

The Pennsylvania State University

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**CONCEPTUALIZATIONS OF ABANDONED MINE LAND RECLAMATION: A CASE  
STUDY OF THE DANIEL BOONE NATIONAL FOREST**

A Thesis in

Geography

by

Hannah Roseann Caudill

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The thesis of Hannah Roseann Caudill was reviewed and approved by the following:

Jennifer Baka  
Assistant Professor of Geography  
Thesis Advisor

Karl Zimmerer  
Professor of Geography

Trevor Birkenholtz  
Associate Professor of Geography

Brian King  
Professor of Geography  
Head of the Department

## ABSTRACT

The Daniel Boone National Forest contains numerous abandoned mine sites left over from eastern Kentucky's long history of coal mining. Many of these abandoned mines are leaching contaminants into the surrounding environment, and the US Forest Service is acting to reclaim these sites to mitigate the negative environmental impacts. There are also several other governmental and non-governmental actors in Appalachia with different conceptualizations of the purpose of reclamation. My research examines the process of mine land reclamation on a protected area within a region with an extensive history of resource extraction. My research builds on previous work within the field of land reclamation to understand different conceptualizations of abandoned mine land reclamation in Appalachia. Content analysis was conducted on DBNF project documentation, interviews with relevant stakeholders, and additional documentation from several state governments, federal agencies, and NGOs. These various documents indicate that government entities tend to conceptualize abandoned mine land reclamation and its purpose in a siloed manner. This stands in contrast to common ecological restoration attitudes, which advocate for a more comprehensive approach. My research reveals that non-governmental actors tend to conceptualize mine land reclamation in a more holistic manner but are less able to exert control over an area. The DBNF largely conceptualizes the purpose of mine land reclamation as achieving ecosystem restoration but may benefit from working more closely with various NGOs and adopting a similarly holistic approach. Opening a dialogue between these actors could help address the knowledge gap present at the DBNF's AML sites.

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## Chapter 1

### Introduction

Since the turn of the 20<sup>th</sup> century, coal mining has occupied a significant role in both the economy and the cultural identity of the Appalachian Mountain region. Since then, the region has produced millions of tons of coal that have powered the rest of the United States. These intensive extraction efforts made many outside corporations and absentee landowners very wealthy, while leaving members of the Appalachian coal communities largely impoverished (Caudill, 2001). As a result, the region has experienced a history of being subjected to exploitation and injustices from the coal companies. Recent declining trends in coal mining have also worsened economic conditions since the region's economy has largely remained specialized around coal. Along with the economic downturn and accompanying social impact, this long history of coal extraction has left behind a legacy of abandoned surface and subsurface mines and environmental contamination, particularly of soil and water. Lands left unreclaimed can perpetuate the environmental injustice that has come to characterize the history of these Appalachian communities. As a result, an extensive need for mine land reclamation has emerged. As of 2015, roughly 800,000 acres of mining-impacted land and water had been reclaimed across the United States, while over six million acres remain unreclaimed (Dixon & Bilbrey, 2015). Across the Central Appalachia states of West Virginia, Kentucky, Virginia, Tennessee and North Carolina, specifically, over 480,000 acres had been reclaimed as of 2015, with over 230,000 acres still requiring reclamation (Dixon & Bilbrey, 2015).

Across the region, numerous government agencies, cooperatives, and nonprofit organizations have participated in reclamation efforts such as the Office of Surface Mining Reclamation and Enforcement (OSMRE), the US Forest Service, the Appalachian Regional



Reforestation Initiative (ARRI), various state level Divisions of Abandoned Mine Lands, and various non-governmental organizations (NGOs). The focus of these efforts has differed among each government entity and NGO. These different actors may utilize different approaches to achieve different goals within the same geographic area, which can lead to issues in the environment or the nearby communities and can lead to tensions between the different actors. For example, if an NGO is interested in involving the nearby community members in every step of a reclamation project, but the government agency overseeing the reclamation is uninterested in or unable to incorporate community input, both the community and the NGO may feel disenfranchised. This feeling may then impact future community and NGO involvement in reclamation projects. This becomes an issue since, in some cases, NGOs and communities can provide sources of financial and physical support that would be vital for a reclamation projects success.

There are also numerous acres of state and federally owned lands across the region as well. As of 2018, the various Appalachian states contained around five million acres of federally owned lands, with over one million acres in West Virginia alone (US Congressional Research Service, 2020). These lands include abandoned mine sites, active mine sites, and split mineral estates with the potential for future mining. In many cases, the state or federal agency or department is responsible for managing and, where possible, recovering contaminated sites that were polluted before the government acquired the land. The study area of this research is the Daniel Boone National Forest (DBNF) located in eastern Kentucky, which is overseen by the US Forest Service. DBNF was chosen for two reasons. First, DBNF is one of the largest single National Forests in the Appalachian Region, third behind the Monongahela National Forest of West Virginia and the Cherokee National Forest of Tennessee and North Carolina (USDA Forest Service, 2011). Second, the land that is now part of the DBNF has a history of coal mining, the legacy of which modern administrators must contend with.

My research into mine land reclamation in the DBNF contributes to filling a few gaps in the literature and provides insight into different conceptualizations of reclamation. Much of the recent land reclamation literature is centered on the western United States, which is characterized by oil and gas extraction, as well as hardrock mines. My research contributes to this body of literature by focusing on a region within the eastern United States with a history of soft rock mining.

The goal of this research project was to gain an understanding of the process of mine land reclamation on a protected area in a region within extensive history of resource extraction. This paper will examine the differences between the various conceptualizations of the purpose of abandoned mine land (AML) reclamation that exist among the numerous government entities and NGOs active in the Appalachian region, with a specific interest in the DBNF. I will show that the DBNF, like many government entities, is siloed in its conceptualization of reclamation and should pursue a more holistic approach by cultivating relationships with NGOs that are actively working toward AML reclamation in the Appalachian region. The research questions of this work include 1) What different conceptualizations of abandoned mine lands reclamation exist among different actors within Appalachia?, 2) Why does the US Forest Service choose their approach to reclamation on the Daniel Boone National Forest?, and 3) How might other conceptualizations of abandoned mine land reclamation inform US Forest Service approaches on the Daniel Boone National Forest?

In the following section, I discuss the history of both eastern Kentucky and the DBNF and how these areas have been subjected to coal extraction. This section also discusses two pieces of relevant legislation - the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - that have had a significant impact on mine land reclamation on the DBNF. This section is followed by a review of the literature on abandoned mine land reclamation, which is

heavily focused on the western United States. Next, I explain the methods used in this research, which consisted of content analysis of interviews, project documents, and other documentation from NGOs and government agencies. The following section analyzes the data and I show that the various agencies and organizations active Appalachia have differing conceptualizations of AML reclamation and the purpose of such projects. In the final section, I discuss the implications of my findings and identify limitations of this research as well as areas for future research.

