the people in Eastern Kentucky affected by the flood of 2022. I hope this thesis builds momentum towards flood mitigation designs in Appalachia to prevent this level of devastation from ever happening again.

I also dedicate this project to my family in Eastern Kentucky that continue to support their community during these hard times. The pride and compassion that they exhibit in their community inspired me to showcase what an amazing region Appalachia is.

Lastly, I dedicate this project to the faculty at CU Boulder's Program in Environmental Design who have inspired me to use design to think critically and have shown me the power of using creativity to make positive impacts.

Abstract

The coal mining industry is losing its presence in Appalachia; however, coal mining heritage persists. Scars are left on the landscape from strip mines, coal camps are abandoned in the woods, the railroad system is deactivated, and coal miners still reside in the valleys. These impacts and more tend to give coal mining heritage a negative reputation as a hazardous industry that has destroyed the Appalachian region. However, this design research project views the ghost of the coal mining industry and its scars left behind as opportunities for reactivation of the region.

Functional design heritage is a term used in this project to describe the function that a built environment was initially designed to serve. This applies to Appalachia because the region developed under the command of the coal mining industry which designed a regional infrastructure to produce coal. Now that the intended function of coal mining is gone, how can the coal mining foundation of Appalachia support a new function?

Reinforcing Appalachia is a design research project that presents a method of design inquiry. The method aims to ideate ways to reapply the foundation of coal mining to a new function or industry in Appalachia. The goal of the method is to prove the potential of the region and its existing conditions post-coal industry in an effort to advocate for Appalachia's future.

The method is applied to a case study of Whitley County in Eastern Kentucky. An analysis of historical documents and qualitative research is utilized to identify the functional design heritage of Appalachia. That functional design heritage informs speculative designs that provoke design inquiry on future developments in Appalachia. The design process and accompanied speculative designs advocate for the potential within the perceived detrimental effects of coal mining. This opportunistic design process and research methodology can be applied to other regions that are losing the original industry that the area was designed to support.

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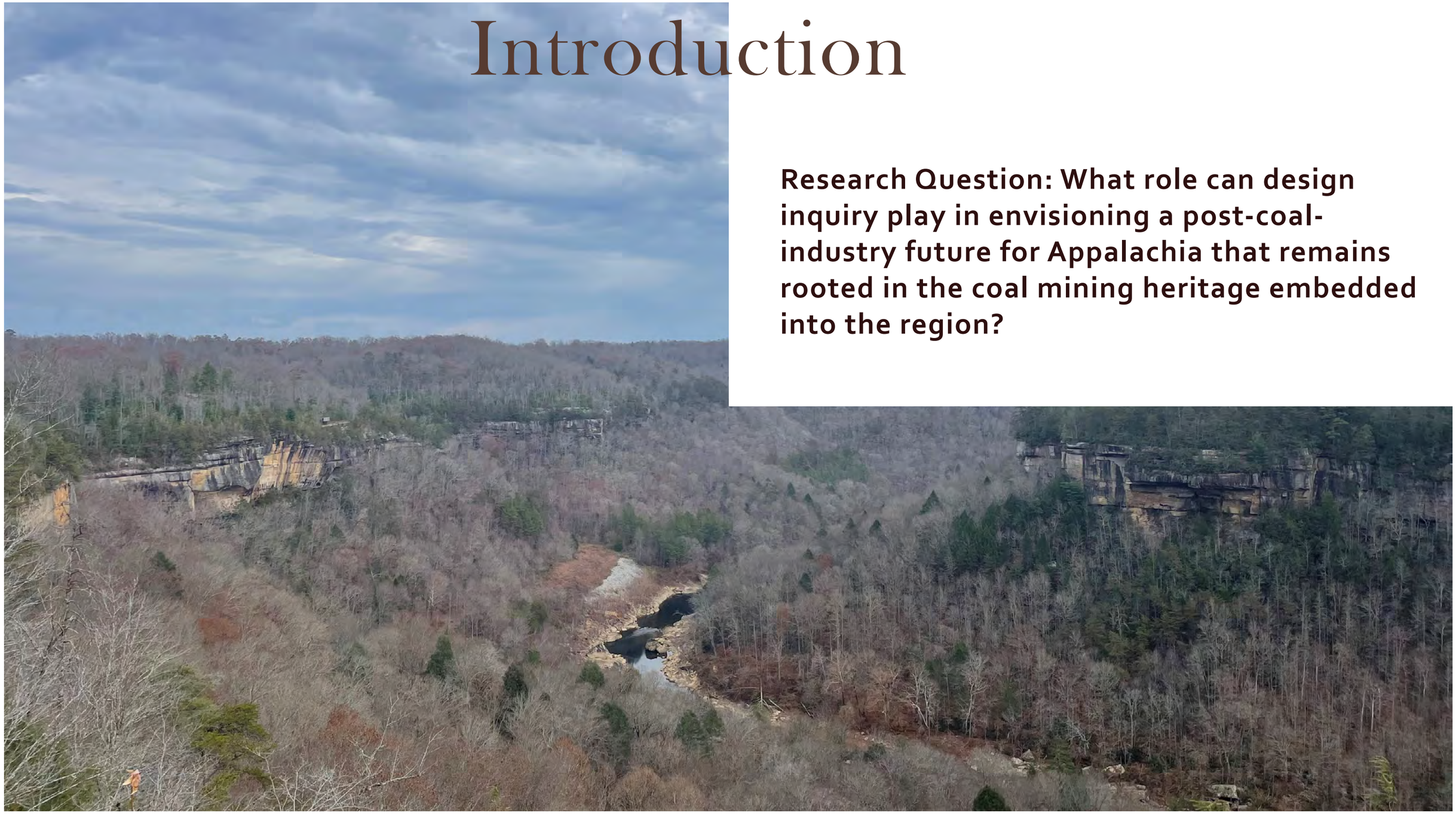
Introduction



Research Question: What role can design inquiry play in envisioning a post-coal-industry future for Appalachia that remains rooted in the coal mining heritage embedded into the region?

To reinforce is to strengthen an existing system. Coal mines are the existing system in Appalachia that fostered vibrant, prosperous mountain towns throughout the region. Coal mining heritage is the beautiful mountains with scars of stripped land sprinkled along its range. It is the coal mines that my great grandfather worked in. It is the quiet towns settled in the valleys that my grandmother has watched deteriorate. It is the lack of opportunity that forced my parents to leave. It's the post-mined land that my uncle now spends his weekends hunting on. It's the ghost of a booming past that fostered American prosperity and industry through hard work, community pride, and a functioning infrastructure. Appalachia was built and governed by an industry that is now nearly dead. As the rest of America progresses, the coalfields that fueled the nation's progress have been abandoned. Reductive stereotypes and negative perceptions of Appalachia have isolated the region in its time of need. In this paper, I explore provocative designs for a post-coal-industry Appalachia that are informed by qualitative research in historic coal mining towns. I will challenge current efforts and introduce new contemplative concepts from a speculative design perspective in hopes of showcasing the potential of post-coal industry Appalachia.

The Appalachian region is nestled in the southeastern Mountain range of America, stretching across seven states from New York to Mississippi. However, in this thesis, the term Appalachia refers to the coal country of Eastern Kentucky and Southern West Virginia, where most of America's coal mines are concentrated. The built environment of Appalachia was initially constructed to serve families associated with the coal industry. Coal production is the primary purpose underlying the overall design of Appalachia. However, coal production is no longer relevant, therefore, the region's design and infrastructure are losing their ability to support Appalachians. Since the 1980s, there has been a loss of 100,000 coal related jobs and emigration out of coal towns at a rate of 1100 people leaving each year (Nussey, 1, 2019). The Surface Mine Reclamation Act of 1977, which enforces the reclamation of post-mined land, pushed many independent coal operators into retirement during the 1980s, with no succeeding generation willing to face the new reclamation standards (Plass, 2000, 39). Only large coal companies continued to operate until recently, when coal companies started to go bankrupt. From 2018-2020, Appalachian coal production has dropped by 42% due to the termination of large coal companies that once ruled the valleys (Zipper, 2021, 341). The succession of coal companies filing for bankruptcy since 2015 has invoked anticipation for coal mining to soon disappear from the region entirely.

The gradual collapse of the coal industry has augmented historical issues of unemployment, poverty, substance abuse, political instability, and environmental injustice in the valleys. It has also contributed to the loss of municipal money, well-paying jobs, and auxiliary services that once created civic infrastructure in Appalachia. Remanence from abandoned coal mines and insufficiently reclaimed coal mines has increased erosion, water pollution, and flooding in communities. These social, environmental, and economic issues have fueled America's habit of defining Appalachia by its poverty, stagnancy and political affiliation relating to coal. Outsider attitudes toward Appalachia usually exhibit a sense of superiority and a savior complex, resorting to the tendency to "fix" the region, relying on a need-based design approach. However, this paper highlights the potential of Appalachia by portraying the seemingly detrimental presence of coal mining heritage as opportunities for the built environment, community and landscape.

The most common reclamation practice emerging in Kentucky and West Virginia is nature restoration. Nature restoration erases impacts of coal mining and turns the land wild again instead of replenishing the support that the coal industry provided Appalachia. Rather than viewing the infrastructure and development around coal as a detrimental impact on the land that must be removed, I plan to re conceptualize the remanence of coal mining as a functional infrastructure ready to be reinforced and reengaged with Appalachian communities. Designers should take advantage of the previously developed industrial systems on coal mine sites to serve a new function. Perhaps the abandonment of coal mining is not a problem to solve, but an opportunity to cultivate a redesigned Appalachia. Perhaps the environmental tragedy of post-mined land can become an eco-human opportunity (a philosophy that connects humans and ecology in a mutualistic relationship). To employ a richer, more optimistic view of the maligned region of Appalachia, I conduct research to identify what role does design play in envisioning a post-coal-industry future for Appalachia that remains rooted in the coal mining heritage embedded into the region?

By identifying the functional design heritage of Appalachian coalfields and reinforcing it through futuristic speculative design, opportunities within the perceived detrimental effects of coal mining can be conceived. In my project, I define functional design heritage as the function that a built environment was initially designed to serve. That initial purpose for development is embedded into the nature of the community, lifestyles, culture, and built forms despite whether it is still serving the original function or not. For example, the supporting infrastructure of Appalachia developed around and under the command of the coal industry. The motive to extract and transport coal informed the establishment of the railroad, the location of settlements, the layout of towns, the placement of roads, and land ownership. These instances are all still present in Appalachia today through the region's functional design heritage. My research identifies the results of Appalachia's functional design heritage and through design, presents it as an opportunity to serve a new function in the region's post-coal industry future.

I articulate this idea through speculative design imagery that argues the design potential of Appalachia's functional design heritage. Speculative design, as explained by Anthony Dunne and Fiona Raby, in their book "Speculate Everything" can be a tool for developing future ideals by pushing the boundary of reality. Speculative design is a space for exploring concepts or ideals through imagery, not necessarily constructing realistic design solutions. My work opens a discussion on visions of how coal mining infrastructure can be reused in the future. The design process that I construct and the images I present are a catalyst for displaying the potential hidden within Appalachia's coal mining foundation.

The Appalachian region is often overlooked. Much of the attention from innovation, green design, human centered design, and anticipated future development is focused on wealthy, urban areas. The display of my speculative designs initiate momentum for injecting the same level of design consideration and imagination for Appalachia's future that has been introduced to wealthy urban

areas . The language of speculative imagery can assert the potential of Appalachia even in its abandoned state.

The human experience of Appalachia has changed drastically in the past one hundred years. From one of the richest, most supported places in the country to one of the poorest, most deserted. The speculative design conceived in this thesis analyzes what systems supported such prosperity in the past and how those same systems can still support the region today in a more relevant 21st century design. It is my intention that such an optimistic, imaginative, and creative design approach to envision the future of Appalachia can communicate the potential of the region, reverse stereotypes, and build on the momentum of progress in Appalachia as it exits the coal era. The images I present argue that creative reuse of the existing conditions of Appalachian infrastructure developed around coal production can maintain the historic quality of Appalachia while helping the region develop beyond the coal industry.

The Dichotomy of Coal Mining

This method recognizes and utilizes the presence of coal mining in Appalachia as a driver for culture, heritage, and development. However, this is representative of the positive role of coal mining in Appalachian communities. It is important to note the negative role of coal mining on the environment. Coal mining is a detrimental practice, which explains why it is no longer heavily utilized in America. The nation's coal mining past is one of the most significant contributors to the greenhouse gas barrier causing extreme climate change worldwide.

The use of this method and the ideas presented in this paper do not encourage the reinforcement of such a hazardous practice. This paper recognizes the obvious environmentally detrimental effects of coal mining and its inevitable fall, and its presence in Appalachian culture. These detrimental effects of coal mining often act as a barrier for Appalachian advocacy and fuel negative perspectives that define the region as an evil environmental wasteland. This paper pushes public perspectives to analyze the role of coal mining beyond environmental effects- the effect that coal mining has had on Appalachian culture, economy, and lifestyles. Once research and the public eye can reach past the horrifying role of coal mining on the environment, and notice the role of coal mining in communities, Appalachia can better be understood, advocated for, and cherished as a region and valued as much more than the environmental effects it once created in the past.

Defining the Functional Design

In this paper, I use the term functional design heritage to describe the heritage design of a region that was developed to serve a specific function. Functional design heritage can be defined by identifying the historic intention behind the initial design of towns and regional infrastructure. The original development of Appalachian towns, as described in the case study historical presence section, was for coal production. That original motive to produce coal guided many design aspects of the region such as location of settlements, regional connectivity, road systems, building typologies, town layouts, and the resident lifestyle of coal miners that is still embedded into Appalachian culture today. This functional design served the region well for the first 200 years when coal production was booming, and towns were prosperous. Functional design heritage recognizes the prosperous past of Appalachia by identifying aspects of the design heritage that successfully served a specific function. Now that the function of coal mining is gone, the foundation for a prosperous Appalachia is not being utilized. Those aspects of the original design intention can be re-enforced to become relevant and functional again, in the contemporary context. It is important to recognize the functional design heritage of Appalachia in its state of abandonment. Reflecting on the prosperous past of Appalachia's coalfields and the intention behind the regions development can help convey the region's strong foundation that presents opportunities to be functional once again.

The Applied Method

The contribution of this thesis is the design inquiry I demonstrate for a region that has lost its main industry. The goal of the method is to discover opportunities within the existing conditions on the site, in its state of abandonment. The activation of existing conditions saves time/money/energy and embeds the site's heritage in its future designs.

The process begins with an immersion in the history of the region, back when it was functioning under an intended industry. During this review, researchers should notice developments designed to serve a specific function. Researchers should also conduct qualitative research at the site to identify instances that are a result of the industry. This is the site's functional design heritage. Speculative design can be used to explore ways that the functional design heritage can be reenacted to serve a new function in the future.

