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Toxic Colonialism and Green Victimization of Native Americans: An Examination of the Genocidal Impacts of Uranium Mining

Averi R. Fegadel
University of South Florida

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by

Averi R. Fegadel

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University of South Florida

Major Professor: Michael J. Lynch, Ph.D.
Kathleen M. Heide, Ph.D.
Lyndsay N. Boggess, Ph.D.
Paul B. Stretesky, Ph.D.

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DEDICATION

This dissertation is dedicated to my dear friend, Scott F. Allen, who we lost too soon. He was everyone's biggest cheerleader, had the best smile, and was the kindest person I have ever met. He was the "dad" of the grad students and was grateful to play that role. We would have weekly talks, which a lot of the time consisted of Catherine and myself gossiping while he was trying to get work done, but he never seemed bothered and always joined in. He found my research fascinating, and I wish he was here so we could talk more about it together. I know he would be proud.

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LIST OF ACRONYMS

ACHP	Advisory Council on Historic Preservation
ACHPR	African Charter on Human and Peoples' Rights
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
AIAN	American Indian/Alaska Native
AK	Alaska
AMD	acid mine drainage
AML	abandoned mine land
ATDSR	Agency for Toxic Substances and Disease Registry
AUM	abandoned uranium mine
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CAA	Clean Air Act
CDC	Center for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH_4	methane
CO_2	carbon dioxide
CWA	Clean Water Act
DAPL	Dakota Access Pipeline
DOE	Department of Energy
DOI	Department of the Interior

DOJ	Department of Justice
DRUM	Defense Related Uranium Mines program
DU	depleted uranium
ECHO	Enforcement and Compliance History Online
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
EPCRA	Emergency Planning and Community Right-to-Know Act
ESM	environmentally sound manner
EPA	Environmental Protection Agency
FGM	female genital mutilation
FRC	Federal Radiation Council
FUD	Formerly Used Defense sites
FUSRAP	Formerly Utilized Sites Remedial Action Program
FWPCA	Federal Water Pollution Control Act
FY	fiscal year
h	hour
HRC	Human Rights Committee
HRS	Hazard Ranking System
IACHR	Inter-American Commission on Human Rights
IARC	International Agency for Research on Cancer
ICCPR	International Covenant on Civil and Political Rights
ICESR	International Covenant on Economic, Social and Cultural Rights
ICRP	International Commission on Radiation Protection
IDHW	Idaho Department of Health and Welfare

IEL	international environmental laws
IHS	Indian Health Service
INP	Indigenous/Native Peoples
IOU	“I owe you”
IRB	Institutional Review Board
ISL	*in situ* leaching
kg	kilograms
L	liter
LUST	Leaking Underground Storage Tanks
m	meter
MCL	maximum contaminant level
mg	milligrams
MNC	multinational corporation(s)
NAGPRA	Native American Grave Protection and Repatriation Act
NCAI	National Congress of American Indians
NCP	National Contingency Plan
NIEHS	National Institute of Environmental Health Sciences
NIOSH	National Institute of Occupational Safety and Health
NMEDOH	New Mexico Environmental Department of Health
NN	Navajo Nation
NORM	naturally occurring radioactive materials
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List

NPO	nonprofit organizations
NRC	National Research Council
NWIS	National Water Information System
OHCHR	Office of the High Commissioner of Human Rights
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining
PEG-C	political economic green criminology
PEL	permissible exposure level
PLC	Protocol on Liability and Compensation
PYC	Protect Your Canyon
Ra	radium
RCRA	Resource Conservation and Recovery Act
RECA	Radiation Exposure Compensation Act
RQ	Research Questions
SDWA	Safe Drinking Water Act
SMCRA	Surface Mining Control and Reclamation Act
TENORM	technologically enhanced naturally occurring radioactive materials
Th	thorium
THSR	Tribal Hazardous Sites Registry
ToD	treadmill of destruction
ToP	treadmill of production
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act

U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
U_3O_8	uranium oxide concentrate; ‘yellowcake’
UDHR	Universal Declaration of Human Rights
ULD	Uranium Location Database
UMTRCA	Uranium Mill Tailings Radiation Control Act
UN	United Nations
UNDRIP	UN Declaration on the Rights of Indigenous Peoples
UNECE	UN Economic Commission for Europe
UNEP	UN Environment Programme
U.S.	United States
USACE	U.S. Army Corps of Engineers
USGAO	U.S. Government Accountability Office
USFS	U.S. Forest Service
USNRC	U.S. Nuclear Regulatory Commission
USSR	Ukrainian Soviet Socialist Republic
µg	micrograms
µR	microRoentgens
µrad	microradians
WHO	World Health Organization
WNA	World Nuclear Association

ABSTRACT

While the field of criminology has delved into environmental justice issues in Black communities through the exploration of urban exposure to toxins, it has failed to expand this research orientation to examine issues affecting peoples in different locations, which in the U.S. draws attention to the green victimization of Native Americans. In short, existing criminological research has largely ignored the social, economic, and environmental injustices experienced by Native Americans. This study addresses this research gap by exploring environmental justice issues as they relate to the ways toxic colonialism affects Native Americans. Specifically, this study confronts historic and current struggles endured by Native Americans in their resistance to ecocide, genocide, and capitalism by focusing on uranium mining in the Southwest United States. Research suggests that the majority of uranium mines and mills that ever existed in the U.S. were located on or near tribal lands, yet how that circumstance creates an unequitable distribution of ecological harms, and environmental and social injustices for Native Americans has been ignored.