## **Chapter 2**

### **Background**

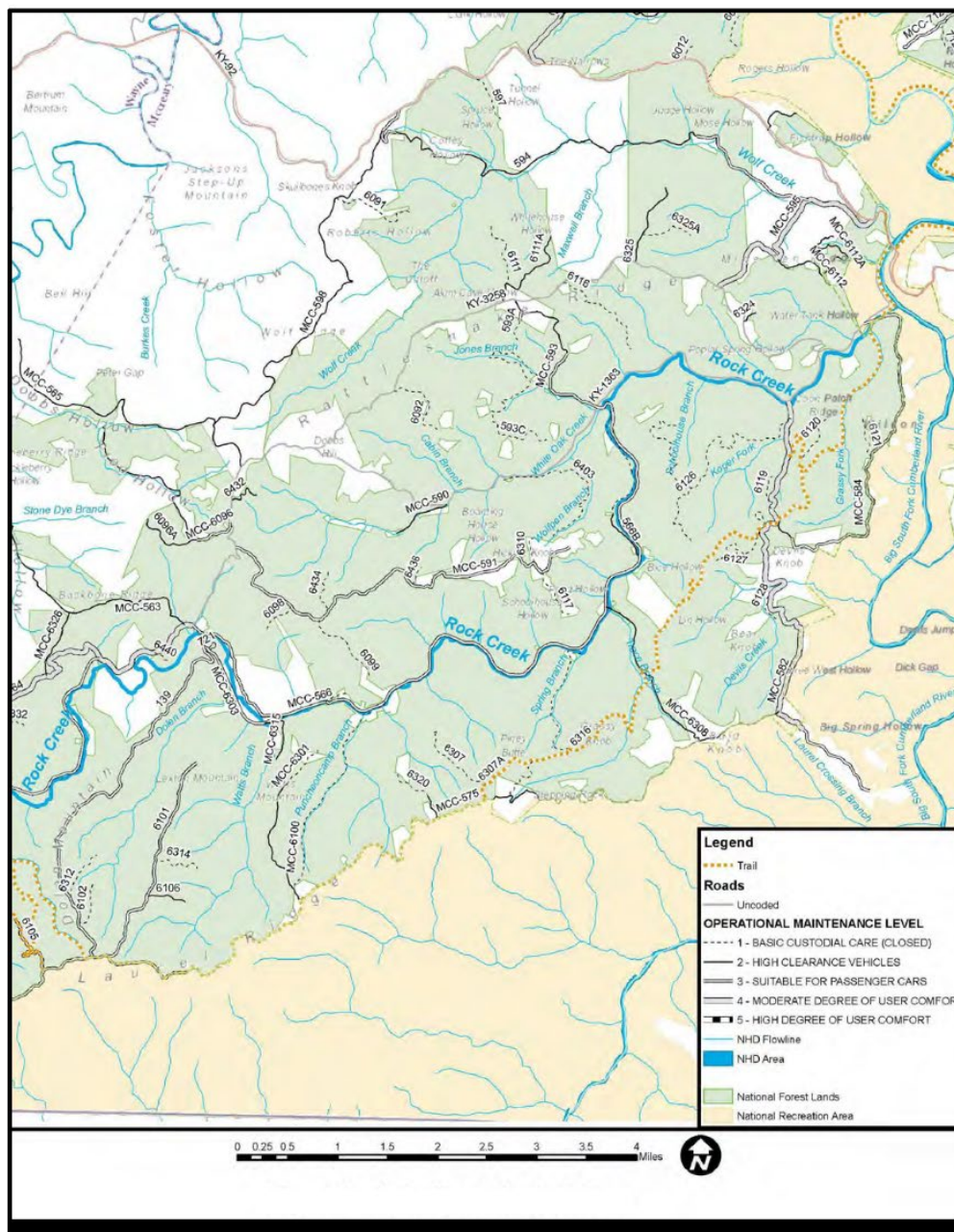
#### **Site History**

Eastern Kentucky is located within the Central Appalachian subregion (Appalachian Regional Commissions, n.d.). The area was initially characterized by small subsistence farms before outside corporations became interested in the timber resources (Caudill, 2001). However, by the late 1800s, the region's timber resources had been depleted too significantly to support a stable economy and the region then turned to coal mining. Coal quickly became king in eastern Kentucky, with coal companies constructing and operating entire communities - including the shops, schools, and political institutions - that existed solely to mine coal. While the region did experience the boom-and-bust cycles characteristic of many resource extraction industries, coal mining supported the economy far into the 20<sup>th</sup> century.

Unfortunately, shifting trends in coal mining as well as energy use in general has caused employment in the industry to sharply decline in the area (Mardon, n.d.). This decline has continued into the 21<sup>st</sup> century with no industry able to take on the role the coal industry held for nearly a century. This has led to numerous social impacts, most notably outmigration and increased rates of substance abuse. The seemingly sudden abandonment of the coal industry has also left behind hundreds of acres of former surface and underground mine lands that have been contaminated by heavy metals and which leach highly contaminated, acidic water into the local waterways. Some of these lands are still technically owned by the coal companies, some are privately owned, and some are owned by state and federal agencies. One such agency is the US

Forest Service, which manages the expansive DBNF that stretches across the entirety of eastern Kentucky.

The DBNF was originally established as the Cumberland National Forest in the 1930s from lands the federal government acquired under the Weeks Act of 1911. The Weeks Act allowed the government to purchase land to protect watersheds and headwaters (Forest History Society, n.d.). In the 1960s, the forest was given its current name and expanded. Today, the Daniel Boone National Forest contains over 700,000 acres of federally owned land located within a larger proclamation boundary containing over two million acres of forestland. In many areas, the federally owned land is fragmented by both private inholdings and state-owned lands, referring to as a split estate. A split estate occurs when the surface rights owner is different from the mineral or subsurface rights owner. Split estate ownership is also present within the DBNF, with 70 percent of the oil, gas, and coal resources being privately owned (USDA Forest Service, n.d.a.). Currently, however, there is no coal mining occurring on the DBNF, although around 30 percent of the forest's land has been negatively impacted by legacy mining (Wisniewski, 2017). There are numerous - it is unclear exactly how many - abandoned mine sites that are contaminating the forest's waterways, with acid mine drainage and heavy metals causing serious water quality issues that the DBNF is presently working to remedy. Not every waterway within the DBNF is affected by acid mine drainage. For example, the upper portion of Rock Creek has been designated as a State Wild River, meaning the waterway has been identified as having "exceptional quality and aesthetic character" (KYEEC, 2019a) (Figure 2-1). However, where affected streams meet unaffected streams, a serious decrease in water quality can occur. For instance, after the unaffected portion of Rock Creek meets the impacted White Oak Creek, the lower portion of Rock Creek becomes a part of the Kentucky 303(d) List of Waters a list of waterways that do not meet water quality standards and are areas of concern (USDA Forest Service, 2017a).



**Figure 1: Rock Creek Abandoned Mine Sites Project Area**  
Daniel Boone National Forest  
USDA, Forest Service, McCleary County, KY  
Project No: 60441898



Figure 2-1: Source: Rock Creek Abandoned Mine Sites Project Area (USDA Forest Service, 2017b)

## Selected Legislation

There are a number of pieces of state and federal level legislation that have informed mine land reclamation on the DBNF. Of particular relevance are the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Prior to the 1970s, regulation of surface coal mines was carried out at the state level. However, state regulations were limited in their ability to address the issues caused by strip mining, and there was significant variety between the state level regulations. Thus, the federal government created SMCRA to create more uniform regulations and requirements for surface mining and surface mine land reclamation. SMCRA requires mine operators to return the land to the original shape and cover composition and is largely concerned with preventing land instability to ensure human health and safety (Pennsylvania Abandoned Mine Land Campaign, 2019; Poplin, 2020; US Fish and Wildlife Service, n.d.). The passage of SMCRA also established an AML Fund for reclamation of sites abandoned prior to the act's passage that is managed by the OSMRE. Many states utilize this funding source to reclaim their mine lands based on the prioritization set forth by SMCRA guidelines, although the OSMRE has been criticized in the past for not properly ensuring the funds are used for their intended purpose (US DOI Office of the Inspector General, 2017). There are also funds available through the AML Pilot Program, a program intended to help states develop "strategies to return legacy coal sites to productive uses by tying reclamation to economic development end-use projects" (Alliance for Appalachia, 2019). However, as is the issue with much environmental legislation, some of the language of the act was vague and has led to less than satisfactory results (Yonk, Smith, & Wardle, 2019; Barry, 1980). A result of this vaguely written, narrowly focused policy was that the focus on erosion control has led to soil compaction on some sites, which makes it difficult for native plants to grow.

CERCLA, colloquially referred to as Superfund, is the second piece of particularly relevant legislation. The 1980 act was created to guide the cleanup of hazardous or toxic materials from waterways (H.R.7020, 96th Cong., 1980). CERCLA is administered by the Environmental Protection Agency with a fund - the so-called superfund that gives the act its colloquial name - to be used in the cleanup efforts. Funding can also be acquired from one or more potentially responsible parties (PRPs). A PRP is usually the company or individual who released the hazardous or toxic materials into the environment and can thus be held financially liable for cleanup. The US Forest Service, as a government agency, does not typically have access to the superfund, but the agency does use CERCLA to guide cleanup procedures and pursue PRPs when available (Respondent 5, Active US Forest Service Employee; Respondent 6, Active US Forest Service Employee; Respondent 7, Retired US Forest Service Employee (See Appendix A)). However, the DBNF largely uses CERCLA just as a guide for surface and subsurface mine reclamation.



## **Chapter 3**

### **Literature Review**

A few relevant gaps in the literature exist when looking into Appalachia and mine land reclamation. Appalachia and its relationship with the coal industry have been studied in the social science literature, particularly surrounding poverty (Glen, 1995; Holtkamp & Weaver, 2018; Lobao, Zhou, Partridge, & Betz, 2016; Partridge, Betz, & Lobao, 2013; Weise, 2009) and rural health (Davidov, et al., 2017; Hendryx, Luo, & Borders, 2017; McDonald, et al., 2020; Runkle, et al., 2021; Yao, Alcalá, Anderson, & Balkrishnan, 2016). Some literature on Appalachia has also utilized cartography and spatial data to understand and document certain phenomena, such as expanding surface mining operations (Pericak, et al., 2018). My research centered on Appalachia adds to this body of work by contributing an understanding of the postmining impacts the coal mining has on land reclamation and how reclamation is conceptualized by those who carry it out within the region.

#### **Abandoned Mine Land Reclamation**

There have also been a number of recent publications focused on land reclamation more broadly. This literature has centered on issues of care, justice, and quality of life, particularly in a post-mining landscape (Beckett & Keeling, 2018; Rice & Burke, 2017; Woods & Gordon, 2011). Some authors have also taken issue with how ‘reclamation’ is defined and who gets to decide what the process looks like (Beckett & Keeling, 2018). The way reclamation is defined on a site can reflect the actor or actors exhibiting control over that particular area. The constitutionality of previous reclamation acts has also been called into question, again relating to issues of justice.