Literature Review

History of Coal Mining and Development in Appalachia

The Cause and Effect of Mine Closures

Appalachian Culture

Politics of Coal Mining

Current Efforts of Reclamation, Nature Restoration and Redevelopment

Feasibility of Developing on Post Mined Land

Post Industrial Design Theory

In order to discern design opportunities within Appalachia, there must be an understanding of the historical, cultural, industrial, and political context of the region. This literature review begins with an explanation of the history of coal mining as it relates to the initial development of Appalachia. An analysis of the historical eras of coal towns gives insight into the state of Appalachian towns today. Then, I review modern studies that explain how the closure of coal mines has affected the region today. Given the remote nature of the region, Appalachian culture is not commonly recognized by the rest of the nation and is often the subject of mistaken stereotypes. I draw from literature explaining Appalachian politics and culture to identify common misconceptions and gain an understanding of the region's sensitive cultural/political state. Next, I explore common efforts taking place on post-mined land through studies that measure the effectiveness of reclamation projects. Lastly, I include geotechnical engineering studies that highlight the reuse potential of post-mined land. A feasibility study asserts the development potential of Appalachia and validates design consideration of post-mined land.

History of Coal Mines and Development in Appalachia

The first settlements in the Eastern Mountain range were the Cherokee and Shawnee tribal communities until European settlers traveled to Appalachia (Appalachian Regional Commission). Company towns were the original infrastructure and development in Appalachia relating to coal. These settlements started as temporary camps for coal miners and turned into self-sufficient towns under the control coal companies. Shifflett explains the growth of company towns through three different phases spanning from 1880-1960. First is the pioneer phase in which immigrants and American men built temporary camps to mine nearby coal (Shifflett, 1991, 48-49). The temporary camps developed into established towns that anticipated urban growth. Families grew in these towns, necessitating schools, doctors, churches, and various other auxiliary services.

The second phase of development in company towns is called the paternalist phase because mine operators had control over the informal towns that developed to serve their mine (Shifflett, 1991, 48-49). Due to the remoteness of and lack of civic structure within company camps, operators abused the vulnerability of coal miners by not providing basic needs. Unfair pay, poor work conditions, and excessive company control lead to the formation of powerful labor unions in Appalachia (Gershon, 2015, 1). Paternalism shaped the settlement of these towns, causing racial, ethical and status prejudices to influence the master plan. These inequalities are reflected in the layout of Appalachian towns today. For example, the tendency for families with a lower socio-economic status to be settled in flood prone valleys traces back to the separation of coal miners and business operators in coal camps (Shifflett, 1991, 48-49). Lastly, the deteriorating phase, from the 1930s to today, is when company towns lose their prosperity as the coal industry fluctuates (Shifflett, 1991, 48-49).

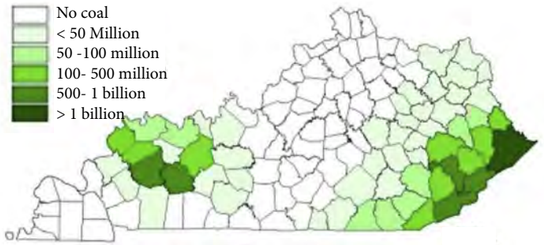
The Cause and Effect of Mine Closures

The initial downfall of coal and the exponential closure of coal mines gives insight into the physical, economic, and political state that Appalachia is in today. The closure of coal mines is largely due to the nation's decreasing demand for coal as an energy source. The high cost and difficulty of continuing coal mine operations compared to other emerging

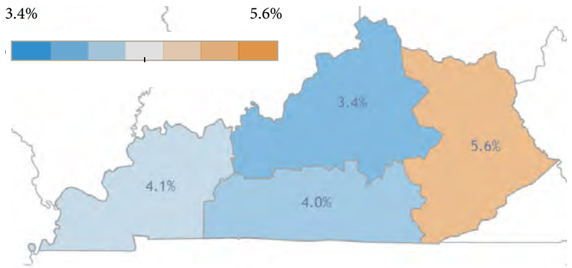
renewable energy resources makes coal mining no longer efficient or economical (US Energy Information Administration, 2020). The US Energy Information Administration states that any coal firing plants remaining will have to invest an unrealistic amount of money into their power plants by 2025 to comply with the Affordable Clean Energy Rule. It is expected that the majority of coal plants remaining today will retire before 2025 (US Energy Information Administration, 2020, 72). Throughout the past 10 years there have been bursts of increased coal mining following the ups and downs of the energy market's demand. It is important to note that coal exists in horizontal rows, called seams. So, each time there is a sudden increase in demand for coal, companies are motivated to spend the time and money required to dig into the next seam. When that demand is not sustained, the company does not make back the money that it just used to reach the next seam of coal (Hay, 1926, 189-196). These coal bursts have made coal mining unpredictable and an economic risk to operators, leading many companies into bankruptcy (Larson, 2020, 1). Furthermore, renewable energy sources have gained the ability to produce much more energy for lower cost and labor than coal plants (Zipper, 2021, 341). Our nation has reacted to the current environmental crisis by regulating fossil fuels and criticizing the use of coal. For these reasons and more, the coal mining industry is bound to soon disappear.

From 2010-2021, more than one third of Appalachian coal mines have retired with an exponential retirement projection through 2023. (Zipper, 2021, 340). Retirement has been, in most cases, forced by bankruptcy. A good example is Alpha, one of America's biggest coal producers with 150 coal mines and 8,000 employees in Appalachia. The company has reported almost $7 Billion in debt and plans to shut down all their mines. (Gale Onefile, 2015, 1). Limited funds prompt the question of if bankrupt coal companies will have enough money to properly reclaim all closing sites at once.

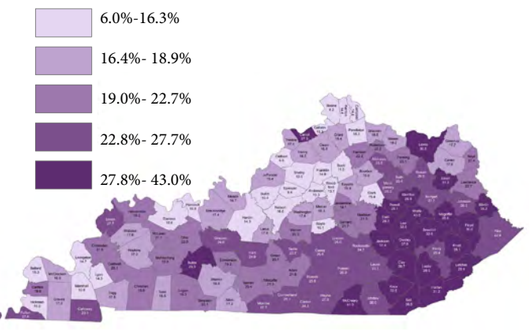
Residential proximity to coal mines is associated with socioeconomic and environmental injustices. While many Appalachian natives have left or been displaced, extreme poverty and remoteness prevents people from leaving. Those who stay are subject to a higher chance of substance abuse and poor health (Zipper, 2021, 330). Increased unemployment since the collapse of the coal mining industry can explain the presence of mental illness and low productivity in the Appalachian region (Chamberlain, 2014, 33). Residents living near coal mines are a vulnerable health population and face the risk of exposure to pollutants. This is due to the failure of coal mines to properly clean up the site and mitigate exposure to nearby residents (Surber, 2018, 1571). In 2022, Eastern Kentucky experienced the most devastating flood in state history with 39 casualties and demolished towns. Speculation that the extreme flooding was due to erosion from previously mined land is still being evaluated in court (Christian, May, Levy, 2023, 2-4). The correlation between coal mines, unemployment, poor education, and substance abuse is demonstrated in the Kentucky state statistics below. In figure one you can see the gradient changing from east- west in each map. (Figure 1)



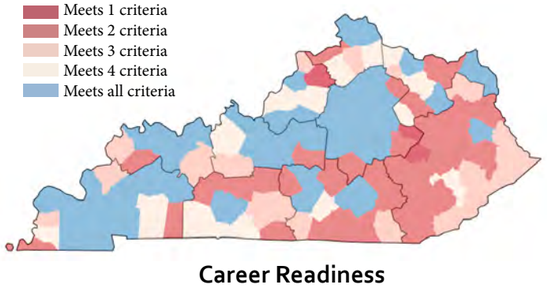
Coal Production
In tons from 1790- 2001



Unemployment
in march 2023



Poverty
percent of population living in poverty



Career Readiness
based on Kentucky educations career readiness criteria

(Figure 1)

https://kystats.ky.gov/Reports/Reports

Appalachian Culture

Despite the social and environmental issues associated with coal mines, Appalachian people have great pride in their heritage and a very distinct culture that is often misunderstood. The Urban Appalachian Community Coalition, an advocacy group, deciphers true Appalachian culture from common stereotypes and media portrayals. The stereotype of white, backwards, inbred, welfare dependent, uneducated, violent mountain people was created by outsiders around the time of the American Civil war to justify taking Appalachian land. Most Appalachians were unionists and avoided the confederacy that was starting to dominate the south. Many small towns in Appalachia were interracial, allowing black students to attend schools and overlooking segregation laws that the rest of the states (Kentucky and West Virginia) enforced. This is reflected today in the general tendency for Appalachians to distrust the government and desire to live individually. The geography of the region has isolated Appalachia and sheltered their true culture from the rest of the country, allowing negative stereotypes to persist. The Appalachian Community Coalition presents their cultural values as "love of the land, strong family ties, religion, and sense of justice" (Urban Appalachian Community Coalition website).

A cultural study shows that residents in the coal fields hold a strong value in traditionalism, which entails upholding historic values and behaviors through generations. This is reflected in the historical presence of coal mining throughout generations of men. Coal mining is a generational occupation and a way of life that families continue to engage in whether the mines are operating or not (Usenick, 2019, 860). The vibrancy of bluegrass music, storytelling, folklore, Appalachian arts and crafts, home grown cooking, and community traditions often do not reach the public realm outside of the

_mountains, making the traditions and culture of the region very private and personal to those who have roots in the area.

Politics of Coal Minning

Despite the decreased demand for coal, Appalachian politics seem to deny the fact that coal is a dying industry. West Virginia and Kentucky state leaders remain loyal to the coal industry, creating campaigns such as "friends of coal". President Trump promised to "bring back coal and put the miners back to work" in the 2016 election, but the coal industry continued to decline during his presidency (Lipton, 2020, 1). These politicians and their supporters are acting out of fear of losing the industry that Appalachian state's economy and job market depend on. United States House Representative David B. McKinley believes coal must maintain a presence in the energy industry to avoid leaving West Virginia vulnerable. West Virginia Senator Joe Manchin has "spoken out against the Clean Power Plan since day one" by calling it a "failed policy that hurt West Virginia." (Usenick, 2019, 859). It is concerning that politicians are using Appalachia's state of fear to gain support for their platform that in the end, cannot alter the downward trajectory of the coal industry.

Current Efforts of Reclamation, Nature Restoration and Redevelopment

A legislative act addressing the ecological impact of coal mines is the Reclamation Act of 1977 which enforces the clean-up of mined land. The mission of the mine reclamation process is to restore post-mined land and prepare it for its specified "best reuse". The process depends on site factors but typically requires covering excavated areas with soil or overburden, and grading and revegetating the land surface to mimic the original contour (Plass _2000, 39). However, the SMRCA has not always been effective in holding coal companies accountable. By the mid-1960s, approximately 3600 km2 had been surface-mined for coal in the seven Appalachian states; but more than 60% of those mined areas were described as having experienced reclamation that was not "adequate" to mitigate negative effects (Zipper, 2020, 55-83). SMRCA previously allowed companies to self-bond by ensuring they have the equipment and assets to mined land once the business retires. However, bankruptcies and cases of forfeiture from coal companies hinder adequate reclamation and allow coal companies to escape reclamation responsibilities (Larson, 2020, 13).

Reclamation legislation harmonizes with nature restoration projects. The most routine projects that take place on post-mined land are reforestation and hayland/pastureland which is usually the original use of the land before mining (Zipper, 2021, 167-188). The economic motive behind forest restoration is to harvest marketable timber or sell carbon sequestration credit to California companies. However, those eventual sale revenues would occur far into the future (Zipper, 2021, 167-188). Reclaimed mines can support livestock by reconstructing the landform, replacing the topsoil, and fertilizing it to suit livestock (Zipper, 2021, 167-188). The economic advantage for farmers is post-mined land's low land rental cost. However, that advantage may be offset by higher operating costs caused by lower animal densities, repeated fertilizations, costs of dealing with invasions by unwanted non-native plants, and management and fencing difficulties imposed by terrain (Zipper, 2021, 167-188). The high rock content in post-mined soil is not ideal for livestock. Furthermore, livestock require proximity to a suitable water source and water near mines is often too acidic for animals (Zipper 2021, 167-188).

An example of built infrastructure that has been constructed on reclaimed land is industrial parks. Industrial parks built on old mines can be iron works, cellphone technology centers, and steel industrial parks. A 2003 evaluation of 4 industrial parks on reclaimed mines in Appalachia presents many social benefits to the region. The industrial sites in the study were built on brownfield sites that were previously coal mines. In the 2003 study comparing housing development, business incubator, industrial parks, and telecommunications, industrial parks were the most successful projects for creating and sustaining long term jobs. However, they do not address the environmental degradation previously caused by coal mines (Appalachian Regional Commission Infrastructure and Public Projects Report, 2007, 1).

Another development on post-mined land that is gaining popularity amidst the climate crisis is climate infrastructure. A coalition called Reimagine Appalachia aims to create local wealth by modernizing the energy grid, building a sustainable transportation system and introducing sustainable manufacturing to Appalachia (Reimagine Appalachia 2023, 1). Six coal mines in Virginia were transformed into solar energy installations as a model for similar sites throughout Appalachia (Annman, 2022, 1).

Feasibility of developing on post-mined land

Appalachia presents an opportunity to develop buildings, however, building on post-mined land is an engineering concern. The soil on top of underground mines is prone to differential settlement if built on (the ground foundation caving in and altering the position of the building). Erosion and building stability is a concern when building on top of surface mines. However, as Appalachia navigates what to do with post-mined land, research is devoted to finding ways to safely and successfully develop on reclaimed land. Engineers present ways that structure tolerance, foundation alternatives, and building design features can prevent issues of settlement and erosion on post-mined land (Kerbs, 2009, 5). Within the BIM (Building Information Modeling) architectural toolbox is a model for measuring the factors that contribute to settlement in a building on a mine site such as using a measurement for the compaction of mine spoils to assess a site's predicted settlement (Little,2008, 41-52). Another study offers building form constraint and mined land preparation strategies that will minimize differential settlement issues in the future. (Zipper and Winter,1997, 1-8). These sources prove the increasing feasibility of safely and successfully building on reclaimed coal mine sites in Appalachia.

Post Industrial Design Theory

Lastly, I review literature that explains theories on postindustrial design. Terrain Vague and Drosscape are two that present abandoned, post-industrial, and brownfield sites as a central concept for design imagination. These theories place relevancy on post-coal mine sites, as spaces that should be considered when designing on the regional scale. Terrain vague: The Edge of the Pale, specifically, demonstrates the power of photography to convey the potential on abandoned sites and discover design opportunities (Sola-Morales, 50, 1995). In Drosscape: Wasting Land in Urban America, Alan Berge describes the Drosscape as " pedagogy that emphasizes the productive integration and reuse of waste landscapes throughout the urban world" (Berger, 2006). This theory argues that areas of previous development or use should be re-used and design should make them relevant once again instead of neglecting them and wasting the productive potential on the sites. Though Appalachia is not an urban environment, coal mines present an opportunity through these theories.