The court system did, however, ultimately uphold SMCRA as constitutional (McAfee, 1981).

This court decision demonstrates how issues of justice and reclamation can expand beyond single sites or specific cases of environmental degradation and become issues of legal rights at the constitutional level. In Appalachia, reclamation of degraded mine lands for the purposes of renewable energy production has also been explored in recent literature (Campoli, Gardner, Mynear, Willis, & Mittle, 2019). Focusing reclamation efforts on renewable energy production can help ensure a just economic transition in areas with a history of resource extraction but may be complicated by unforeseen environmental impacts or changing narratives and attitudes. My work centered on mine land reclamation adds to the conversation of care and justice in relation to reclamation by contributing an understanding of the postmining, long-term impacts of the coal industry to this wider body of work.

There is also a variety of literature available on land reclamation within the field of GIS. This body of literature has largely centered on site inventorying, selection, and prioritization, usually for the purposes of remining or use in renewable energy production (Dolney, 2007; Dolney, 2015; Dolney & Flarend, 2012; Mauger, Baker, Butalia, & Wolfe, 2011; Gorokhovich, Voros, Reid, & Mignone, 2003). This literature is more spatially diverse than the broader geography literature on land reclamation, which tends to be centered on the western United States. This area is characterized by both conventional and unconventional oil and gas (UOG), as well as hardrock mines (Haggerty et al., 2019; McKinstry & Anderson, 1994; Walsh & Haggerty, 2019; Walsh & Haggerty, 2020; Wireman & Stover, 2011). Some land reclamation literature has focused on Appalachia, specifically the economic benefits of reclamation (Schwartzman, 2021; Mishra, Hitzhusen, Sohngen, & Guldman, 2012) and post reclamation environmental quality and effects (Kronrad, 2002; Hutnik & Hughes, 1990; Wei, Wei, & Viadero, 2011; Zipper, Younos, & Yagow, 1992). However, the broader region does not occupy a significant place when compared to the western United States and many of the publications

centered on Appalachia are older. My research contributes to the body of land reclamation literature by exploring the justification and decision-making process behind the reclamation methods chosen and the different conceptualizations of reclamation within the eastern United States, specifically within Appalachia.

## Chapter 4

### Methods

This research was conducted using a case study approach to understand the abandoned mine land reclamation process within a protected area, as well as which aspects of that process were emphasized over others. The qualitative nature of the case study approach allowed for a closer examination of the “contemporary phenomenon in depth and...its real-world context” (Yin, 2018, Pg. 286). Interviews, project document content analysis, and analysis of other documentation (NGO reports, state government guidance documents, federal guidance documents and legislation, reclamation project documents, public outreach documentation, action memorandums) were conducted. Semi-structured elite interviews were carried out with twelve relevant stakeholders involved in the mine land reclamation process. These interviews were carried out at various points in time between January and March of 2021, as well as between November and December of 2021. One final interview was conducted in January of 2022. Interviewees included active US Forest Service employees, retired US Forest Service employees, and NGO members (Table 4-1). Active DBNF employees were included due to their current involvement in reclamation projects and retired DBNF employees were included due to their knowledge of the techniques and conditions prior to the establishment of the official reclamation program, as well as knowledge of the early years of the program. Finally, the sample included a number of NGO members who are involved in reclamation in Appalachia.

Table 4-1: Stakeholders interviewed

Stakeholder Group	Number of People Interviewed
Active US Forest Service Employees	4
Retired US Forest Service Employees	2
NGO Members	7

Total	13
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In total, twelve interviews were conducted, lasting between 30 and 60 minutes. Initial contact was established through email and all interviews were conducted over the phone due to the COVID-19 pandemic. A preliminary, short list of primary contacts was identified from publicly available contact information included in the reclamation project documents and on the NGO websites. From this initial list, snowball sampling was utilized to identify other potential interviewees. Interview questions were mainly focused on the participants' involvement in the process, the strengths and weaknesses of the current program, areas of improvement, and goals. For the retired employees, questions were also included regarding the history of the process and changes over time. After obtaining verbal consent, the phone interviews were recorded. Then, the interviews were transcribed manually in Microsoft Word and coded by hand using the coding scheme outlined in Appendix C. The coding scheme was centered on how the interviewees discussed reclamation needs, processes, and goals in order to gain an understanding of the different conceptualizations of reclamation among the different stakeholders. To help facilitate analysis of the interviews, two content clouds were created, one for the DBNF employees and one for the NGO members. Content clouds allow for data visualization and analysis in qualitative research. They do so by presenting the most frequent words from a piece of text and then adjusting the size and darkness of each word in relation to their rate of occurrence (Cidell, 2010). Content clouds are useful tools for identifying jumping off points and areas of focus for data analysis. For the creation of the content clouds, the website TagCrowd.com was utilized following the methodology in Cidell (2010). The interviewees were compiled into two plain text files according to their respective affiliations. The file was then uploaded to TagCrowd and visualized multiple times to identify irrelevant words that appeared in the cloud and add them to the list of unwanted words. The list of removed words is available in Appendix E.

Content analysis of various DBNF project documents was also performed (Table 4-2). These seven documents were evaluated to both get an understanding of the decision-making process and inputs when the DBNF chooses a treatment technology as well as the stated goals or aims of the projects. Specifically, the documentation involved the Wildcat Branch - Addison Branch Mine Site and the Rock Creek Abandoned Coal Mine Sites. For the Wildcat Branch - Addison Branch Mine Site, documentation included a cover letter, fact sheet, the Engineering Evaluation/Cost Analysis draft, and the action memorandum identifying the chosen treatment option for Wildcat Branch Area A. For the Rock Creek Abandoned Coal Mine Sites, documentation included a fact sheet, the Engineering Evaluation/Cost Analysis draft, and the action memorandum identifying the chosen treatment option for the Cabin Branch. Apart from the action memorandums, all documents were available online through the Daniel Boone National Forest website. The action memorandums for both projects were provided by one of the interviewees. These two project sites were chosen because they are presently underway and substantial documentation exists for them both. They are also indicative of the types of reclamation projects the DBNF has carried out in the past. There are no novel or experimental treatment techniques used or suggested for these sites and they largely rely on reforestation and passive water treatment. Two other projects are also underway but are in the early stages and documentation was unavailable at the time of this research. Additional documentation was analyzed to supplement the low number of DBNF project documents and interviewees, which is discussed next.

Table 4-2: Project documents

Title	Date	Number of Pages	Purpose of Document
Cover Letter: Wildcat and Addison Branch	February 10th, 2016	3	Requesting public comments on the project

Fact Sheet: Wildcat Branch - Addison Branch Mine Site	January 2015	2	Dissemination of information to the public
Draft Engineering Evaluation/Cost Analysis: Wildcat Branch - Addison Branch Mine Site	No Date	101	Provides information on the site's history and characteristics and treatment options and their feasibility
Action Memorandum: Non-Time-Critical Removal Action Wildcat Branch Area A Anoxic Limestone Drain	January 2020	25	Final treatment decision and justification factors
Fact Sheet: Rock Creek Abandoned Coal Mine Sites	September 2016	2	Dissemination of information to the public
Draft Engineering Evaluation/Cost Analysis: Rock Creek Abandoned Mine Sites	January 2017	337	Provides information on the site's history and characteristics and treatment options and their feasibility
Action Memorandum: Cabin Branch Non Time-Critical Removal Action Rock Creek Abandoned Mine Sites	April 2018	22	Final treatment decision and justification factors

Due to the small number of interviews, as well as the interviewees heavily presenting a federal perspective, the content analysis was supplemented with additional documentation and reports from NGOs, state governments, and federal government agencies (Table 4-3). This corpus of documents included government news articles and informational AML program webpages, government reports, guidance documents, government acts, NGO articles, and NGO reports provided by Appalachian Voices, Reimagine Appalachia, the Reclaiming Appalachia Coalition, Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR), the Pennsylvania

AML Campaign, the Appalachian Regional Reforestation Initiative (ARRI), the Alliance for Appalachia, the Appalachian Citizens Law Center (ACLC), Green Forests Work, the Kentucky state government and the Kentucky Energy & Environment Cabinet (KYEEC), the Pennsylvania Department of Environmental Protection (DEP), the West Virginia Department of Environmental Protection (DEP), the federal government, Bureau of Land Management (BLM), the Department of the Interior Office of Surface Mining Reclamation and Enforcement (DOI OSMRE), and the Department of the Interior Office of Inspector General (Table 4-4).