Research Methodology

This research methods section of the paper outlines my research to discover design opportunities within the historical development of coal mining in Appalachia. My research is encompassed by a trip to Eastern Kentucky coal country, a reliable representation of coal mining's presence in Appalachia. My research is formatted as a case study of Whitley county in which I rely on qualitative research methods to identify the functional design heritage of coal mining in Appalachia. First, I will explain the method that I have constructed. Then, I will introduce the case study on which my method is applied. Then, I will explain the qualitative research methods I employed to draw information related to the functional heritage of coal mining. Lastly, I will describe the connection between my research and the speculative designs I created to argue the role of design in envisioning Appalachia's future.

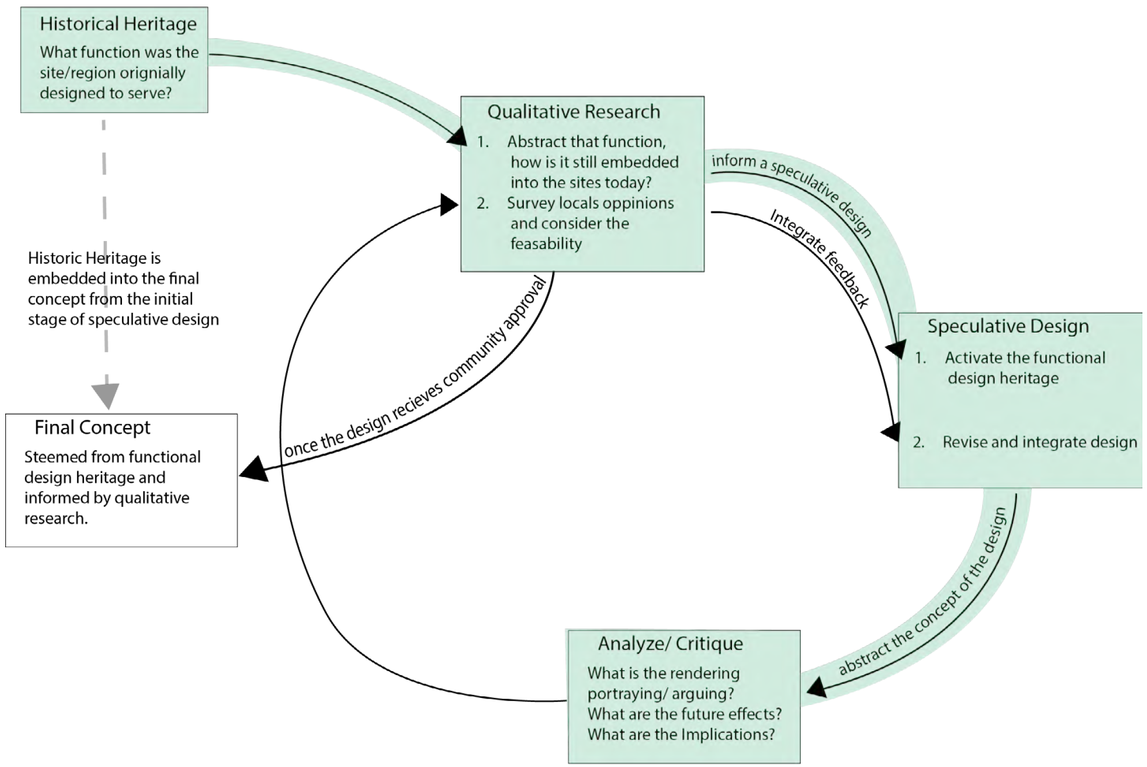
Circular Methodology
Case Study
Qualitative Research
Speculative Design

Circular Method

Methods of design inquiry, by nature, start out very theoretical. However, design inquiry needs to be grounded in a circular method to ensure actual future impacts and results. In this paper, I demonstrate the first four steps (highlighted in green) of this method which aims to utilize the functional design heritage of a place. The process continues by allowing locals to critique the speculative designs and inserting more feasibility and reality into the design idea each time it undergoes this circular process. The method ends when a final design that ideally has been agreed upon by locals. That final design will have the historical heritage embedded into it from the beginning of this process.

The circular method begins with a study of historical heritage and existing conditions of a region: the region's functional design heritage.

This circular method results in plans and design concepts that stemmed from a functional design heritage analysis and underwent critical analysis of imaginative speculations. The process of pairing functional design heritage with speculative design throughout the process gives space for important design exploration that is theoretical and explores concepts rather than technical plans. Those concepts and design exploration findings are rooted in the final design that results from the method as it slowly filters out imagination and inserts reality, resulting in a final design that is well thought out, rooted in the region's heritage/ culture, and the most productive/ sustainable solution.



First 4 steps

1. Acknowledge the Historical Heritage

What has functioned well in the past?
What was the functional intent behind developments and designs?

+

2. Survey the existing conditions through qualitative research

What is a result of the previous functioning industry?
What is available for reuse?

Embody the sucessful functions in the past

Turn into design opportunities

=

3. Inform a speculative design

Explore the re-activation of elements in the past.

Reinforce existing conditions

↓

4. Analyze and critique the implications of speculative concepts

=

Build momentum for design inquiry within the precieved detrimental affects of an abandoned industry

(Figure 2)

This higher-level critique and design inquiry should be implemented in Appalachian contemplation considering the problem-solution method that is currently being applied to Appalachia's future. During my time spent in Eastern Kentucky, talking to locals, I realized the reality of many of the problem-solution methods presented in research:

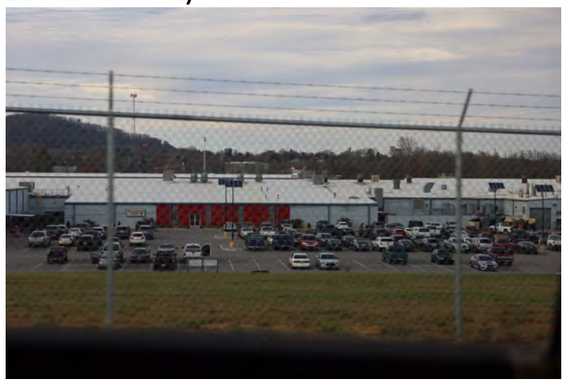
Eastern Kentucky's Higher ground community plan

Problem: Flooding
Solution: Place houses on top of mountains

The Reality:

Jeff Fugate, Design professor at the University of Kentucky, explains how the Higher Ground Community plans need more design intervention- in collaboration with the engineering firm to integrate culture and heritage into the design that is focused on solving the issue of flooding.

Firestone Electric car battery factory expansion in Eastern Kentucky



Problem: Unemployment
Solution: Build sustainable technology factories in rural Appalachian towns.

The Reality:

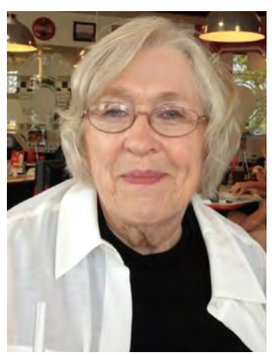
"They already can't hire enough people to run that factory as it is, I don't know where they'd find the people with the skill to fill another one. There's more jobs than people willing to work 'em. The income potential here is low. The people that are staying here are the people who can't do anything else anywhere else." -Skip Walden

University of the Cumberlands, Williamsburg, KY

Problem: Lack of education
Solution: Build a university in town

The Reality:

"I guess they was hoping that people will become professionals and come back to help Eastern Kentucky, but most don't stick around."
- Virginia Walden



Though many of these solutions are praised in research, the problem-solution framework presented in these Eastern Kentucky efforts is very elementary and do not exhibit design inquiry. These efforts isolate an issue that has historically developed in Appalachia and create an isolated solution that only emphasizes Appalachian struggles and places a temporary band aid over one problem-area. When developing Appalachia, the entire region needs to be considered because these problems are not isolated- they are integrated together in one regional context. The isolation of efforts comes from the tendency to define Appalachia by its range of issues. The issues can be categorized such as unstable economy, substance abuse, lack of education, unemployment. That causes efforts to pick one category and isolate it to find a solution. My method presents the opposite approach of focusing on the historical development, the region as a whole, and investing in the opportunities discovered in the functional design heritage instead of emphasizing issues.

Defining the Functional Design Heritage of Appalachia

In this paper, I use the term functional design heritage to describe the heritage design of a region that was developed to serve a specific function. Functional design heritage can be defined by identifying the historic intention behind the initial design of towns and regional infrastructure. The original development of Appalachian towns, as described in the case study historical presence section, was for coal production. That original motive to produce coal guided many design aspects of the region such as location of settlements, regional connectivity, road systems, building typologies, town layouts, and the resident lifestyle of coal miners that is still embedded into Appalachian culture today. This functional design served the region well for the first 200 years when coal production was booming, and towns were prosperous. Functional design heritage recognizes the prosperous past of Appalachia by identifying aspects of the design heritage that successfully served a specific function. Now that the function of coal mining is gone, the foundation for a prosperous Appalachia is not being utilized. Those aspects of the original design intention can be re-enforced to become relevant and functional again, in the contemporary context. It is important to recognize the functional design heritage of Appalachia in its state of abandonment. Reflecting on the prosperous past of Appalachia's coalfields and the intention behind the regions development can help convey the region's strong foundation that presents opportunities to be functional once again.

The Applied Method

The contribution of this thesis is the design inquiry I demonstrate for a region that has lost its main industry. The goal of the method is to discover opportunities within the existing conditions on the site, in its state of abandonment. The activation of existing conditions saves time/money/energy and embeds the site's heritage in its future designs.

The process begins with an immersion in the history of the region, back when it was functioning under an intended industry. During this review, researchers should notice developments designed to serve a specific function. Researchers should also conduct qualitative research at the site to identify instances that are a result of the industry. This is the site's functional design heritage. Speculative design can be used to explore ways that the functional design heritage can be reenacted to serve a new function in the future.

1. Acknowledge the Historical Heritage

What has functioned well in the past?
What was the functional intent behind developments and designs?

2. Survey the existing conditions through qualitative research

What is a result of the previous functioning industry?
What is available for reuse?

Embody the sucessful functions in the past

Turn into design opportunities

3. Inform a speculative design

Explore the re-activation of elements in the past.

Reinforce existing conditions

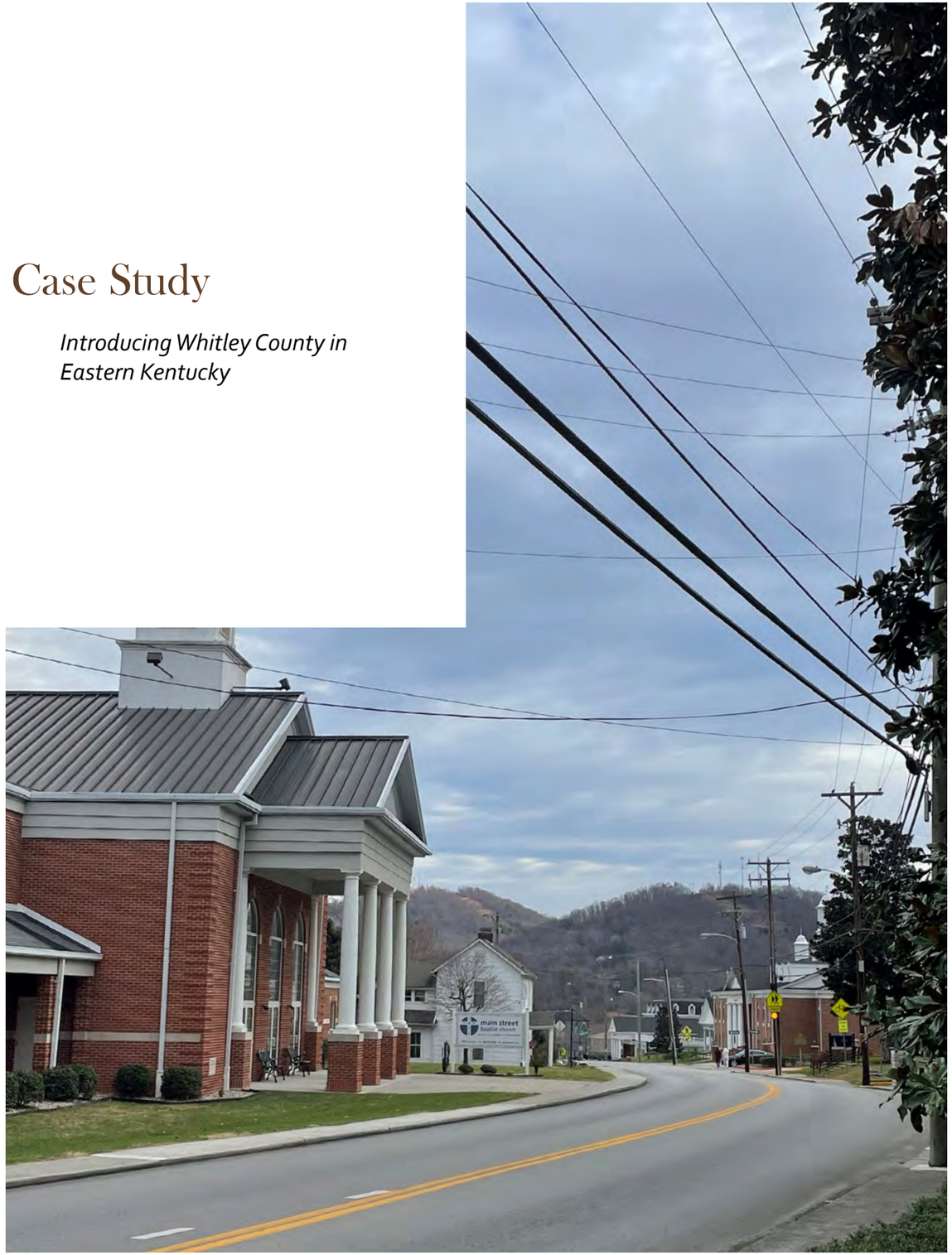
Analyze and critique the implications of speculative concepts

Build momentum for design inquiry within the precieved detrimental affects of an abandoned industry

(Figure 2)

Case Study

Introducing Whitley County in Eastern Kentucky

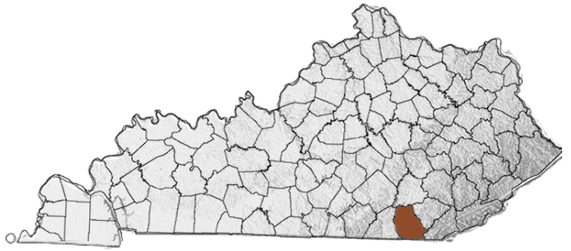


I conducted my research in Whitley County, a coal county in Eastern Kentucky. Whitley county was established in 1818 due to the Gatliff coal mine expansion. The development of the L /N railroad in 1833 was the largest contributor of growth to the county (Whitley news, 2021). The most developed town in Whitley County is Williamsburg with a population of 36,000. The surrounding settlements around Williamsburg are often called "the holler". These are small communities in the valleys between coal mines. During the 1900s, Whitley County had 62 coal mines, employing 5,362 total employees (Kentucky Coal Education).

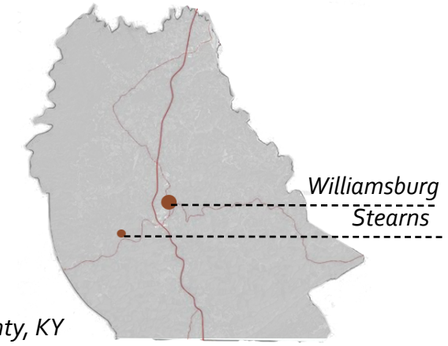
This case study explores the past, present, and future of Whitley county. Part of identifying functional design heritage is considering what the sites once were, compared with how they function now, in order to conceptualize the future. This wholistic analysis grounds future ideas in the history of the site.

My research begins with an immersion into the prospering past of Appalachian towns through historical documents discovered in Whitley county's archive. Then, I explore the present state of Appalachia through collages of my experience visiting six sites. Annotations of these collages reveal aspects of the functional design heritage. My analysis of the current state of Appalachia reveals how coal mining has influenced the Appalachian region today as it loses its founding function. Each site visit's annotations correlate to an aspect of the speculative designs that I created. Lastly, I compare my speculative designs to the Kentucky state government's Eastern Kentucky development plans. Consideration of the past, present, and future helps designers explore ways to enact that functional design heritage.

The United States of America



The State of Kentucky



Whitley County, KY

(Figure 3)

Acknowledge the History

Analysis of historical documents of Whitley county

Historic photo collage

Cumberland avenue, Middlesboro, Ky., today, with Cumberland Gap in the distance

Photos and copies by Dan Cravens

Boom Town and Bust

Settled, commonplace, and nearly anonymous, Middlesboro, Ky., has almost forgotten the 20-million-dollar project at Cumberland Gap that lifted hopes high for three short years

By Bill Woolsey

Alexander A. Arthur, the promoter with entree to London drawing rooms and London financiers

FLOOD, fire and pestilence have swept through the one-time boom town of Middlesboro, Ky., in Biblical proportions. Financial panic and wanton killings marked the 60-year-old city's adolescence.

Adversity, however, has neither reduced Middlesboro to a ghost town, like florid and fabled Leadville, Colo., nor made it a living legend, like San Francisco. Instead, for all its extravagant youth, Middlesboro has become settled, middle-aged, commonplace—and very nearly anonymous. Its few remaining pioneers are too busy running for elective office or managing successful businesses to reminisce about the $20,000,000 boom that, although it lasted only from 1889 to 1891, stirred the hopes of industrialists, promoters and bankers in New York and London and made men dream of a manufacturing city of 150,000 at the foot of Cumberland Gap.

Vice and crime stained those ambitious early years. Middlesboro's raffish element flourished in a district known as "over the Rhine," supposedly named after a red light section in Cincinnati, and violence flared in the mining areas outside of town. In the bloody battle of the "Quarter House," a blind tiger in coal-rich Mingo Hollow, most of the feudists in both attacking and defending forces were wiped out.

Today's citizen comments less on such frontier shenanigans than on the scenery of his mountain-rimmed city, the two Rhodes scholars it has produced and the playwright it once sheltered—Owen Davis, who won a Pulitzer prize in 1923.

Coal, iron ore and blast furnaces were to have made Middlesboro rich, populous and famous after the example of Birmingham, Ala., but the promoters of the bubble went broke and the iron ore ran out. Only the coal mines have continued in operation. They are, to a great extent, the backbone of the city's economy today.

WHILE it lasted, however, Middlesboro's honeymoon with high finance was an exhilarating experience. City lots in a cornfield brought $410 a front foot; railroads invaded the quiet mountains; British peers and famous Americans came to see the miraculous transformation of the backwoods valley into another Pittsburgh; a million dollar resort hotel mushroomed in the shadow of the peaks where Tennessee, Kentucky and Virginia meet.

In 1888, a year before the boom began, Cumberland Gap was a corner of the nation little altered by the passage of 135 years since a Virginia physician turned land speculator, Dr. Thomas Walker, wrote down his discovery of the Gap in his journal and noted that coal abounded on the banks of Yellow creek.

The historic but barely passable Wilderness

(Continued on page 18)

THE NASHVILLE TENNESSEAN MAGAZINE, DEC. 4, 1949

FIVE

(Figure 4)

In my grandmothers storage, I came across a story published in the local newspaper, The Cumberland Echo, on December 4, 1949, called "Boom Town and Bust". This article explained the historical development of Middlesboro, a town outside of Williamsburg- how it became a bustling city, how it almost disappeared, and why it was able to make a comeback in the 1940s. The article highlighted the boom/bust pattern in Appalachian towns dependent on coal mining. I found relevancy in the history of Middlesboro that illustrated how industries determine the placement and design of urban centers and once that industry is gone, the urban foundation can continue to serve residents in a new way.

The story starts with a geologist's discovery of coal at the site of Middlesboro, back when it was just a wild mountainous landscape. Once a land speculator wrote down in his discovery that "coal abounded in the banks of the Yellow Creek", companies raced to purchase land, "railroads were their immediate concern. They financed a rail line from Knoxville (city in Tennessee) to the coal fields of Eastern Kentucky. Louisville and Nashville railroads were soon extended into Yellow Creek as well." Middlesboro was the center of "a region… stuffed, one may say, with coal, streaked with iron, abounding in limestone, covered with superb forests, on the eve of an astonishing development… a dozen (rail) roads, projects or in progress, are pointed toward this center. It is a race for the prize." The future development was anticipated to "break like a storm over the quiet valley…. The quiet of the valley was doomed."

Descriptions of how Middlesboro would be formed and connected to the rest of the region informed my understanding of the functional heritage of coal towns. For instance, "laborers straighten the twisting bed of Yellow Creek by digging a canal through the townsite… A reservoir, big enough to serve a community of 150,000 and costing $750 was created 2 miles south of town by damming the waters of Yellow Creek. Arthur (a developer) circles the city with a belt line railroad to serve the coal mines and industries he expected to develop at the edges of the valley". "Overnight, Middlesboro became one of the most cosmopolitan towns in the land… Tied in with the long-range development of Middlesboro was… the idea that Middlesboro would be the industrial town" (with more residential surrounding towns). "Railroads invaded the quiet mountains, British peers and famous Americans came to see the miraculous transformation of the backwoods valley into another Pittsburgh." When the mountains were too treacherous to build a road over, tunnels were dug that connected Middlesboro to urban centers. The simple discovery of coal motivated settlement and urban development in the mountains.

Workmen who completed bridge across canal, dummy engine in background

The article takes a sharp turn when it states, "But if Middlesboro went up like a gas balloon, then it came down like a lead balloon." A fire burned the business center, and investors lost hope of the town's future. "a year later, Middlesboro had taken on the vacant look of a ghost town. Factories were abandoned, the great future the backers of the town had dreamed of had evaporated and the population had wilted to fewer than 4,000." The article credits the recovery of Middlesboro to "a few hearty souls who... had faith to stick it out... Middlesboro has been resurrected into the business center it is today (1949) " they reasoned that "Any town that once had boomed like Middlesboro, sure had some spark left". This is exactly what I argue with my research to uncover opportunities in the abandoned state of Appalachia and create designs that demonstrate the potential held in the historical presence of these towns.

The city hall stood above bridge in background at the lot sale, May 30, 1890

This article was written when Williamsburg was riding the success of coal mining. Only after the collapse of the coal industry, can I connect the Boom/ Bust pattern described in this 1949 article to Williamsburg and towns throughout the Eastern Kentucky Region that are now in their downfall with the decline of coal. I found it most interesting that the article stated: "The celebrants... gave no thought to the hangover after the party. In this case however, the hangover lasted for 50 years.", demonstrating how remote towns are in their dependencies to certain buyers/ investors. At the time this article was written in Williamsburg, I could envision that no one was anticipating the development of renewable energy that would diminish the demand for coal. Even in the instability of Middlesboro, coal mining continued to support the town- "Coal, iron, ore, and blast furnaces were to have made Middlesboro rich populous, and famous... only the coal mines have continued in operation. They are, to a great extent, the backbone of the city's economy today (1949)." Now that coal mining is no longer the backbone of Middlesboro, there must be a new capital employed from the foundation of the town that was designed with the momentum of a "booming town".

Arthur, top left in "boater" with English promoters in saddle of Gap

Now that coal mining is no longer the backbone of Middlesboro, there must be a new capital employed from the foundation of the town that was designed with the momentum of a "booming town".

The development of these Eastern Kentucky towns, as demonstrated in the story of Middlesboro, anticipated growth with a sturdy economy due to the financial stability of coal mining occupations. The future that Appalachia envisioned was one of prosperity and growth- the infrastructure, urban planning, and landscape anticipated urban growth tied to industry. "The industrial size goes back to the early days when its builders had visions of a large industrial city, which, in time might occupy the whole valley. So the planners laid down zoning restrictions, ruling that, for instance tanneries should be on the west side, founders on another side and so on". Even though this vision did not fully come to fruition, the foundation still stands- ready to serve the next boom in Appalachia.

These newspapers give a primary perspective on the power and influence that coal once had over the Eastern United States. This newspaper article proves coal mining's role in the development of Eastern Kentucky. The towns were built to serve the purpose of coal mining, and they did for a period of time. This article proves the functional intent behind the design of Appalachian towns.

Historic Photo Collage

Figures x-y present a photo collage of four out of the six sites I visited. The base layer, in color, is photos I took on the site visit. The historic photos in black and white are of the same sites in the 1800s. The historic photos are from the National parks historic photos gallery. These images demonstrate the coal mining heritage that persists through time even once the industry is gone. The activity in the historic photos gives a sense of the potential embedded in the foundation of these sites that are now stagnant.

Black and White Image

Barthell Coal Camp Church circa 1970s

Stearns Logging Camp Shack, National Parks Service Historic Photos , 1970, https://www.nps.gov/media/photo/gallery.htm?id=396F982F-1DD8-B71C-070A03E295B87C6B

Color Image

Barthell Coal Camp Church current day

(Figure 5)

Black and White Image

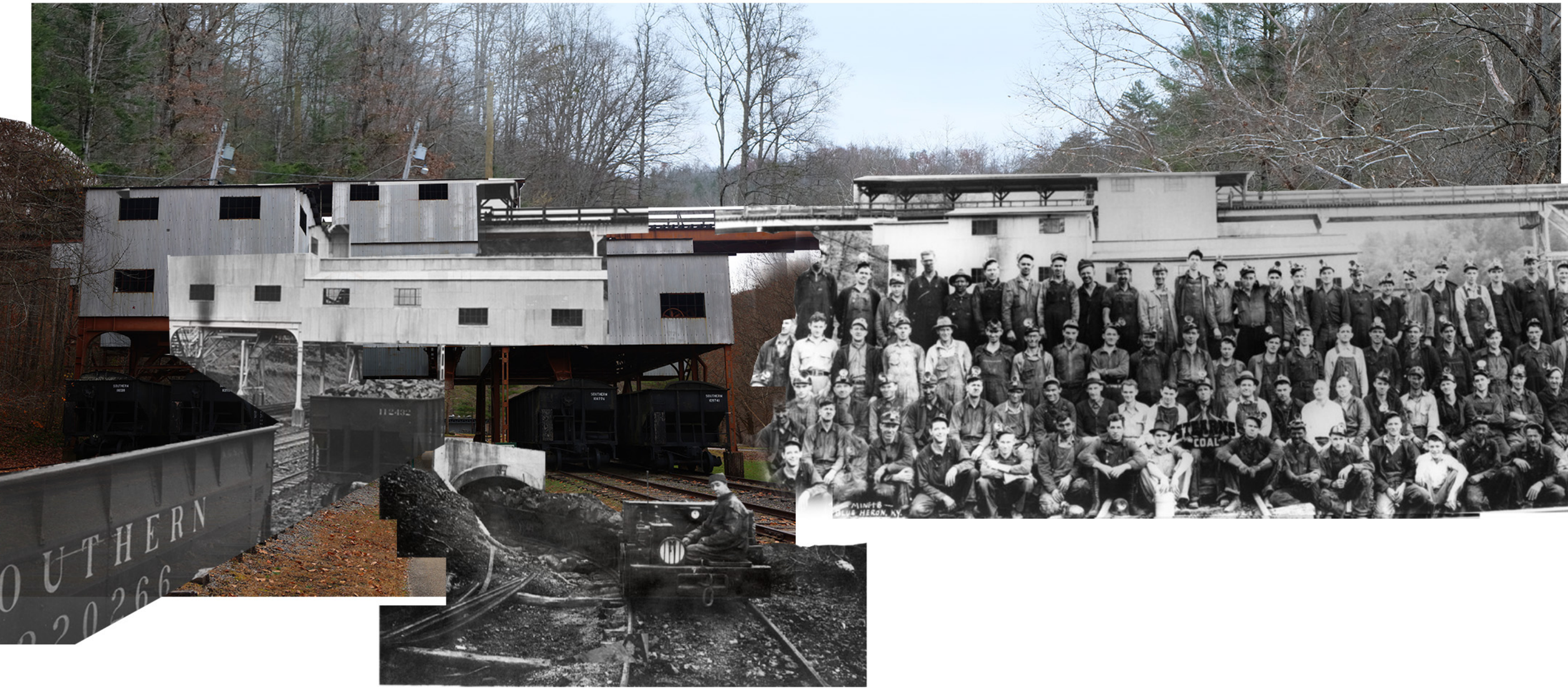
Barthell Coal Camp circa 1970s

Blue Heron Coal Mine Gallery, National Parks Service Historic Photos , 1970, https://www.nps.gov/media/photo/gallery.htm?id=396F982F-1DD8-B71C-070A03E295B87C6B

Color Image

Barthell Coal Camp current day

(Figure 6`)



Black and White Image

Blue Heron Tipple Bridge circa 1970s

Mine Shift Group Photography, National Parks Service Historic Photos , 1970, https://www.nps.gov/media/photo/gallery.htm?id=396F982F-1DD8-B71C-070A03E295B87C6B

Color Image

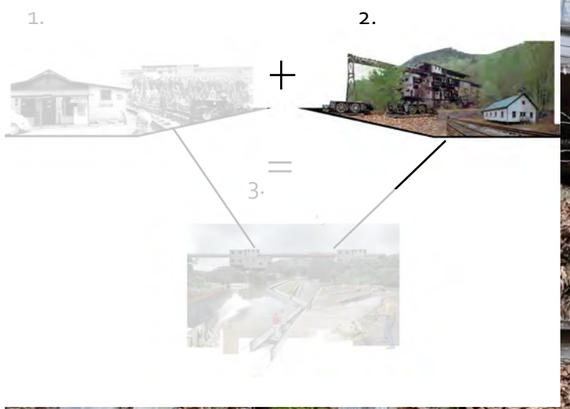
Blue Heron Tipple Bridge current day

(Figure 7)

Survey the Existing Conditions through Qualitative Research

Theoretical Frame Work:
Asset Based Design Approach

Methods:
A. Participatory Research
B. Interviews
C. Observational Research on 6 sites



Asset-Based Design Approach

Expanding Archiecture- Design
by Amanda Henler- Voss and Seth Hendler-Voss

The first theory that inspired my opportunistic research efforts is the Asset-Based Design Approach. The Book "Expanding Architecture- Design as Activism" presents innovative design approaches to serving a community. The asset- based design approach by Amanda Hendler- Voss and Seth Hendler- Voss "empowers communities that are not cash-rich, but many possess many other resources" (Hendler-Voss, 2008, 124). Traditional community development follows the need-based design model, which focuses on solving issues within a community. The asset-based design approach searches for the strengths and opportunities within a community rather than identifying problems to solve. Jane Flora, the author of "Rural Communities", states that the assets-based design approach is most appropriate for rural communities because they have different community needs than urban areas that the need-based design approach is customed to. According to Mcknight, services that focus on need based approaches can disable rural communities by overlooking the capacity of the people, places, and systems already in existence to solve problems themselves.