Table 4-3: Additional Documentation Types

Sector Affiliation	# of Documents and Articles
Federal Government	15
Kentucky State Government	35
West Virginia State Government	5
Pennsylvania State Government	18
NGOs and Other Civil Society Organizations	21
Total	94

Table 4-4: Additional Documentation Sources

Source Type	# of Documents and Articles	# of Documents and Articles
Government News Articles and Public AML Program Webpages		8
Government Reports, Guidance Documents, and Acts		62
Maps		2
NGO and Other Civil Society Organization Reports and Articles		22
Total		94

Both the interviews and the documents were coded in multiple rounds. A concept coding scheme was utilized (Saldaña, 2016). A grounded theory approach was also used in development of the codes (Chun Tie, Birks, & Francis, 2019). The initial coding round identified commonly occurring terms and concepts related to how the various interviewees and documents discussed reclamation needs, processes, and desired outcomes. This was done to create an understanding of



the different conceptualizations of reclamation among the different state governments, federal government agencies, and NGOs. The codes were then simplified, with some codes removed as irrelevant while others were combined (i.e., ‘contaminants’ and ‘acidity’ were combined with ‘water quality’). Initially, two separate coding schemes were made for the interviews and the documents, and a second round of coding was conducted using these separate lists. Since there was substantial overlap, the schemes were combined into one master list. The new list was then applied to the interviews and documents to check for errors that may have occurred in the earlier rounds. The coding scheme contained two main themes - Ecosystem and Environment, and Economy. These two themes were selected after it was observed that two overarching patterns to the codes emerged and were thus able to be grouped together according to those patterns. Under each main theme, a number of subthemes appeared (Table 4-5). A number of codes appeared frequently throughout both the interviews and the documents, including ‘Water Quality,’ ‘Soil Quality’ and ‘Safety.’

Table 4-5: Main themes and subthemes of the coding scheme

Ecosystem and Environment	Economy
Water Quality	Employment
Soil Quality	Job Creation
Land Stabilization	Economic Development
Revegetation & Reforestation	Community Development
Aquatic Vegetation	Tourism
Wildlife Presence	Infrastructure Development
Wildlife Habitats	Aesthetics
Passive Water Treatment	Funding Sources
Active Water Treatment	Renewable Energy Construction
Safety	Agriculture
Conservation	Fisheries
Environmental Legislation	Justice
	Resource Production

## Chapter 5

### Results and Analysis

The difference between the way the DBNF, other federal agencies, and state agencies conceptualize reclamation is influenced in part by the legislation each entity must follow. State run abandoned mine land reclamation projects are largely overseen by the OSMRE and utilize SMCRA when prioritizing and carrying out reclamation. As a result, these states follow the site prioritization ranking system, which largely prioritizes erosion control and land stabilization, and they have access to the AML Fund, which was established as a provision of SMCRA and allows for more financial security for reclamation. Similarly, some federal agencies like the DOI also use SMCRA. The DBNF, however, differs from other entities in that it uses CERCLA instead of SMCRA to guide its reclamation efforts. CERCLA is more heavily concerned with water and air quality and similarly has a ranking system that prioritizes improving these aspects of an AML site. CERCLA would allow for access to a funding source, but as a federal agency the DBNF doesn't usually have access to this money and must request funds from the USDA, their parent agency (Respondent 5, Active US Forest Service Employee; Respondent 6, Active US Forest Service Employee). As a result of these different legislative landscapes, these various agencies thus conceptualize reclamation differently. However, all state and federal agencies, including the DBNF, must comply with certain broader environmental legislation like the Clean Water Act and the Endangered Species Act so there are some similarities between their processes and considerations during reclamation.

### **Differing Conceptualizations**

NGOs and other non-governmental actors tend to approach AML reclamation in a more holistic manner, typically seeing the end goal as a mixture of environmental restoration and economic growth, with one interviewee describing the goal of their organization as achieving “an intersectional win for Appalachia” (Respondent 10, NGO Member). Figure 5-1 below consists of a word cloud created from the interviews with NGO members and Table 5-1a and Table 5-1b show the frequencies of each code in descending order from the additional documentation discussed in the previous section. Some NGOs have also conceptualized reclamation as a way to fight climate change while others within the legal realm to protect and advocate for citizens and community groups negatively affected by abandoned mine lands (Respondent 11, NGO member). For example, the Reclaiming Appalachia Coalition describes itself as “a regional collaboration that seeks to spur mine reclamation projects throughout Central Appalachia that are responsive to community needs and interests and accelerate the growth of new, sustainable sectors” and is made up of a number of individual NGOs working together toward common goals (Appalachian Voices, Coalfield Development Corporation, Rural Action, and Downstream Strategies, 2020). The coalition reports on and supports projects such as trail system construction, watershed cleanup, landslide mitigation, agricultural program expansion, a water quality testing and restoration program in West Virginia, and motorsports tourism development, among many other programs (Appalachian Voices, Coalfield Development Corporation, Rural Action, and Downstream Strategies, 2020). Other NGOs not only promote certain projects, but also seek to work with federal and state governments to influence policy (Dixon, 2021; Dixon & Bilbrey, 2015; Respondent 8, NGO Member; Respondent 9, NGO Member; Respondent 10, NGO Member). Reimagine Appalachia, another coalition, has made a number of policy recommendations to the federal government surrounding economic justice for workers,

strengthening “mine reclamation to incorporate ecological health, prioritize reforestation and abating GHG [sic] emissions, and bring more land into public and local stewardship,” and providing better funding and site inventorying (Dixon, 2021). The Appalachian Citizen Law Center has similarly made policy recommendations based on an analysis of the “economic, environmental, and financial repercussions” of current policies (Dixon & Bilbrey, 2015).



Figure 5-1: NGO Interviewee Word Cloud. Created by author using TagCrowd.com

Table 5-1a: NGO, State, and Other Federal Agencies Documentation Ecosystem and Environment Code Frequencies

Code	Frequency
Water Quality	60
Human Health & Safety	42

Passive Water Treatment	34
Revegetation & Reforestation	31
Soil Quality	25
Land Stabilization	21
Wildlife Presence	11
Wildlife Habitats	6
Active Water Treatment	6
Conservation	6
Environmental Legislation	4
Aquatic Ecosystem	3
Total	249

Table 5-1b: NGO, State, and Other Federal Agencies Documentation Economy Code Frequencies

Code	Frequency
Funding Sources	58
Infrastructure Development	38
Economic Development	29
Community Development	27
Agriculture	24
Tourism	22
Justice	18
Resource Production	17
Employment	10
Renewable Energy Construction	9
Aesthetics	8
Job Creation	4
Total	264

However, NGOs and other civilian actors have a limited ability to directly exert their influence on state and federal lands. Even when NGOs are able to meet with government representatives who appear receptive, those representatives are subject to their superiors and the guiding legislation of the agency or department (Respondent 9, NGO Member). This trend has emerged as a major challenge to environmental governance across the United States, creating what appears to be a dissonance between what the public needs or wants and what policies high ranking environmental officials pursue and promote. This perceived or real dissonance can result in tension or confusion between the environmental agencies or departments and the public, and can lead to poor policy decisions (Landy, Roberts, & Thomas, 1990). Despite their limited ability

to exert influence, NGOs and citizen actors can provide a potential workforce source and funding. For example, one interviewee reported that their NGO was able to acquire around five million dollars of funding through grants (Respondent 8, NGO Member). The DBNF, in partnership with a reforestation centered NGO, has also invited a number of Scout Troops and other civilian groups to assist in their reforestation efforts in recent years (Respondent 1, NGO Member).

State level reclamation agencies conduct their work under SMCRA and thus use the SMCRA prioritization guidelines. For example, the Kentucky Division of Abandoned Mine Lands inspects mining permits specifically to ensure they comply with SMCRA (Office of Surface Mining Reclamation and Enforcement, 2021). As a result, state run reclamation projects are often conceptualized as a way to ensure public safety through soil stabilization and erosion control. Many states have also sought to use these sites for economic development. For example, the state of Kentucky operates an AML economic revitalization program specifically aimed at helping southcentral and eastern Kentucky “achieve economic and community development goals in areas that have been impacted by the downturn of coal production” (KYEEC, 2019b). The program is overseen by both the Kentucky Energy and Environment Cabinet and the OSMRE.

The DBNF has partnered with the Kentucky state government in the past on reclamation projects on Forest Service land (Respondent 2, Former US Forest Service Employee; Respondent 7, Former US Forest Service Employee; Respondent 8, NGO Member). However, in recent years this partnership has dissolved, despite DBNF interviewees expressing an interest in revitalizing this relationship (Respondent 5, Active US Forest Service Employee; Respondent 6, Active US Forest Service Employee; Respondent 7, Former US Forest Service Employee). While there is not a clear reason why, one interviewee theorized what might be the reason:

So we tried very, very hard to get in with the state to work with them and to be able to um put proposals in on their funding and...to try and get them to work with us and bring some of that money...because that's a lot of money to have to spend on one state you know in one year so uh we felt that they could take advantage of our successes because you know if they were a part of our project

you know so we were always trying to propose to them that...they put in 50 percent we put in 50 percent but we- we were never successful in uh getting any of that- any of that SMCRA funding and- and I think the main reason is because we were using CERCLA and the Division of Abandoned Mine Lands felt like since their money was coming from SMCRA that it was a conflict of interest (Respondent 7, Former US Forest Service Employee).

Another interviewee also felt that the lack of cooperation between the state government and the Forest Service surrounded funding and the state's perception of what and how much funding is available to the Forest Service:

I guess the biggest contention would be the state of Kentucky. They're not too interested in- in working with us too much it seems. Of course, they figure, 'Hey we're federal, we have all the money' which is not really the case. (Respondent 6, Active US Forest Service Employee).

The state level reclamation programs are overseen by the OSMRE, which allows for each state to have a certain level of autonomy over their projects. A major exception within the Appalachian region is the state of Tennessee, whose AML program is completely controlled by the OSMRE. The Office similarly follows SMCRA guidelines and thus also tends to be siloed around public safety and erosion control. The Office is also responsible for overseeing the AML Fund and the AML Pilot Program. The Pilot Program is explicitly meant to be used by states and Tribal groups for community and economic development projects (Office of Surface Mining Reclamation and Enforcement, 2020). However, both NGOs and other federal offices have critiqued the Office for a lack of proper oversight as well as how the AML Fund is unevenly distributed across the United States (Dixon & Bilbrey, 2015; US Department of the Interior Office of Inspector General, 2017). The AML Fund was established under SMCRA and is supplied by fees collected on the amount of minerals and other resources extracted. More funds are distributed to the western United States because the mining industry is presently centered in this area and thus the most recent, post-SMCRA reclamation sites are located across the western states. However, the eastern United States has a much longer history of mining and thus has many more pre-SMCRA, legacy sites that are also unreclaimed but receive less money from the fund

for reclamation. This uneven distribution of funds between the western United States and the eastern United States can leave legacy mine land abandoned or inadequately reclaimed in communities that have experienced a long history of resource extraction and environmental degradation, which in turn perpetuates environmental injustice.

Other federal agencies are similarly siloed in their conceptualization of AML reclamation, with their efforts focused on development of reclaimed sites. For example, the Department of the Interior has provided over \$170 million to various states and tribal groups for the purpose of reclaiming abandoned mine lands to be used for new development projects, with West Virginia alone receiving \$22 million (US Department of the Interior, 2020). The grants provided by the interior are meant to be used explicitly for development projects, not conservation or environmental restoration for its own sake.

### **Forest Service Approach on the DBNF**

The DBNF is also largely siloed, although their reclamation efforts are focused on environmental restoration, specifically restoration of water. Figure 5-2 contains a word cloud of the DBNF retired and active employees' interviews, showing the common words and phrases used by the interviewees while Table 5-2a and Table 5-2b show the frequencies of each code in the DBNF project documentation mentioned in the previous section in descending order. A number of codes have a value of 0. These are codes that have appeared in the other documentation, but not in the DBNF documentation. Within the DBNF project documentation, 'Water Quality,' 'Passive Water Treatment,' 'Environmental Legislation,' and 'Human Health & Safety' appeared most often. The first two largely revolve around the treatment techniques and technologies utilized by the DBNF officials. Improved water quality is a stated goal in these documents and passive water treatments are a cheaper and less personnel intensive way to



achieve this goal. Thus, they are more appealing to the Forest Service. The project documents also go into detail regarding the various pieces of legislation the Forest Service must adhere to when carrying out AML reclamation projects, including CERCLA, the Clean Water Act, E.O. 11990 Protection of Wetlands, Endangered Species Act, and the Migratory Bird Treaty Act, among others (USDA Forest Service, n.d.c; USDA Forest Service, 2017a). The narrow focus of the DBNF is likely due to the various pieces of environmental legislation that the Forest Service must follow, in particular the Clean Water Act. The DBNF also differs from other state and federal agencies in that it uses CERCLA instead of SMCRA to guide its reclamation efforts. CERCLA utilizes a Hazard Ranking System, which calculates a score based on the “likelihood that a site has released or has the potential to release hazardous substances into the environment...characteristics of the waste...and people or sensitive environments (targets) affected by the release” (US Environmental Protection Agency, n.d.). The score also factors in how contaminants might enter the environment through “ground water migration...surface water migration...soil exposure and subsurface intrusion...and air migration” (US Environmental Protection Agency, n.d.). Air pollution is minimal from these sites, if it is a concern at all, and soil quality is connected to water quality, thus the administration focuses on water. Funding also limits the scope of reclamation projects within the DBNF, forcing forest officials to narrow their prioritization.



Figure 5-2: DBNF Interviewee Word Cloud. Created by author using TagCrowd.com

Table 5-2a: DBNF Project Documentation Ecosystem and Environment Code Frequencies

Code	Frequency
Water Quality	42
Passive Water Treatment	24
Environmental Legislation	23
Human Health & Safety	21
Active Water Treatment	16
Land Stabilization	13
Wildlife Presence	13

Wildlife Habitats	13
Soil Quality	12
Aquatic Ecosystem	10
Revegetation & Reforestation	7
Conservation	2
Total	196

Table 5-2b: DBNF Project Documentation Economy Code Frequencies

Code	Frequency
Infrastructure Development	12
Tourism	8
Aesthetics	3
Funding Sources	3
Community Development	2
Employment	1
Job Creation	0
Economic Development	0
Renewable Energy Construction	0
Agriculture	0
Justice	0
Resource Production	0
Total	29

There has also been a conscious effort to prevent development on former reclamation sites. When asked about the possibility of development for recreation or other purposes, one interviewee responded:

We don't allow development on these sites...We don't have any trails or uh facilities or anything like that on these sites and there's...no plans to- to do that cause...they've got a ways- I mean we've only...restored these in the last seven years um so I mean they're still pretty small, they're still pretty open right now and...we don't want to do anything in there with them. (Respondent 4, Active US Forest Service Employee).

In theory, successfully reforested sites could provide a source of income for the forest in the future but based on past events, this is unlikely to happen. Recently, the DBNF attempted to begin timber sales within the forest, but they were blocked by both the public and the Fish and Wildlife Service (Allison, 2019; USDA Forest Service, n.d.b.).

## **Informing the Forest Service Approach**

As mentioned, other federal and state governments agencies are largely siloed in their approach to AML reclamation, mainly around erosion control or development. The DBNF is similarly siloed, although the forest is centered largely on ecosystem restoration and water and does not particularly prioritize economic or community development in their current reclamation projects. Looking to the DBNF interviewee content cloud, the terms ‘forest’ and ‘water’ are both the largest and darkest terms, while terms like ‘economic’ and ‘development,’ which appear in the NGO interview content cloud, aren’t present at all. When looking at the code frequencies of the DBNF, a similar trend appears with ‘Water Quality’ appearing considerably more often than any other subtheme. This narrow conceptualization can mean that other environmental or community benefits or issues can go overlooked or unaddressed. However, the DBNF’s approach to reclamation could be positively informed by the more holistic approach taken by many NGOs. While each individual NGO does not hold every possible conceptualization at the same time, their more diversified nature as well as their ability and willingness to work outside their organization may be beneficial to the DBNF. This diversified nature can be seen in the NGO interview content cloud. Terms related to the environment as well as the economy both appear in the cloud. The cloud contains similarities to the DBNF, such as ‘water,’ ‘work,’ and ‘forest,’ but also contains terms not found in the DBNF cloud, such as ‘economic,’ ‘development,’ and ‘research.’

## Chapter 6

### Discussion and Conclusion

For over a century, the economy and identity of the Appalachian region has relied on the coal mining industry. However, the recent decline of the coal mining industry in the region has led to a number of social and economic issues, including poverty, outmigration, and substance abuse. The legacy of mining has also led to numerous abandoned mine sites that plague the communities and environment with contamination and safety risks. As a result, a serious need for AML reclamation has emerged. In response to this need, several federal agencies, state agencies, and NGOs have gotten involved in reclamation with different conceptualizations of what reclamation should look like and what the end result should be. This research project was centered on the DBNF and how the forest officials carry out and conceptualize reclamation. The research questions explored in this work include 1) What different conceptualizations of abandoned mine lands reclamation exist among different actors within Appalachia?, 2) Why does the US Forest Service choose their approach to reclamation on the Daniel Boone National Forest?, and 3) How might other conceptualizations of abandoned mine land reclamation inform US Forest Service approaches on the Daniel Boone National Forest?