Voss explains two essential steps to the asset-based design approach: Immersion and inventorying capacities instead of listing needs (Bell and Wakeford, 2008, 126). I have been immersed in Appalachia coal country by growing up with my family in Eastern Kentucky. I inventory capacities by identifying the functional design heritage of Whitley County. I expand this process by investing in the assets (or functional design heritage) that I identify through speculative design intervention. Through speculative designs, I utilize aspects of the functional design heritage identified in Whitley County.

A. Method: Participatory Research

6 Days in Whitley County

I stayed in my grandmother's house in Williamsburg Ky for 6 days as an act of participatory research. During this time, I engaged in day-to-day activities with my grandmother and wrote down observations throughout my experience. The drive to Williamsburg crosses the entire state of Kentucky, exposing me to the highway system and transportation infrastructure within the broader Eastern Kentucky Region. I traveled through communities across Appalachia to arrive in Williamsburg. Throughout my travels, I noticed characteristics of the broader infrastructure of Eastern Kentucky, especially the transition from the metropolitan West to the mountainous Eastern part of Kentucky.

B. Method: Interviews

Casual Conversations with Family Members and Design Professionals

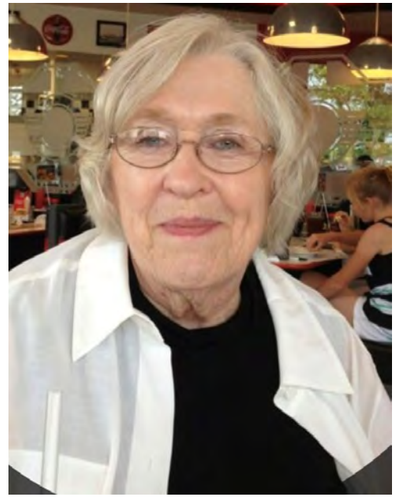
During my time in Williamsburg, I engaged in unprompted conversations with family members that revealed their experience living in Whitley County their entire life. The overall takeaway during these conversations was pride and passion for the Eastern Kentucky community, contrasting the typical Appalachian interviews I have seen on the internet. Typical interviews of Appalachians ask questions that imply a negative answer instead of opportunistic inquiries such as "why do you love living in rural Appalachia? What are the strengths of your community". This extremely positive and compassionate attitude locals had toward their community inspired me to utilize the asset-based design approach and argue the potential in Appalachia's coal mining heritage.

Skip Walden, Whitley County resident and active community member

My uncle skip offered to drive me around Whitley County to see the changing infrastructure. He showed me a variety of coal mines (abandoned, reclaimed, and still operating) and adjacent settlements with stories of his experience interacting with the sites. Skip is very integrated in the community, often facilitating fundraisers, bible classes and community events for Whitley County. He has friends that are miners, hold high positions as operators, and own post-mined land. His perspective was very valuable to understanding the connection between residents, the infrastructure, and coal mines.

Jeff Fugate, Associate Professor and Program Director for the Urban & Environmental Design Program at the University of Kentucky's School of Architecture.

I also interviewed Jeff Fugate, a design professor from the University of Kentucky that grew up in Eastern Kentucky. His professional perspective and personal perspective on the role of design in Appalachia's future inspired my speculative design focus. He introduced me to the state's future development plans in Eastern Kentucky and offered his opinion on the role that design plays in envisioning future development in Appalachia.



Virginia Walden, Whitley County resident and passionate historian

My grandmother, Virginia, grew up in Eastern Kentucky with her father who worked in the coal mining industry. Virginia is very interested in southern culture and was very excited to talk about the history of the Gatliff coal mine in Whitley county. She told stories form her childhood growing up in Appalachia. She has watched Eastern Kentucky go from a lively coal mining region to an abandoned infrastructure.

Methods Limitations

Due to the qualitative nature of my research, there are limitations relating to biases and small sample size. Three informal interviews cannot provide the perspective of the entire population in Appalachia, especially if one of the interviewees is very opinionated. Because of this reason, I rely on the interviews for specific information about the sites rather than the interviewees opinions. Skip and Virginia travelled to the sites with me and explained the conditions of each site.

(Figure 8)

C. Method: Observational Research

6 Site Analyses

1. Barthell Coal Camp, Stearns KY

a historic company town that once supported coal miners and their families. Company towns were only present for the beginning years of coal production, however, the preservation of Appalachia's original settlements pertaining to coal illustrates the heritage of Appalachian infrastructure today. Experiencing the historic company towns informs my understanding of Appalachian lifestyle that has historically developed out of company towns.

2. The natural landscape and trail systems

The natural landscape and trail systems. I stopped at various state parks and hiked the trails to large overlooks. I was able to see the natural landscape and outdoor recreational infrastructure present within Whitley County.

3. Gatliff Coal Mine, Williamsburg Ky

The Gatliffs were the family that originally initiated the development of Williamsburg. They established a large coal mining company that is now one of the only coal mines still operating in Williamsburg.

4. Blue Heron Mine, Stearns KY

a former mine that has been reclaimed as a tourist attraction. This tourist attraction is a historically preserved site that depicts the typical infrastructure and layout of a coal mine operation. Old buildings and structures have been restored to depict the function and placement of systems in surface mines and underground mines.

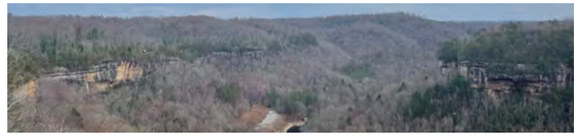
5. Downtown Williamsburg, Ky

Williamsburg, KY is the wealthier town in Whitley County. I visited Main Street in downtown Williamsburg, the Cumberland University, Williamsburg's industrial parks, and the hollers outside of downtown.

6. Stearns, KY

Stearns is a historic coal mining town that was once full of businesses and activity to support miners. Now, the town feels abandoned, however, there is access to outdoor activities thanks to the National Park's Foundation purchase of land outside of Stearns.

1 Barthell Coal Camp, Stearns Ky



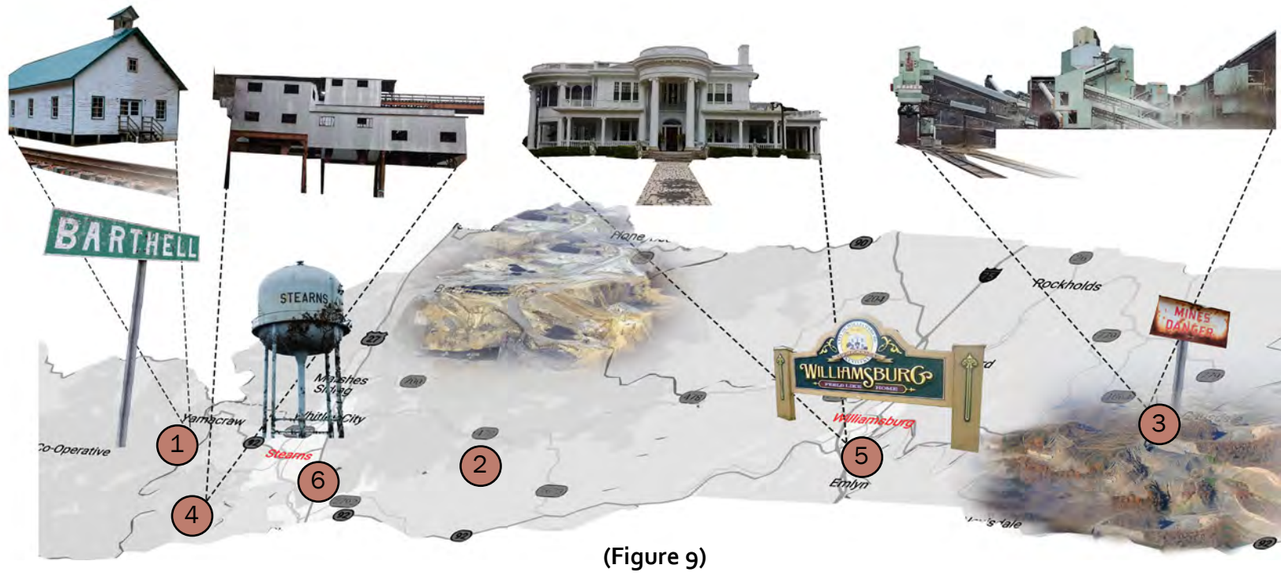
2 The natural landscape and trail systems

3 Gatliff Coal Mine, Williamsburg Ky

4 Blue Heron Coal Mine, Stearns, Ky

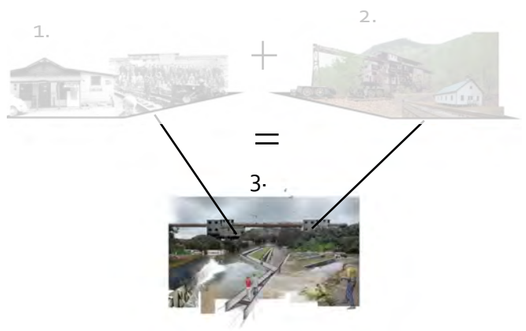
5 Downtown Williamsburg, Ky

6 Downtown Stearns, Ky



(Figure 9)

Theoretical Frame Work:
Speculate Everything, Anthont Dunne and Fiona Raby
Community Capitals, Jane Flora



Speculative Design

Speculate Everything
by Anthony Duune and Fiona Raby

I use the asset-based design approach in conjunction with speculative design to demonstrate the activation of assets within rural communities in Appalachia. Speculative design, as explained by Anthony Dunne and Fiona Raby, in their book "Speculate Everything" can be a tool for developing future ideals by pushing the boundary of reality. Speculative design is a space for exploring concepts or ideals through imagery, not necessarily constructing realistic design solutions (Dunne, Raby, 2013, 101-138). My work opens a discussion on visions of how coal mining infrastructure can be reused in the future. The design process that I construct and the images I present display a method for engaging the potential Appalachia's coal mining foundation. The design freedom to explore possibilities outside of reality is very important to underrepresented communities such as Appalachia that would otherwise face constraints within design development. My demonstration of an assets-based design approach applied to speculative designs can be a catalyst for seeing and engaging Appalachia's potential.

The speculative design renderings I created present alternatives futures for spaces that are typically viewed as detrimental and have been abandoned. To initiate this opportunistic perspective on consequential instances of coal mining, I pair a positive word with a detrimental result of the coal mining industry. The exploration of these juxtaposing phrases guided the general idea behind each render. The five renders I created are titled: Functioning Floods, Strip Mine Settlements, Coal Camp Adventure, and Innovative at the Mines. The renders begin with a desaturated base image of existing conditions in Appalachia that I captured during my visit to the region. In these desaturated images of Appalachia, I define the functional heritage present on each site by identifying abandoned aspects that used to serve a purpose in the coal mining industry. The hand drawn contribution to each image represents design interventions that enact the functional heritage of the site. Lastly, the saturated parts of the rendering represent possibilities for the future once the functional heritage is invested in.

Community Capitals

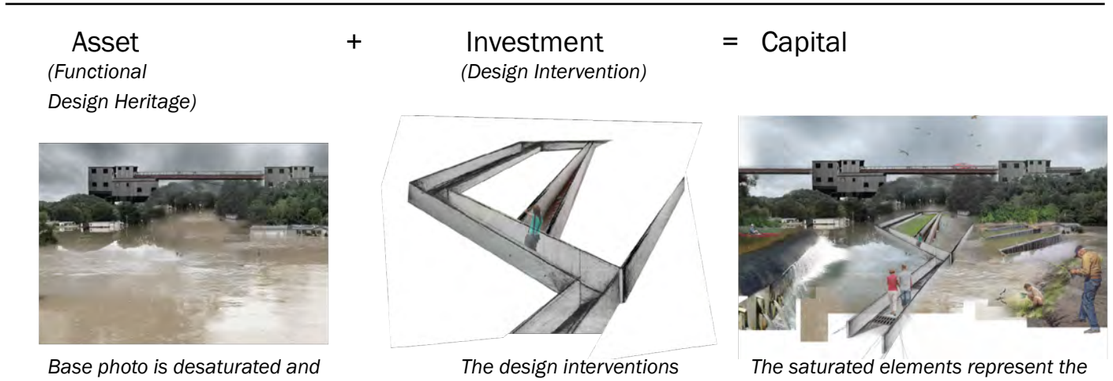
Rural communities
Jane Flora

In Jane Flora's book "Rural Communities", she constructs the "Community Capital Framework" to foster productive and appropriate change in rural communities. The theory believes that instead of identifying a problem in rural communities and solving it right away, efforts to support rural communities should first identify the strengths in a community and invest in them. Flora's framework specifies the difference between "assets" and "capitals". Assets are the potential opportunities in a community's landscape, built environment, and people. An asset becomes capital when it is invested in. Capitals are resources that have been given the capability of producing more resources.