The different actors that are involved with reclamation within Appalachia have adopted differing conceptualizations of the purpose of reclamation efforts. NGOs tend to approach AML reclamation in a more holistic manner and often see the end goal as a combination of environmental restoration and economic growth. However, NGOs and civilian groups are often unable to exert direct influence on state and federal lands but could act as a potential workforce and funding source. State reclamation agencies are often siloed around soil stabilization and erosion control due to being overseen by the OSMRE and having to comply with SMCRA

guidelines. Many states have also conceptualized reclamation as a pathway to economic and community development. SMCRA has allowed the states to access the AML Fund through the OSMRE for their reclamation projects, but the OSMRE has been critiqued for that way these funds are distributed as well as how the states are allowed to use the funds (Dixon & Bilbrey, 2015; US Department of the Interior Office of Inspector General, 2017). Other federal agencies are similarly siloed with reclamation projects often focused on development of reclaimed sites. On the DBNF, however, Forest Service officials utilize CERCLA to guide their reclamation process and are instead narrowly focused on mitigating pollution of the environment by contaminated air and water from the abandoned mines.

The DBNF aims to achieve ecological restoration on their abandoned mine sites, but there is a disconnect between typical ecological restoration practices and how the DBNF practices restoration. Ecological restoration is seen as needing to prioritize biological complexity, move toward self-sustainability, and restore ecosystem services that can benefit humanity (Suding et al., 2015). Within ecological restoration science, a narrow focus has been critiqued as potentially causing more problems in the future and a wide variety of disciplines should be involved in the restoration process to help avoid these issues (Bradshaw, 2002). The DBNF, however, does have a narrow focus of restoration, largely centered on water quality and reforestation. Again, the DBNF must comply with certain environmental legislation and must do so with limited funding. In many of the interviews with forest officials, funding was cited as a major limiting factor in their ability to reclamation abandoned mine sites (Respondent 2, Former US Forest Service Employee; Respondent 5, Active US Forest Service Employee; Respondent 6, Active US Forest Service Employee; Respondent 7, Former US Forest Service Employee). Thus, the officials are forced to focus their efforts where they feel they can make the biggest impact with the least amount of spending, and they have decided on water quality improvement. Another major issue on former mine sites in the DBNF is compaction of soil and resulting invasive species

from improper reclamation in the past. Forest officials have adopted the Forestry Reclamation Approach (FRA) to facilitate reforestation in part because this approach has seen recent success and also likely in part because one of the developers of this approach has a personal relationship with a number of the foresters on the DBNF (Angel et al., 2009; Respondent 1, NGO Member; Respondent 2, Former US Forest Service Employee; Respondent 4, Active US Forest Service Employee; Zipper et al., 2011). However, the FRA itself has been criticized as too narrow in focus and a more comprehensive Ecosystem Reclamation Approach (ERA) has been suggested to replace it (Burger, 2015). The DBNF's narrow focus on water quality and reforestation have left their reclamation efforts largely siloed.

The DBNF can use other conceptualizations, particularly those of NGOs, to inform their reclamation projects going forward and can benefit from cultivating closer relationships with a wider variety of NGOs that are active in the Appalachian region. This could help the DBNF in a number of ways. First, forest administrators are restricted in their ability to design reclamation projects by CERCLA and other environmental legislation that require them to narrowly focus their efforts. A partnership with one or more NGOs with broader reclamation goals can also allow the DBNF to expand their conceptualization of reclamation. NGOs and other citizen groups can also be potential sources of funding and a workforce. Multiple interviewees identified a lack of funding and capacity to complete projects and monitor sites as a major hurdle to successfully reclaiming abandoned mine lands over the long term (Respondent 1, NGO Member; Respondent 2, Former US Forest Service Employee, Respondent 5, Active US Forest Service Employee; Respondent 6, Active US Forest Service Employee; Respondent 7, Former US Forest Service Employee). A number of NGOs are also focused on research, development, and education and could be a potential source of expertise from which the DBNF could draw.

The DBNF has worked closely in recent years with an NGO on their reforestation efforts on the abandoned surface mines within the forest and this relationship has

been characterized as harmonious and productive. However, the involvement with this NGO appears to be winding down since many of the surface mines have been replanted and are entering a monitoring stage (Respondent 1, NGO Member). In the past, the DBNF has also worked with another NGO on research and treatment application, although this was a most indirect relationship facilitated with the state in the 1990s, before the forest's official AML reclamation program began (Respondent 8, NGO Member). The DBNF has benefited from working with different NGOs in the past, both directly and indirectly, and would likely benefit from continued cooperation with a variety of NGOs going into the future.

### **Limitations of This Research**

A few limitations of this research project should be mentioned. There were a few challenges involved in the interview process. First, not all potential interviewees responded to the initial email or a follow-up email. Second, the COVID-19 pandemic has led to various complications in conducting research including remote working conditions, which hinders body language observations and makes it more difficult to establish relationships with the interviewees. The interviewees consisted largely of US Forest Service employees, limiting the generalizability of the results to US Forest Service reclamation projects. Also, it was beyond the scope of this study to include all of Appalachia or include specific reclamation projects carried out by the state of Kentucky. This also limits the generalizability of the results. The unforeseen COVID-19 pandemic limited fieldwork to remote collection. Despite these limitations, the results can still provide insight into the reclamation process in an area with a history of extraction and can provide a jumping off point for future research.



## **Future Research**

Future studies should explore reclamation projects in other subregions of Appalachia. This research was specifically centered on eastern Kentucky, an underrepresented geographic area in academic literature on mine land reclamation. While there are common characteristics across the Appalachian Mountain region, each state and site have unique circumstances that must be approached differently. For example, oil and gas extraction is relatively uncommon in eastern Kentucky, but Pennsylvania has experienced a recent boom in natural gas extraction and thus faces different reclamation challenges. The Marcellus Shale gas boom in Pennsylvania may also be an area of interest for research in the near future as land reclamation needs arise and patterns might emerge that are consistent with reclamation needs on the gas fields of the western US. The nature of the relationship between federal agencies, state agencies, and NGOs is also likely different across the mountain range given the different historical and cultural contexts that have developed over time. Finally, future research should also study state level reclamation projects since, at least in Kentucky, the federal government and state government use different legislation to guide their projects and provide funding sources. This can influence the intensity, effectiveness, and goals of the reclamation projects.

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## Appendix A

### Interviewees

Number	Interviewee	Date
1	NGO Member	Feb 9 <sup>th</sup> , 2021
2	Former US Forest Service Employee	March 15 <sup>th</sup> , 2021
3	Active US Forest Service Employee	March 9 <sup>th</sup> , 2021
4	Active US Forest Service Employee	Jan 5 <sup>th</sup> , 2021
5	Active US Forest Service Employee	Feb 3 <sup>rd</sup> , 2021
6	Active US Forest Service Employee	Jan 6 <sup>th</sup> , 2021
7	Former US Forest Service Employee	Jan 12 <sup>th</sup> , 2021
8	NGO Member	Nov 29 <sup>th</sup> , 2021
9	NGO Member	Dec 3 <sup>rd</sup> , 2021
10	NGO Member	Dec 8 <sup>th</sup> , 2021
11	NGO Member	Dec 9 <sup>th</sup> , 2021
12	NGO Member	Dec 14 <sup>th</sup> , 2021
13	NGO Member	Jan 28 <sup>th</sup> , 2022

## Appendix B

### Additional Documents Analyzed

#	Name of Document	Year	Institution	Type of Document
1	H.R.2156 - Revitalizing the Economy of Coal Communities by Leveraging Local Activities and Investing More Act of 2019	2019	US House of Representatives	Government Act
2	The Abandoned Mine Reclamation Fund: Issues & Legislation in the 116th Congress	2020	US Congressional Research Service	Government Report
3	Status of the AML Reclamation Fund	2020	US DOI OSMRE	Government Report
4	OSMRE Reclaiming AML	2021	US DOI OSMRE	Public AML Program Website
5	S. 961 and S. 1701, AML Rec Reform Act of 2005	2005	US DOI OSMRE	Government Act
6	OSMRE'S Oversight of the AML Program	2017	US DOI Office of the Inspector General	Government Report

7	The OSMRE's AML Program	2017	US DOI OSMRE	Public AML Program Website
8	OSMRE Handbook for Calculation of Reclamation Bond Amounts	2000	US DOI OSMRE	Guidance Document
9	Interior Investing Over \$260M to Help Create Jobs and Revitalize Land in Coal Communities	2021	US DOI OSMRE	Government Article
10	AML Reclamation Program	N/A	US DOI Natural Resources Revenue Data	Public AML Program Website
11	Biden's jobs plan holds promise for Appalachia	2021	Appalachian Voices	NGO Article
12	Executive Order on Tackling the Climate Crisis at Home and Abroad	2021	White House	Executive Order
13	The Forestry Reclamation Approach: Guide to Successful Reforestation of Mined Lands	2017	USDA Forest Service, Northern Research Station	Guidance Document
14	Good – and not-so-good – mine rec. projects	2019	Appalachian Voices	NGO Article
15	AML Program: A Policy Analysis for Central Appalachia and the Nation	2015	Appalachian Citizens' Law	NGO Report

			Center, The Alliance for Appalachia	
16	Land Restoration article	N/A	Appalachian Voices	NGO Article
17	Central Appalachia Coal Mining Rec Bonding Policy Recs	2018	The Alliance for Appalachia	NGO Report
18	Restoration and Renewal: The New Appalachian Economy	2020	Reclaiming Appalachia Coalition	NGO Report
19	Many Voices, Many Solutions: Innovative Mine Rec. in Central Appalachia	2018	Reclaiming Appalachia Coalition	NGO Report
20	A New Horizon: Innovative Reclamation for a Just Transition	2019	Reclaiming Appalachia Coalition	NGO Report
21	Reimagine Appalachia Blueprint	2020	Reimagine Appalachia	NGO Report
22	Impacts of the Reimagine Appalachia & Clean Energy Transition Programs for WV	2021	Reimagine Appalachia	NGO Report



23	Impacts of the Reimagine Appalachia & Clean Energy Transition Programs for PA	2021	Reimagine Appalachia	NGO Report
24	Impacts of the Reimagine Appalachia & Clean Energy Transition Programs for OH	2020	Reimagine Appalachia	NGO Report
25	Growing Clean and Efficient Manufacturing	2021	Reimagine Appalachia	NGO Report
26	Repairing the Damage	2021	Reimagine Appalachia	NGO Report
27	Repairing the Damage Report	2021	Reimagine Appalachia	NGO Report
28	Buy American Act Requirements for WVDEP AML Waterline and PILOT Projects	N/A	WV DEP	Guidance Document
29	Equipment Guidance for Pilot Projects	N/A	WV DEP	Guidance Document
30	Real Property Purchase Guidelines for Pilot Projects You	2018	WV DEP	Guidance Document
31	Guidance for Project Eligibility Under the AML Rec Econ Dev Pilot Prog for FY2020	2020	WV DEP	Guidance Document

32	Standardization of plans and specs	N/A	WV DEP	Guidance Document
33	Interior Provides More Than \$22.8M in Conservation Funding for WV to Reclaim & Repurpose Abandoned Coal Mines	2020	US DOI OSMRE	Government Article
34	PA AML Campaign Fact Sheet	2020	PA AML Campaign	NGO Article
35	EPCAMR AML Trust Fund	N/A	EPCAMR	NGO Article
36	EPCAMR Project History Highlights	N/A	EPCAMR	NGO Reports
37	Hicks Creek Natural Stream Channel Design Project	N/A	EPCAMR	NGO Article
38	Regional Watershed Support Initiative	N/A	EPCAMR	NGO Article
39	AMD Sludge Sampling	N/A	EPCAMR	NGO Article
40	Number of AML sites by County	2013	PA DEP	Map
41	AML Problems by Field Office	2013	PA DEP	Map
42	AML Funding	N/A	PA DEP	Public AML Program Website
43	AML Hazards & Problem Types	N/A	PA DEP	Public AML Program Website

44	Assessment of PA's Bonding Program for Primacy Coal Mining Permits	2000	PA DEP Office of Mineral Resources Management Bureau of Mining and Reclamation	Government Report
45	PA's SMCRA Funded AML Program: Past, Present, and Future Fact Sheet	2020	PA DEP Bureau of Abandoned Mine Reclamation	NGO Article
46	Surface Mining Conservation & Rec Act: Rec & Remining Incentives Reports	2016	PA DEP	Government Report
47	Surface Mining Conservation & Rec Act: Rec & Remining Incentives Reports	2017	PA DEP	Government Report
48	Reclamation Fee Fiscal Year Report	2009	PA DEP	Government Report
49	Reclamation Fee Fiscal Year Report	2010	PA DEP	Government Report
50	Reclamation Fee Fiscal Year Report	2010 - 2011	PA DEP	Government Report

51	Reclamation Fee Fiscal Year Report	2012	PA DEP	Government Report
52	Reclamation Fee Fiscal Year Report	2013	PA DEP	Government Report
53	Reclamation Fee Fiscal Year Report	2014	PA DEP	Government Report
54	Reclamation Fee Fiscal Year Report	2015	PA DEP	Government Report
55	Reclamation Fee Fiscal Year Report	2016	PA DEP	Government Report
56	Reclamation Fee Fiscal Year Report	2017	PA DEP	Government Report
57	Reclamation Fee Fiscal Year Report	2018	PA DEP	Government Report
58	Title 30 Mineral Resources: Chapter VII Part 917 - Kentucky	1982 - 2018	Electronic Code of Federal Regulations/US Fed gov	Guidance Document
59	OSMRE Appalachian Region Kentucky Page	2020	OSMRE Appalachian Regional Office	Public AML Program Website
60	405 KAR 5:065. Premining and postmining land use	N/A	KYEEC	Guidance Document

61	405 KAR 5078. Contemporaneous reclamation	N/A	KYEEC	Guidance Document
62	405 KAR 5082. Reclamation bond	N/A	KYEEC	Guidance Document
63	405 KAR 7:097. Reclamation in lieu of cash payment of civil penalties	N/A	KYEEC	Guidance Document
64	405 KAR 10:015 General bonding provisions	N/A	KYEEC	Guidance Document
65	405 KAR 10:035. Procedures, criteria and hearing requirements for cancellation of surety bonds after notice of noncompliance issued for failure to maintain contemporaneous reclamation.	N/A	KYEEC	Guidance Document
66	405 KAR 10:070. Kentucky reclamation guaranty fund	N/A	KYEEC	Guidance Document
67	405 KAR 16:020. Contemporaneous reclamation	N/A	KYEEC	Guidance Document
68	405 KAR 16:200. Revegetation	N/A	KYEEC	Guidance Document
69	405 KAR 16:210. Postmining land use capability	N/A	KYEEC	Guidance Document

70	405 KAR 18:020. Contemporaneous reclamation	N/A	KYEEC	Guidance Document
71	405 KAR 18:200. Revegetation	N/A	KYEEC	Guidance Document
72	405 KAR 18:220. Postmining land use capability	N/A	KYEEC	Guidance Document
73	405 KAR 30:220. Postmining land use	N/A	KYEEC	Guidance Document
74	Technical Reclamation Memorandum #1	1982	KYEEC	Guidance Document
75	Technical Reclamation Memorandum #2	1982	KYEEC	Guidance Document
76	Technical Reclamation Memorandum #3	1982	KYEEC	Guidance Document
77	Technical Reclamation Memorandum #4	1982	KYEEC	Guidance Document
78	Technical Reclamation Memorandum #5	1982	KYEEC	Guidance Document
79	Technical Reclamation Memorandum #6	1982	KYEEC	Guidance Document
80	Technical Reclamation Memorandum #7	1983	KYEEC	Guidance Document

81	Technical Reclamation Memorandum #8	1983	KYEEC	Guidance Document
82	Technical Reclamation Memorandum #9	1983	KYEEC	Guidance Document
83	Technical Reclamation Memorandum #10	1983	KYEEC	Guidance Document
84	Technical Reclamation Memorandum #11	1983	KYEEC	Guidance Document
85	Technical Reclamation Memorandum #12	1983	KYEEC	Guidance Document
86	Technical Reclamation Memorandum #13	1983	KYEEC	Guidance Document
87	Technical Reclamation Memorandum #14	1984	KYEEC	Guidance Document
88	Technical Reclamation Memorandum #15	1984	KYEEC	Guidance Document
89	Technical Reclamation Memorandum #16	1984	KYEEC	Guidance Document
90	Technical Reclamation Memorandum #17	1985	KYEEC	Guidance Document
91	Technical Reclamation Memorandum #18	1990	KYEEC	Guidance Document

92	Technical Reclamation Memorandum #19	1991	KYEEC	Guidance Document
93	Technical Reclamation Memorandum #21	1995	KYEEC	Guidance Document
94	AML Economic and Community Development Pilot Grants Project Listing	N/A	KYEEC	Guidance Document