My research focuses on identifying assets within Appalachia's functional design heritage. I demonstrate the transformation of assets into capitals through speculative design intervention. This unique application of the Community Capitals theory paired with an asset-based design approach is an important part of initiating design exploration in Appalachia. For a region that is typically defined by its issues, an asset-based design approach and speculative design releases the site from its constraints and builds excitement and inspiration for future possibilities without the constraints of reality.

I have utilized the seven areas of capital outlined in the community capitals theory to analyze each speculative design. Each rendering communicates a different general idea for Appalachia that is rooted in the region's coal mining heritage. Aspects of each rendering visually portray the activation of the seven community capitals. Through color coordination, annotations from the site visits correspond to annotations of the renderings which correspond to the community capitals analysis. My explanation of the community capitals presented in each rendering is informed by my experience in Appalachia, observations of the environment, knowledge of the region, and interactions with locals.

1. Social capital: This reflects the connections among people and organizations, shared identities, shared views, and comradery.
2. Financial capital: This includes the financial resources available to invest in community capacity building, underwrite businesses development, support civic and social entrepreneurship, and accumulate wealth for future community development.
3. Built capital: This is the infrastructure that supports the community, including telecommunications, industrial parks, main streets, water and sewer systems, roads, etc. Built capital is often a focus of community development efforts.
4. Political capital: This is the ability to influence standards, rules, regulations and their enforcement. It reflects access to power including government officials and leverage with a regional company.
5. Human capital: This includes education, health, skills, and youth to determine the human potential and predict the human reaction to future development.
6. Natural capital: The environment, landscape, rivers, lakes, forests, wildlife, soil, weather, and natural beauty.
7. Cultural capital: This includes ethnic festivals, multi-lingual population, traditions, heritage, view, and values.



(Figure 10)

Research Documentation

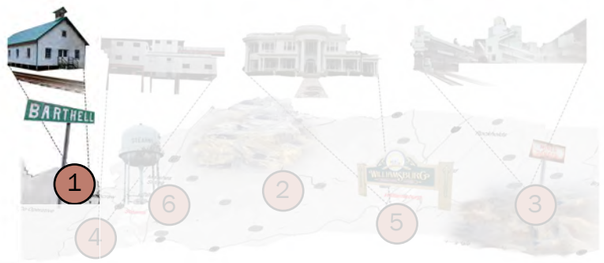
Site visit collage and annotations

Speculative design collage and annotations

Community Capitals analysis

Site 1:
Barthell Coal Camp, Stearns Ky

Barthell Coal Camp is a historic preservation of the coal camp associated with the Blue Heron Mine in Stearns Kentucky. The site educates visitors on the lifestyle and operations of a coal camp back in the 1800s. Coal miner's families filled the coal camps with activity, provided auxiliary services and maintained civic order within the small, remote coal mining community.



The layout of the coal camp is small and walkable. Public places are placed in the center of camp with residents scattered around. The self sufficiency of the coal camp isolates the community.

Auxiliary services such as a single dinner, a company store, and a motor house, a church, and a school form a small town center.

The railroad enters town from a remote path through the mountains. The railroad connects coal camps to other coal mines, and eventually to urban cities.

The Residential area of camp is elevated above the railroad/ creek. Houses are placed linearly along the railroad. As the coal camp expanded, houses were built higher up into the woods

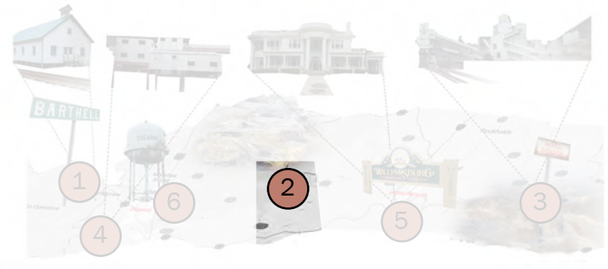
The access to coal mining equipment allowed the camp to alter natural rock formations, resulting in very unique rock placements and forms.

Coal camps were usually placed along a creek to have access to a water source.

(Figure 11)

Site 2:
The Natural Landscape
Appalachian Trail Systems

The Appalachian mountains have a lot to offer within the natural landscape. Famous trail systems such as the Appalachian trail pass by the region and national parks have claimed historic sites as tourists destinations.



Site Visit Annotations

Abandoned equipment, structures, and artifacts left in the woods from abandoned coal mines create unique areas of interest within the wilderness.

The reminiscence of abandoned coal mines pollutes nearby waterways, causing acid mine drainage. Acid mine drainage increases the ph level of water, causing it to turn bright orange and become inhabitable to wildlife.

Abandoned railroad tracks establish a flat path that winds through the mountains- reaching beautiful places that cars can not travel.

The national Parks Service has invested in the Appalachian mountains. Abandoned coal mines have been bought by the parks service and turned into state parks of historical preservation. The Cumberland gap National Historic Park is often forgotten because the Appalachian region lacks infrastructure and reputation to draw tourism.

Barthell Adventure Camp

Speculative Design 1

Informed by Site 1. Barthell Coal Camp and Site 2. Natural Landscape and Trail Systems

Along the Kentucky railroad trail, you can visit coal camp adventure towns. These cozy towns provide access to nature activities nearby and a historical experience of Appalachia. Hikers and bikers completing the 500 mile long Kentucky Railroad Trail will pass through coal camps to stock up on supplies and gear before heading out to the next camp.

How can historical sites and natural landscapes facilitate outdoor tourism?

(Figure 13)

Barthell Adventure Camp

Speculative Design 1

Informed by Site 1. Barthell Coal Camp and Site 2. Natural Landscape and Trail Systems

Speculaitve Design Annotations

The public spaces and auxiliary services in the coal camp can become restaurants, gear shops, and places to stock up on supplies as people travel through the railroad trail system. This creates jobs and tourism infrastructure for locals.

The remote, historic, and isolated camp makes the site a desirable destination for people seeking an escape form the complexity of modern day. The camp allows visitors to experience Appalachian values of nature, self sufficiency, and privacy.

Increased tourist infrastructure such as lodging, recreation, and auxiliary services allows access to the hidden beauty in Appalachia

The residential neighborhoods in coal camps can be converted into rental cabins or air bnbs for people seeking a remote nature retreat or access to outdoor activities.

The railroad path has become an iconic trail system for backpackers and bike packers to experience Appalachian

Backpackers travel along the railway trail, to a series of coal camps in which they can seek food, lodging, and gear/ supplies.

Historical artifacts are embedded into the Kentucky Rail-way trail that would educate travelers on the history of the region

The unique rock formations from mining present the opportunity of setting climbing routes throughout the Appalachian Mountains. Climbing is a very trending sport that people would travel to do.

Access to the creek allows water recreation such as kayaking and swimming.

Water recreation brings aware-ness to the direct source water pol-lution around coal mines. Bringing activity to polluted waterways will force effort toward clean up.

(Figure 14)

Community Capitals

Social Capital

Infrastructure that celebrates the Appalachian Mountains would install a pride in the region. Locals would feel honored that people from outside the community have traveled to visit their home. Social capital could be created within each coal camp that becomes an adventure town. Guides, small business owners, Airbnb hosts, and workers within each coal camp would have a shared identity in the operation of their destination.

Financial Capital

The romantic feel of a remote, historic adventure town in Appalachia can be appealing to those living in an urban society. The establishment of tourist infrastructure could benefit the region financially by creating jobs, increasing activity with small businesses, and creating financial resources regionally. The financial resources obtained could be used to recover from flooding, clean up abandoned mines, or to invest in more industries that will create wealth within the region.

Built Capital

Tourism infrastructure supports the community by introducing new systems, showcasing the natural landscape which markets the region as attractive, and utilizing space that has already been developed to do so. Transportation systems that connect remote towns to urban centers would be developed. Coal camps have the foundation to support a small campus-like environment in the wilderness. The construction of adventure camps would just add up to date infrastructure, buildings, people, and transportation that utilizes the suitable site of coal camps.

Political Capital

When introducing tourism, there is a risk of introducing capitalism, consumerism, and external control over the region. If a large company such as Airbnb gets involved in the adventure camp experience, it could take control away from local administration. The administration of Adventure Camps should be regulated by local community members, jobs should be given to local community members, and the community should be making decisions about future development. Revenue from the adventure camps should be invested back into the community that houses the tourist destination.

Human Capital

Increased access to the outdoors and exposure to nature recreation such as climbing, hiking, and biking would benefit locals' mental and physical health. Access to and the capitalization of nature directly correlates to residents' quality of life. Urban areas strive to integrate more access to nature for this reason.

Natural Capital

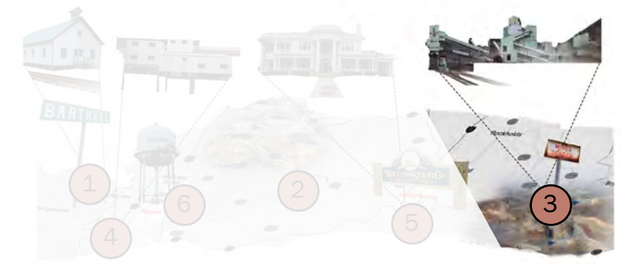
The natural capital in Eastern Kentucky is plentiful, however, it is not often utilized. The creation of tourist infrastructure in Appalachia allows access to Appalachia's great outdoors. Rock formations throughout Kentucky, following the rivers and being carved out from coal mines would make amazing climbing walls- putting Appalachia on the map as a major rock-climbing site in America. The Transamerica bike packing route passes right by Eastern Kentucky and could have a detour through coal country that offers riders a historical experience of coal camps. Introducing the outdoor recreational community to Appalachia would initiate advocacy from environmentalists for ecological restoration in sites polluted by the coal mining industry.

Cultural Capital

Appalachian culture, historically, values the land. Local outdoor culture of hunting, fishing, riding dirt bikes, and hiking would be celebrated and emphasized in an adventure camp. On the other hand, outdoor tourism would be a more foreign concept for the community. There is a sense of territory over the land and isolation of the culture that doesn't embrace outsiders as tourists. Change within the small rural communities is not often celebrated and the introduction of new systems is often doubted. However, increased tourism in Appalachia would make outsiders experience the vibrancy and authenticity of Appalachian culture for themselves, instead of believing stereotypes and narratives about the region.

Site 3:
Gatliff Coal Mine
Williamsburg, Ky

The Gatliff coal mine is the only coal mine still operating in Whitley County. It is the largest and oldest coal mine in the county. The Gatliffs initially harvested lumber in Eastern Kentucky and eventually turned their lumber business into a coal inning business. The Gatliffs helped develop Williamsburg Kentucky by extending the Kentucky railway to Whitley county, establishing Cumberland University in Williamsburg, and providing jobs to locals.



Strip mining has created large pits in the earth that usually fill up with water and create a swamp. The land around Gatliff strip mine has been stripped to reveal terraces of rock and subsoil. It is unlikely that vegetation will grow back.

The coal mine has an associated church on site for miners to attend. This community infrastructure creates camaraderie and social connections amongst miners that extend beyond their time spent at work.

The coal processing plant is an established industrial site that extracts coal from the earth, cleans it, and transports it. The tall steel structure is the tipple. This industrial system stretches from deep within the earth to high in the sky. The tipple present opportunity to elevate infrastructure off the ground.

Because Appalachian coal mines supplied the country with coal, mines have an established transportation system that connects to metropolitan areas. Railroads were established throughout Appalachia to connect coal mines in remote places to the nearest cities.

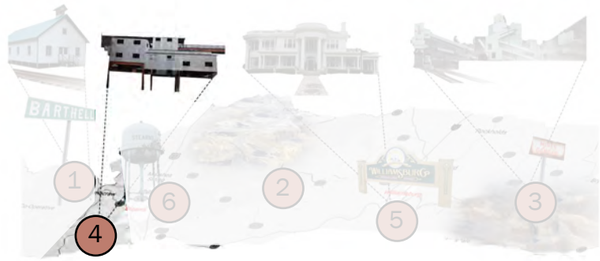
The Gatliff coal mine is on a remote site in the mountains about 20 minutes form Williamsburg. The road leading to the coal mine is rough and narrow with nothing but stripped land on the sides. Directly before reaching the coal mine is a "holler". The houses are old, falling apart, and narrow through the valley.

Skip tells a story about some of the people he knows who live in the holler. They inherited the house form their father or grandfather who once worked as a coal miner. Most of the people currently living in these houses, according to skip, are drug addicts surviving off of welfare benefits. Skip states that the people who have skills and ambition leave town.

(Figure 15)

Site 4:
Blue Heron Coal Mine
Stearns, Ky

The Blue Heron Coal Mine is a former mine that has been reclaimed as a tourist attraction. This tourist attraction is a historically preserved site that depicts the typical infrastructure and layout of a coal mine operation.



The concrete structures around the mine are a storage system that once house materials such as sand, dirt, and rock. These storage structures still stand today due to the resiliency of the material.

Underground deep mines have a wooden frame that defines space underground. The underground system has a track with carts that were used to transport coal out of the mine. The underground space naturally cools in the summer and warms in the winter. The infrastructure of underground mines presents opportunity to utilize space that has already been established underground and transport materials and people from underground to above ground.

The Tipple stretches across the valley, railroad, and creek. The tipple presents opportunity for above ground transportation. It also connects to transportation on the ground because the tipple would drop coal into train cars as they passed through.

The strength of materiality and permanence of structures built into the land makes coal mining leave a permanent mark on the land. Concrete structures built into a hillside and into the ground remain intact today. The long span of steel trusses within the tipple are a valuable piece of architecture that could be reused.

(Figure 16)

Innovative Coal Mines
Speculative Design 2

Informed by Site 3. Gatliff Coal Mine and Site 4. Blue Heron Coal Mine

The industrial heritage of coal mine sites persists into renewable energy campuses. Renewable energy replaces coal mining as an energy source distributed throughout the country from the Appalachian region. Coal mines are at the forefront of renewable energy development with innovative efforts, research, green technology, and data collection. This new industry re-establishes stable jobs for locals, connects the region to the rest of the country, re-purposes industrial systems from the coal mines, and honors the history of Appalachian culture.

(Figure 17)

Innovative Coal Mines

Speculative Design Annotations

Informed by Site 3. Gatliff coal mine and Site 4. Blue Heron Coal Mine

The color of the Speculative Design annotation correlates to the color of site visit annotation and the color of Community Capital

Introducing another energy source to the site could create camaraderie, education, and advocacy around the role of renewable energy in combating climate change.

Renewable energy creates new jobs and skills for locals to be immersed in. The jobs would hold the same sense of pride that coal miners had in supplying the country with energy.

The industrial center of coal mines can house geothermal energy because there is an established connection between underground and high in the sky. Geothermal energy needs access to both underground and above ground. A post-industrial site is the most effect site to place a new industrial system.

The industrial heritage and pride in providing the nation with energy persists in renewable energy production

The transportation system that transported coal to urban centers throughout the country can guide the energy grid that will supply the country with renewable energy. The railroad was a very effective path to connect sites. Perhaps that path can be utilized again in a different form of connection.

The height of the represents opportunities for renewable energy sources that utilize height and gravity- such as hydroelectric energy and windmills.

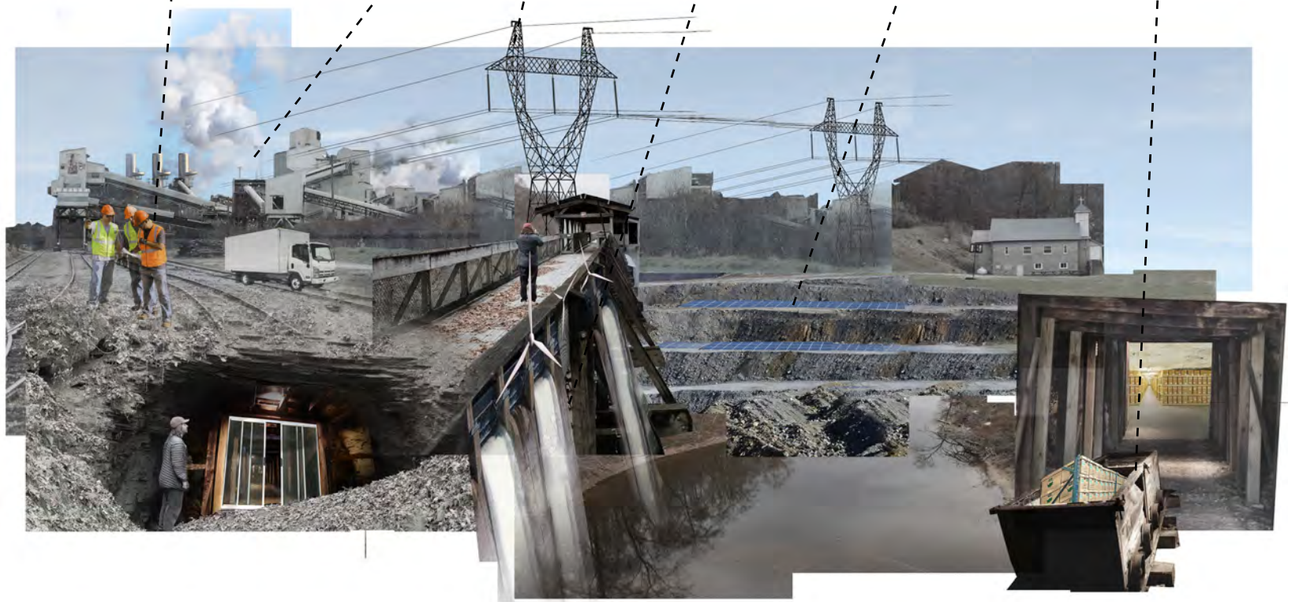
The remoteness of the coal mine makes for an industrial site that is less disruptive to the community. In an effort to introduce jobs to Eastern Kentucky, an electric car battery factor was recently placed right outside of downtown Williamsburg, giving the town a rough industrial feel.

Strip mines are a perfect site for solar panels because no vegetation obstruct the panels and the series of terraces optimize space along the hillside.

Coal mine structures are typically built out of steel or concrete. The strength and resiliency of these materials allows parts of the structures to be utilized in an adaptive reuse project.

The underground system of deep mines natural cools/ warms making it suitable for the storage of data, chemicals, or other materialls that require a regulated environment

The methodical storage system on coal mines can be reused as a storage system once again.



(Figure 18)

Community Capitals Analysis

Social Capital

Social capital would be created around the concept of sustainability. Comradery towards combating climate change would be such a powerful force in Appalachia where the coal industry once contributed to climate change. The connection of multiple renewable energy sources and research centers within one site would be a very powerful presence in rural towns. Workers in the geothermal plant would share an identity but also be connected to workers on the solar farms.

Financial Capital

Sustainable energy is much more financially reliable than coal mining. Renewable energy companies can provide locals with promising jobs that are not going to be abruptly taken away anytime soon. The revenue from renewable energy plants should be invested back into the region.

Built Capital

The construction of a renewable energy plant and innovation center would provide many opportunities to the public. It could be a site for research, education, skills certifications, and job sites. Renewable energy companies could reinforce the hollers adjacent to the coal mine to provide better quality housing for workers. The postindustrial site of coal mines is a susceptible to placing a new industrial site of renewable energy sources.

Political Capital

Political stigmas deem renewable energy a leftist view and Appalachia as a right leaning region. However, political stereotypes around Appalachians are not always true. A Yale study showed that --- of people surveyed in Eastern Kentucky believe in climate change and would support the establishment of renewable energy. Despite political views, Appalachian communities remain practical. If renewable energy has the power to bring jobs and opportunities to Appalachia, then it will be supported, despite political differences. Furthermore, the placement of renewable energy sites within Appalachia would break political stereotypes and assumptions about the region and its stagnancy/ resistance of progressive technologies.

Human Capital

Introducing a new industry to the region would provide locals with jobs and education around new skills in innovative technologies. The concentration of hard-working Appalachians in need of jobs is a resource to the region. Human potential in Appalachia can be utilized to create sustainable energy for the nation.

Natural Capital

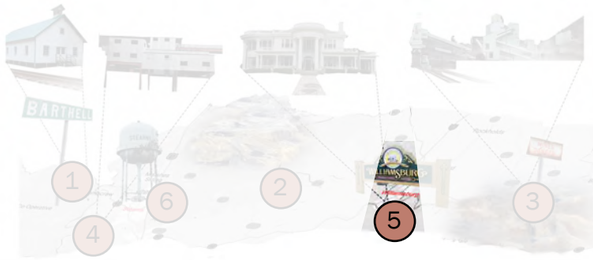
While the overall motive of creating renewable energy sources is to combat climate change and protect nature, the establishment of renewable energy plants does not enact the natural capital of the Appalachian region. The mines would remain very industrial and possibly alter the natural landscape.

Cultural Capital

Coal mining developed a culture within Appalachia that is still embedded in the people today. The coal mining culture entailed hard work, acceptable risk, community pride, and the satisfaction of supplying the nation with energy. The renewable energy industry can be an outlet for coal mining culture once again.

Appalachian Town, Williamsburg, Ky

Williamsburg is the wealthier town in Whitley County. I visited Main street in downtown Williamsburg, the Cumberland university, Williamsburg's industrial parks, and the hollers outside of downtown.



The Cumberland University provides many services to the community. The recreation center, post office, dinning hall, library, ect. is open to public use during certain times in order to provide Whitley county with more resources. Virginia Walden states "The college is a huge part of our town." A small campus layout that provides services to an entire town is an effective way to serve the community.

Main street Baptist Church is in downtown Williamsburg near the wealthier residences. The church is the center of community and social capital. Religion plays a significant role in Appalachian culture, making the church building the site for most community events and gatherings.

The Gatliff mansion is on main street right across from main street Baptist Church. The Gatliff mansion is the largest, most expensive home in Williamsburg, taking up about four acres of land off main street. There is a series of luxury historic mansions in downtown Williamsburg that mine operators once built. Now, these mansions are inhabited by wealthy families in Williamsburg. The wealthy families live in downtown Williamsburg, close to the college, church, school, downtown and other civic infrastructure. Poorer families live in the flood prone hollers outside of Williamsburg.

Houses within neighborhoods in Williamsburg are very spaced out. A value within Appalachian culture is privacy and territory. The residences are private, but the community spaces in the town center are public and very active creating community. Within Appalachian communities there is a balance of private possessions and communal sharing.

Roads through and around Williamsburg wind around coal mines. In this image, a central highway was placed where two strip miners mined towards each other until they met in the middle, creating a flat section wide enough for a three lane highway. This process eliminated the need to blow up the land to create a flat path for the road. The placement of road

Strip mines create flattened sections along a hillside. The strips vary in size throughout mines. The height of the hill is maintained on a stripped hillside. The round contours of the hill are turned into horizontal sections. Strip mines are some of the only sites that have large flat pieces of land amongst the hilly Appalachians.

There is an attitude of self sufficiency in the hollers. The remote hollers lacks transportation infrastructure and services such as restaurants and stores. Appalachians have developed traditions of cooking, and craft that allow the community to collectively provide for themselves. I observed this tradition when my grandmother showed me what her neighbors gave her for Christmas. Everything was hand sewn, widdled, or homemade instead of ordered form an on line store or picked up at the mall.

The separation of mine operators and coal miners has created areas of wealth and poverty within Williamsburg. The wealthy families live in downtown Williamsburg, close to the college, church, school, downtown and other civic infrastructure. Poorer families live in the flood prone hollers outside of Williamsburg.

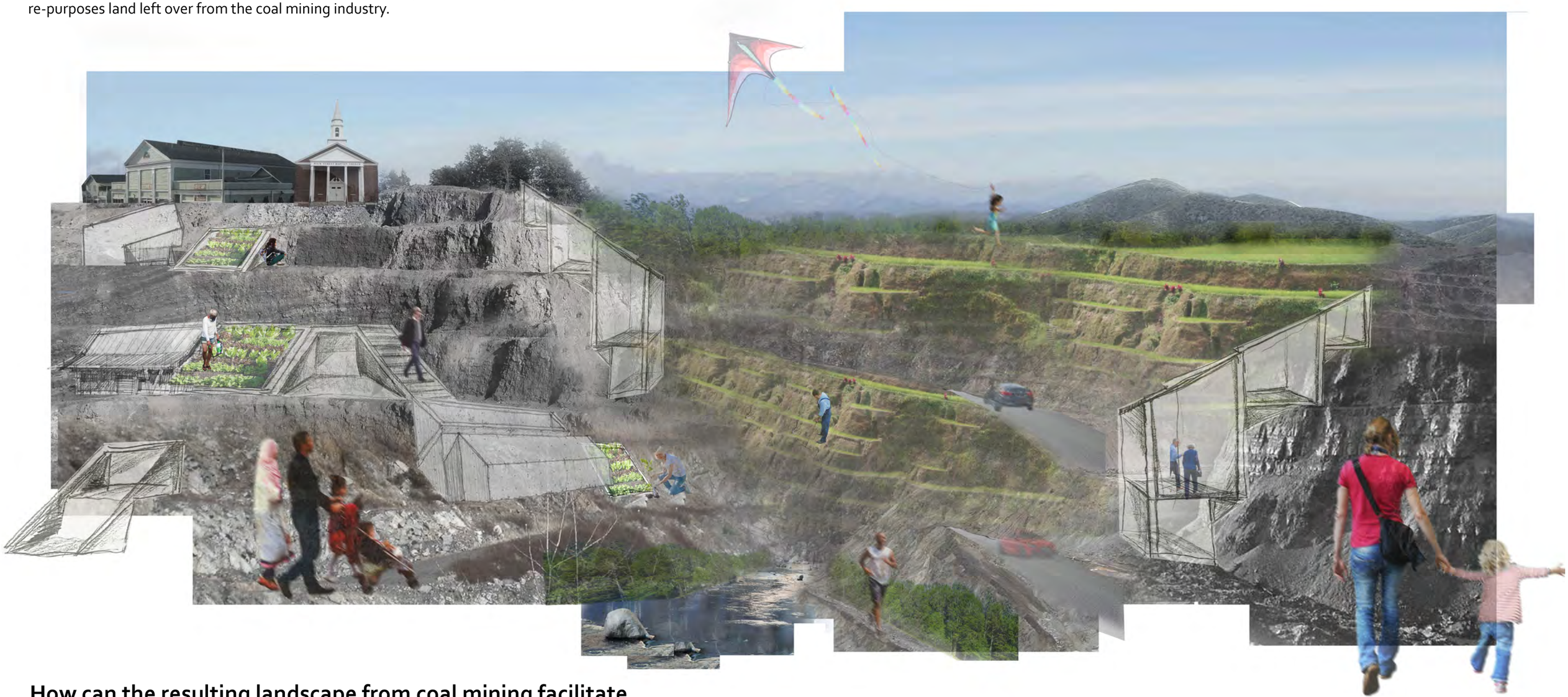
(Figure 19)

Strip Mine Settlements

Speculative Design 3

Informed by Site 5 Williamsburg Ky

Strip Mine Settlements explore how the resulting landscape from strip mining can support Appalachian culture. The design objective is to create community spaces that emphasizes Appalachian culture and re-purposes land left over from the coal mining industry.



How can the resulting landscape from coal mining facilitate Appalachian Community and Culture?

(Figure 20)

Strip Mine Settlements

Speculative Design Annotations

The color of the Speculative Design annotation correlates to the color of site visit annotation and the color of Community Capital

Strip Mine Settlements explore ways that architectural forms can fill in the missing contours of hillsides that have been stripped.

The historic separation of wealth in coal mining towns has created perpetual cycles of poverty and environmental injustice in the hollers. Strip mine settlements would create community campuses on top of the strip mine that are accessible to the entire hillside- regardless of wealth.

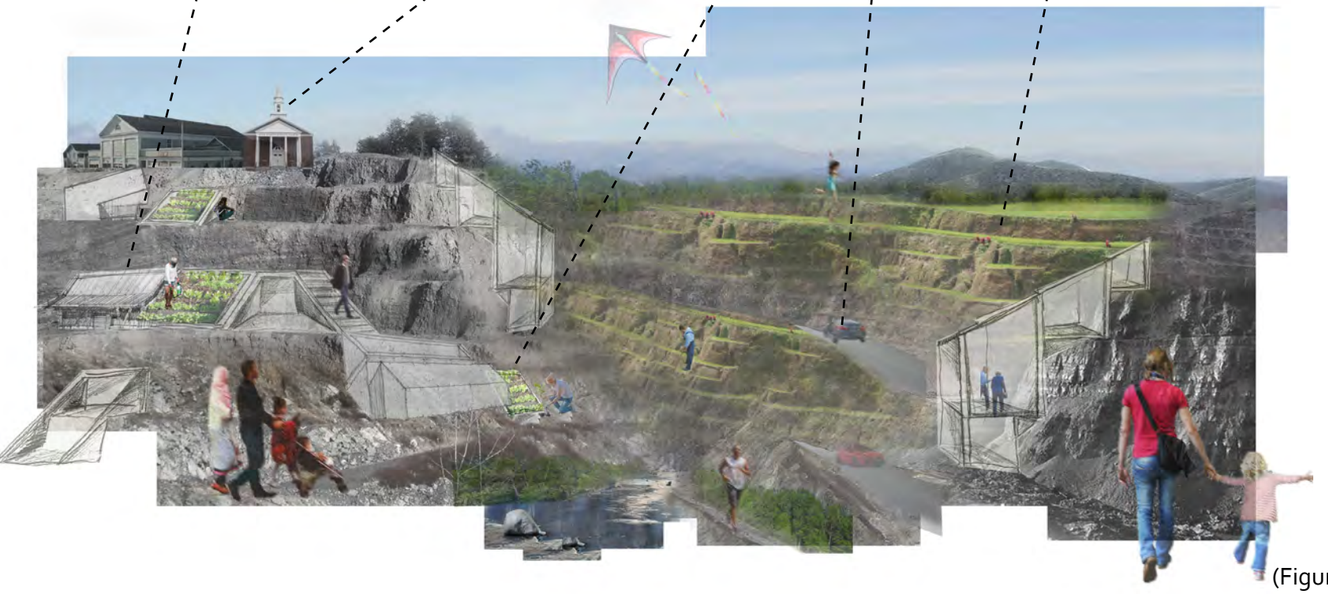
There is already a road system established around strip mines. There are service road systems within strip mines that trucks full of coal used to wind around to exit a strip mine. These road systems can be reenacted as access roads for community members and residents. Service roads within the strip mine can become running paths or trail systems within the community.