**Appendix C**  
**Coding Scheme**

Name	Description
<b>1. Ecosystem and Environment</b>	<b>Restoration of ecosystem health and mitigation of the impacts of past mining</b>
<ul style="list-style-type: none"> <li>• Water Quality</li> </ul>	Acidity/AMD, heavy metals, discoloration, conductivity, groundwater, surface water
<ul style="list-style-type: none"> <li>• Soil Quality</li> </ul>	Nutrients, invasive species, compaction, productivity
<ul style="list-style-type: none"> <li>• Land Stabilization</li> </ul>	Recontouring, erosion control, re/grading, polishing
<ul style="list-style-type: none"> <li>• Revegetation &amp; Reforestation</li> </ul>	Native and nonnative vegetation used on sites, Forest Reclamation Approach
<ul style="list-style-type: none"> <li>• Aquatic Ecosystem</li> </ul>	Indicator of aquatic and broader ecosystem health
<ul style="list-style-type: none"> <li>• Wildlife Presence</li> </ul>	Is the site usable to native fauna?, endangered species, bats, biodiversity
<ul style="list-style-type: none"> <li>• Wildlife Habitats</li> </ul>	Is the site usable to native fauna?, Does the site provide habitation?, fragmentation
<ul style="list-style-type: none"> <li>• Passive Water Treatment</li> </ul>	<i>Types:</i> constructed wetlands, biochemical reactors, limestone-based systems, source removal, hydraulic isolation, submergence
<ul style="list-style-type: none"> <li>• Active Water Treatment</li> </ul>	<i>Types:</i> chemical injection, in-line active treatment of flows, treatment plants, regrading of waste

	piles, revegetation of waste piles, upgradient planting
<ul style="list-style-type: none"> <li>• Human Health &amp; Safety</li> </ul>	Mine portal closure, fencing, signage, national security
<ul style="list-style-type: none"> <li>• Conservation</li> </ul>	Conservation of ecological assets
<ul style="list-style-type: none"> <li>• Environmental Legislation</li> </ul>	SMCRA, CERCLA, Wild & Scenic Rivers Act, USDA Best Management Practices, Clean Water Act, National Oil and Hazardous Substances Pollution Contingency Plan, National Environmental Policy Act, Executive Order 12580, Endangered Species Act
<b>2. Economy</b>	<b>Revitalization of the local economy through reclamation</b>
<ul style="list-style-type: none"> <li>• Employment</li> </ul>	Employment in historic and new industries
<ul style="list-style-type: none"> <li>• Job Creation</li> </ul>	Creation in new industries
<ul style="list-style-type: none"> <li>• Economic Development</li> </ul>	Explicitly stated as a goal
<ul style="list-style-type: none"> <li>• Community Development</li> </ul>	Explicitly stated as a goal, public relations, public comments, public engagement, research, education, rural development
<ul style="list-style-type: none"> <li>• Tourism</li> </ul>	Hunting, fishing, camping, hiking trails, biking trails, historical preservation, cultural preservation, mine tours, folkways
<ul style="list-style-type: none"> <li>• Infrastructure Development</li> </ul>	Water pipelines, railroads, roads, broadband internet, access, construction
<ul style="list-style-type: none"> <li>• Aesthetics</li> </ul>	Visual appeal

<ul style="list-style-type: none"> <li>• Funding Sources</li> </ul>	<p>Grants, permits, bonds, fee collection, securities, AML Fund, trust fund, insurance</p>
<ul style="list-style-type: none"> <li>• Renewable Energy Construction</li> </ul>	<p>Solar, biofuels, hydropower, nuclear energy, geothermal</p>
<ul style="list-style-type: none"> <li>• Agriculture</li> </ul>	<p>Expanded agricultural efforts, livestock, fisheries</p>
<ul style="list-style-type: none"> <li>• Justice</li> </ul>	<p>In relation to a just economic transition, equity, welfare, housing, climate change, resilience, resource curse</p>
<ul style="list-style-type: none"> <li>• Resource Production</li> </ul>	<p>Timber, biofuel, iron extraction, mineral access/rights, remining, natural gas, “beneficial use”</p>

## Appendix D

### Interview Questions

#### General Questions

1. How long have you worked with [Affiliated Agency/Organization]?
2. What does your position entail?

#### Program History

1. What was the impetus or motivation for starting the AML reclamation program?
2. What was the reclamation process like when the program began?
3. How has the program change between the beginning and now?
4. What other agencies were involved with the mine land reclamation at the beginning of the program?
  - a. How did the relationship between the Forest Service and these other agencies change over time?
5. What is the relationship between the forest and the coal industry like, especially since the forest doesn't own all of the mineral rights?
6. How did Daniel Boone work with the coal companies who had abandoned the mines that you were then reclaiming?
7. How common was it to identify a responsible company and go after them?
8. At what point would a project have been considered complete while you were at Daniel Boone?
9. When choosing a site to prioritize for reclamation, what were the criteria or maybe heavy metal levels that you were looking for to classify it as a priority?

- a. Did any of the criteria or how each individual criteria was weighted change over time or has that been consistent?
  - b. Has the way that you prioritize these sites changed over time?
10. How has the process changed since you came to the Forest Service or took over your current position?

### **Current State of Program**

1. Can you describe how the process of AML reclamation works in the DBNF?
2. What's your opinion on the process in general?
3. What would you say the strengths and weaknesses of the program are?
  - a. Have these strengths and weaknesses changed over the time?
  - b. What influenced these changes?
4. What improvements or modifications would you suggest for the program?
5. What kind of technical resources would be helpful for the program?
6. What environmental or human benefits have you seen after reclamation?
7. Have you seen negative consequences after a reclamation project is done?
8. What is the relationship between the forest and the coal industry like?
9. With the companies that own the mineral rights, how does the forest work with those companies who own the abandoned mines within the forest but they're not being reclaimed yet?
10. How does Daniel Boone work with the coal companies who had abandoned the mines that you were then reclaiming?
11. How common was it to identify a PRP and go after them?

12. How are abandoned mines managed when they're not being considered for reclamation or when a proposal's been put in, but it hasn't been approved yet?
13. What are the criteria for choosing which mine site to submit a proposal for reclamation for?
14. At what point would public use of an area be allowed?
15. Within the abandoned mine land program, is the ongoing monitoring of a site managed within the abandoned mine land program or does it pass to another program within the forest?
16. What does historical preservation look like for the abandoned mines?
17. What other agencies are involved with the mine land reclamation?
  - a. What is the relationship like between the Forest Service and these other agencies?
18. At what point is a project considered complete?
19. At what point is any kind of development allowed on the site?
20. When choosing a site to prioritize for reclamation, what criteria would classify it as a priority?

### **Comparison to Other Programs**

1. How did the process at Daniel Boone differ from some of the other places you've done work?
2. Are there any issues that you've seen in Daniel Boone that differ from other areas you've worked?
3. I'm under the impression from what I've read and other people I've interviewed that hardrock mines seem to be more of a priority at the federal level than coal mines. Is that something you've noticed?

4. Besides the forest service, what other agencies have you worked for?
5. With your time at those different agencies, what differences have you noticed between how they treat mine land reclamation?

### **Bonds and Funding**

1. Since many of the coal companies began their operations before reclamation bonds were required, did Daniel Boone make the companies post these bonds retroactively or was there some form of grandfathering in?
2. What was the bonding process like for abandoned mine land within the forest, like the use of reclamation bonds?
3. My understanding is that funding for these programs comes from the USDA. Has this changed over time, or has it always come from the USDA?

### **Specialists**

1. Could describe how [Specialty] factors into the process of abandoned mine land reclamation in the Daniel Boone?
2. How has the work of a [Specialist Role] in the process changed over time or has your involvement with reclamation been consistent?
3. My understanding is that, on these abandoned mine sites, invasive species are also an issue, at least for the soils. Do these invasive species cause issues for the water as well?
4. As a [Specialist Role], does your involvement in a reclamation project finish when the project finishes or does your involvement continue after the project is officially considered complete?
5. How much direct involvement do the District Rangers have in the abandoned mine land program?

6. Are there other agencies that are involved in the [Specialty] aspect of AML or does Daniel Boone just handle that within the Forest Service?
7. In terms of [Specialty], what are the criteria you look for when choosing a mine site to reclaim?
8. At what point is a reclamation project at least in terms of the [Specialty] considered complete?
9. As a [Specialist Role], does your involvement finish when the project finishes, or does your involvement continue after the project is officially considered complete?

### **NGO Specific**

1. Can you just describe the work that [NGO Name] does in general?
2. If/when you work with the active coal mining operations, are they receptive to your requests or suggestions?
3. What federal or state agencies has [NGO Name] worked with on AML reclamation project?
  - a. How did you come to start working with this agency?
  - b. How has the work that [NGO Name] does with this agency's AML program changed over time?
  - c. How would you categorize the relationship between [NGO Name] and this agency?
  - d. How do the goals of [NGO Name] align with this agency's?
4. Have you done work with the DBNF?
  - a. How did you come to start working with the Daniel Boone?



- b. How has the work that [NGO Name] does with the Daniel Boone AML program changed over time?
- c. How would you categorize the relationship between [NGO Name] and the Daniel Boone?
- d. How do the goals of [NGO Name] align with the DBNF's?

## Appendix E

### Content Cloud Removed Words

- Basically
- Can't
- Complete
- Didn't
- Done
- Don't
- Far
- Getting
- Going
- Gonna
- Guess
- I'm
- I've
- Looking
- Lot
- Maybe
- Mine
- Okay
- People
- Pretty
- Probably
- Really
- Several
- Something
- Started
- Stuff
- That's
- There's
- They're
- Things
- Think
- Typically
- Used
- We've
- Yeah
- Years
- You're
- You've
- Around
- Called
- Comes
- 'Em
- Example
- Level
- Making
- Runs
- Sure
- They've
- Turn
- Alright
- Let's
- Start