The spatial layout of strip mines creates invisible borders between each terrace. Each family can claim a strip as their own private territory and the spaces on top and bottom of the mine can be communal. Strip mine settlements lend them self to a design that balances private territory and public communal space. There is a sense of community within the whole hillside and a sense of privacy within a single strip of land.

A community campus is an effective way to provide a remote community with a range of services. The community campus is walkable and accessible to each strip settlement. The community center is programmed to adapt to the communities needs and serve a range of purposes. In Strip Mine Settlements, there is a community campus on top of each hillside.

Self sufficiency can be utilized in terrace gardens along the strip mines. Each resident's designated plot of land can be responsible for growing one crop to share with the community the entire hillside together can have a variety of crops.

Reclaiming stripped hillsides play a role in minimizing erosion and flooding in the valleys below. Reclaiming strip mines will re-vegetation the hillside, reinforced the exposed subsoil, and introduce constant activity to the site



(Figure 21)

Community Capitals Analysis

Social Capital

Families residing on one single hillside creates a residential community- like a neighborhood. The placement of these homes near each other creates a shared identity. The community campus on top of the hill would create shared community space that facilitates interactions with neighbors and the sharing of goods/ services.

Financial Capital

The state of Kentucky's abundance of flood recovery funds are being used to rebuild communities destroyed in the 2022 flood. The plan is to construct what the designers call "higher ground communities". The communities are being built on top of a mountain top removal project to protect from flooding in the valley below. The project has received a lot of criticism from locals who believe the design is not culturally appropriate. The opportunity of flood recovery funds should be used to not only rebuild safe housing but to enhance community, honor heritage, and emphasize culture as well.

Built Capital

The design of strip mines is conducive to creating community and unity through buildings and landscape architecture. The placement of buildings, parks, roads, and gardens along an abandoned strip mine would turn place a productive use on the hazardous land. Development on post-industrial sites of post-mined land protects the wild forest from development.

Political Capital

With the establishment of a community and shared spaces comes the regulation of a governing body. Questions of who profits from community services, how does the hierarchy of the land contribute to social hierarchy and class distinction, who maintains the community spaces, and how leadership over the neighborhood is carried out.

Human Capital

Strip mine communities would enhance locals' quality of life by providing access to education, health care services, and outdoor trails. The heritage of coal camps would be reflected in the strip mine communities' proximity of church, school, doctors office, business center, ect. The establishment of a small, rural community that supports itself through internal operations will allow Appalachian communities to thrive once again

Natural Capital

The land on strip mines would be transformed into not only useful land for humans but ecologically restored land for the natural environment. The establishment of residents along the stripped terraces would warrant the planting of vegetation and gardens. The architecture on strip mine settlements explores ways that architecture can fill in the original contour of hillsides. Filling in the void of strip mines can help prevent flooding into the valleys.

Cultural Capital

Strip mine communities explore ways to rebuild residential areas destroyed in the floods in a more culturally appropriate and innovative way. The strip mine landscape creates strips of territory along each residence, honoring the cultural value of land ownership and privacy amongst Appalachia homes. The creation of strip mine communities would be customizable by residents, allowing cultural values and traditions to develop along the strip mine settlement.

Appalachian Town, Stearns, Ky

Stearns is a historic coal mining town that was once full of businesses and activity to support miners. Now, the town feels abandoned, however, there is access to outdoor activities thanks to the national park's foundation purchase of land outside of Stearns.

Kids gather in the steel yard to play basketball because it is directly next to their neighborhood.

The coal tipple stands tall as the highest piece of infra-structure in the town.

An old rail yard has become a steel processing plant to recycle all the steel leftover from the railroad and coal mines.

Residential areas of the town often flood with heavy rainfall because they are settled in the valley- the lowest area within the mountains.

Deep mine entrances reveal an underground infrastructure.

There is a lot of open space that the county plans to develop in the future using funds for flood recovery.

The downtown is two buildings with local businesses and a train stop with a diner.

(Figure 22)

Functional Flooding
Speculative Design 4

Informed by Site 6 Stearns Ky

Functioning floods presents a regional solution to address a regional issue: flooding. The increasing issue of flooding in Appalachia as coal mining exits the region has not been permanently addressed. This speculative design pushes the idea of engaging with flooding, utilizing it to create specific water patterns and a functioning pater of the region instead of fixing everything each time a flood rolls through.

How can regional infrastructure utilize flooding in an eco-human opportunity?

(Figure 23)

Functional Flooding

Speculative Design Annotations

The color of the Speculative Design annotation correlates to the color of site visit annotation and the color of Community Capital

The higher dimension of the tipple presents and opportunity to elevate transportation above the valley when it floods.

The regions abundance of steel can be recycled locally into flood infrastructure that controls and guides flood patterns.

Flood infra-structure can also be visually interesting and create areas of recreation for humans.

The state of Kentucky plans to rebuild houses lost in the flood of 2022. Those houses can be placed in a less flood prone area. The flood prone area can engage with flooding in an innovative way such as floating farms or hydroelectric energy.

Underground infrastructure presents and even lower dimension than the valleys which usually flood. Utilizing the lower level of deep mines can drain flood water in the valleys.

Flood recovery funds can be used to not just prevent the effects of flooding, but enhance the community as

Embracing the natural environment in an eco-human way creates access to nature. Access to nature gives the kids more places to play outside.

(Figure 24)

Community Capitals Analysis

Social Capital

The concept of utilizing floods would likely face resistance from locals who have developed a fear of flooding. The concept of embracing flooding contrasts from the culture's survival tendencies. Concepts that could arguably be beneficial for the region but contradictory to the cultural perspective would need collaboration with the community to gain a consensus. Theoretically, functioning flood infrastructure would allow communities to celebrate rainfall and operate normally during months of heavy rainfall instead of fearing the destruction that is sure to come.

Financial Capital

The state of Kentucky has collected a very sustainable amount of flood relief foods. The state has decided to invest that money in rebuilding houses that were destroyed in the 2022 flood. However, it could be more financially sustainable to prevent flooding in the future entirely instead of raising funds to spend on rebuilding each time that a devastating flood passes through the region.

Built Capital

Flood infrastructure is a form of built capital. It would be using built designs to create eco-human opportunities. This idea explores the opportunity for designing a structure that utilizes water to serve a specific function and contributes to the human experience of the landscape. The built capital would be involved in ecological systems and human behavior.

Political Capital

In general, an ecological restoration project would warrant regulation and control from environmental organizations such as the EPA. Such radical government intervention in the valleys could cause local resistance.

Human Capital

Flooding is one of the biggest environmental issues that Appalachia continues to face. It contributes to struggles of poverty, unemployment, and health issues throughout the region. By eliminating the singular issue of flooding in residential areas, Appalachians are more likely to reach their potential. The opportunity to introduce new industries around ecological restoration, aqua farming, and hydroelectric energy would expose the community to new skills and educational opportunities.

Natural Capital

Functioning floods would work to enhance the natural landscape. Concentrated areas of water could increase biodiversity, allow space for aqua farms, or create access to water activities. The main objective of flood infrastructure would be to embrace flooding in specific areas that can benefit from increased water and prevent flooding in residential areas at risk of flooding.

Cultural Capital

Functioning floods would embrace the fishing culture and increase access to outdoor activities. The flood infrastructure could change the cultural view around flooding in Appalachia. The infrastructure would demonstrate resiliency to embrace the force that has historically destroyed the region. Design incorporated into the infrastructure could find a way to honor the lives lost in Eastern Kentucky's fatal floods.

The Future

Reviewing Kentucky's Appalachia development plans

Lower socioeconomic populations in Appalachia have historically settled in the valley between coal mines, commonly called "hollers" because one can yell from one end of the town and the sound will travel through the valley to the other end of the linear town. The functional heritage of Appalachia explains the relation between company camps and the settlement of poorer families in the hollers. The historical development of these lower socioeconomic populations in flood prone valleys surrounded by coal mines presents a social environmental issue. The exposed subsoil of surrounding coal mines and increased rainfall due to climate change has heightened the historical issue of flooding in the hollers. After the Eastern Kentucky flood of 2022, the state initiated a plan to progress development in Appalachia by building sustainable housing and community centers on top of a mountain, above the flood plain. When Bell engineering firm released their Eastern Kentucky development plans and renders to the public (Figure 26), they received universal criticism from Appalachian locals and designers. The development plan entailed displacing people, redesigning communities on an urban scale that did not match the nature of Appalachia and modernizing the Appalachian landscape. Locals were scared that these development plans would interfere with their culture and lifestyle. Anna Eldridge, a local high school senior, is concerned that the engineering firms is "trying to city-fy something that shouldn't be" and advocates for designing creative housing in flood prone areas instead of displacing entire communities. Designers feel that there was not enough critical thinking about the site context and community capital in the engineered plans. Jeff Fugate, an Urban Planner at the University of Kentucky and an Eastern Kentucky native believes that the Higher Community plan "is very culturally inappropriate", and that development in Appalachia should be speculated by designers instead of engineers.

The lack of design creativity and cultural consideration in Bell Engineering's development plans further demonstrates the value of engaging in speculative design for Appalachia's future post-coal industry. Future development in Eastern Kentucky needs to enact the functional heritage of Appalachia in order to maintain the aesthetic, culture, and lifestyle of the region. In the Site analysis and sipart of this paper, I construct a design process that enacts creativity and ideation in an idealistic manner. My work is meant to overcome the invisible wall between imagination and everyday life. The local criticism of Kentucky's rural development plan demonstrates the need for a more considerate design process that will explore cultural values, ways of living, and alternative futures for Appalachia that are connected to its vibrant past.

Kentucky Governor Andy Beshear presenting "Higher Ground Communities" plan

(Figure 25)

(Figure 26)

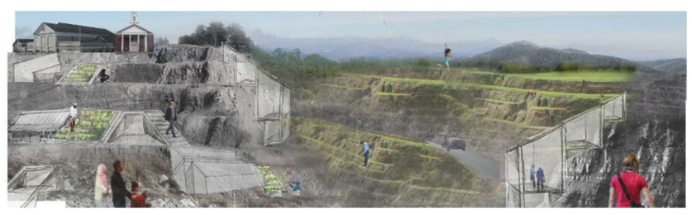
Conclusion

Community Capitals Analysis Results

Generalization

Limitation

Design as Advocacy

	Social	Financial	Built	Political	Human	Natural	Cultural
1 Outdoor Tourism 							
2 Eco-human Flood Infrastructure 							
3 Renewable Energy 							
4 Integrating Community on Reclaimed Mines 							

(Figure 27)

Generalization

The method that I have constructed in this project ultimately aims to demonstrate ways in which design inquiry can identify and utilize the remanence of a lost industry to envision a future for a community that once depended on that particular industry. The idea of functional design heritage can be applied to any infrastructure developed to serve a specific function. For example, Colorado ski towns have been designed to allow tourists to ski in large amounts of snow. In the future, the ski resorts might not be able to operate due to decreasing snow fall each year. My method can be used to identify the original function of parts of the ski town- and use design to explore the role that they could play in the future. The purpose of a gondola is to transport people up a mountain above ground. How can the function of transporting weight up a mountain be useful in the future? Ski resorts have developed distinct paths down a mountain with no vegetation- how can an unvegetated path down a mountain function in the future without as much snow?

Nothing is permanent- everything built has a life span. Society has constructed entire towns and regions to serve specific purposes for a fleeting amount of time in the grand scheme of things. My approach to reusing original foundations to serve a new function will play an important role in the future as society changes. I am a strong believer in the productivity of adaptive reuse. To adapt an original foundation to serve a new need saves more materials, time, and energy than wiping the original foundation clean and constructing an entirely new system. That is why I have created a method of design inquiry for surveying what parts if a site was once successful in the past, the designs' purpose, and how the general functions can be utilized in a new way once again.

Limitations

The use of qualitative research to identify the functional design heritage and the role of speculative design in demonstrating the activation of that heritage is successful in creating critical design inquiry. However, there are limitations in speculative design due to the nature of design freedom. The lack of constraints can cause this design process to be dismissed by user groups that are focused on practical application. Furthermore, qualitative research relies heavily on observations and often assumptions from the researcher. The site visit annotations that I rely on were constructed from my own observations and information from Virginia and skip Walden. This makes the research very personal to my own observational perspective.

Speculative Design as Advocacy

The basic result of my research is speculative design renderings that display the beneficial activation of systems that have been abandoned or are inherently detrimental to the landscape and Appalachian society. At the root of design is inquiry. Design is not only a process for carrying out ideas. It is a process for exploring possibilities, implications, and visually communicating circumstances. My method argues for a process for re-using the foundation and remanence of coal mining- a concept that is not typically considered in Appalachia due to negative perceptions of the coal mining industry. Current tendencies wipe any remanence of coal mining clean, tear down mine structures, repair the landscape, and revegetate coal mining sites. My process demonstrates that there is an opportunity to reuse coal mining systems- the access roads, the underground corridors, the height of the tipple, the remote location of coal camps, the path of the railroad, the terraced landscape of strip mines. All these particular circumstances were designed to serve a functioning within the coal mining industry. That function can be generalized and applied to a new industry that will support Appalachian society once again.

Arguing the opportunity within Appalachia's abandoned landscape as the coal mining industry exits the region is essential to bringing design attention to the region. My speculative designs and design process argue the potential in Appalachia's future. Advocacy for Appalachia's future through design contributes to the advocacy for Appalachian communities' health, education, safety, and reputation amongst the rest of the nation. Growing up in Kentucky and often visiting family in Appalachia has developed a deep admiration for the region and its culture. It wasn't until I moved to the other side of the country for college that I realized how misunderstood the region and its people were. I hope that through the display of design opportunities in Appalachia, I can reverse stereotypes and convince the world of Appalachia's value.

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