To explore these issues, four research questions are generated based on findings from sociological and public health studies addressing the effects of uranium mining on the environment and human health. A case study approach is used to merge and analyze evidentiary materials from multiple data sources, including the Environmental Protection Agency, Agency for Toxic Substances and Disease Registry, Greenpeace, and the Grand Canyon Trust. Findings suggest several adverse environmental and health effects are associated with uranium mining operations and have genocidal consequences for Native Americans. This study concludes by

discussing implications for environmental justice, environmental policy, and criminological theory. Additionally, this study provides important directions for future research.

CHAPTER ONE:

INTRODUCTION

Toxic colonialism and Native Americans

This study examines environmental (in)justice and toxic colonialism in Native American communities, as well as the intersection of genocide and ecocide in the context of Native American experiences with regard to exposure to uranium mining and pollution. To begin, key concepts employed in the introductory sentence need to be defined to make sense of the focus of this work.

Toxic colonialism was defined by Jim Puckett of Greenpeace in the early 1990s as "the subjugation of people to an ecologically-destructive economic order by entities over which the people have no control" (Bullard, 1993, p.100). Research on toxic colonialism has traditionally focused on Indigenous groups in Third World settings, most likely because the concept is not included in any laws in the United States. With the expansion of the global economy, economic interest in access to natural resources increased; however, these resources were typically found on indigenous lands. Through conflict, exploitation, and genocide, power forces were able to gain absolute control over the land and the people who inhabited it. Thus, the Indigenous were rendered powerless while their lands were exploited, destroyed, and polluted by extractive industries (Reed, 2009).

Here, parallels can be drawn between Native Americans and Indigenous groups in other countries, thus it can be assumed that Native Americans also face toxic colonialism although this concept is excluded from U.S. laws. For instance, Native Americans have been at the receiving end of subjugation for well over 500 years due to conflicts over natural resources on their lands that originated with industrialism. The expansion of the industrial global economy brought a desire for domination of the natural world, requiring increased raw material inputs and more extraction of raw materials, resulting in the subsequent expansion of destructive resource extraction industries. Since tribal lands contain a variety of resources necessary for industrial development, they are targeted by the government and commercial industries (Gedicks, 1993). As a result, Native Americans are threatened by the ecologically destructive actions promoted by multinational corporations (MNC) and governmental attempts to gain access to "cheap" resources on their lands (Gedicks, 1993, p.15).

In addition, native peoples and their lands are destroyed by agricultural expansion. Demands for food and biofuels (e.g., ethanol; which is mainly derived from corn) continue to intensify as a result of the rapidly increasing human population, requiring greater areas for cropland – thus, vast tribal lands are desirable for land clearing and cultivation, despite encroachment into native grasslands and wetlands. Native Americans rely on land cultivation and agricultural practices for cultural and economic survival, with more than 200 federally recognized tribes participating in the production of raw agricultural commodities (National Congress of American Indians).

Several studies have shown that agricultural expansion has major adverse environmental impacts (Johnston, 2013; Tilman, 1999; Tilman, Balzer, Hill, & Befort, 2011). For example, cropland expansion and land clearing threatens biodiversity, increases soil erosion (which degrades soil quality and pollutes streams), increases the need for fertilization and the use of pesticides (contributing to groundwater and river pollution), and accounts for about 25% of anthropogenic (i.e., human generated) greenhouse gas (GHG) emissions (Johnston, 2013; Tilman, 1999; Tilman et al., 2011). These adverse environmental implications are increased for Native Americans whose traditional lifestyle is intertwined with the environment through several factors such as diet, health, medicine, and religion.

Therefore, it should come as no surprise that environmental spoliation and its detrimental impact on Native Americans, by way of industrialism and agricultural expansion, are driven by capitalism. Here, the excessive consumption and pollution of natural resources results in disruptions of the ecosystem and its ability to properly regenerate, culminating in an outcome known as ecological disorganization (Lynch, Long, Stretesky, & Barrett, 2019; Schnaiberg, 1980). The term ecological disorganization is employed to describe the negative cumulative impacts of an expanding capitalist treadmill of production (Schnaiberg, 1980). In addition, actions that contribute to ecological disorganization have been identified as part of the metabolic rift (Foster, 2011; Foster, Clark, & York, 2011), where nature is dominated by humans, and the constant exploitation of nature disrupts the natural processes of the ecosystem. The expansion of the capitalist economy generates unnecessary and excessive ecological disorganization and consumption that coexists with and contributes to the division between social classes (Foster et al., 2011). To be clear, capitalism also produces a social rift, where the domination of human being by human being is based on societal divisions of class, inequality, and acquisition, which is reinforced by the exploitation of Nature (Foster et al., 2011).

As Foster (1999; 2000; 2005; 2012) has argued, neither human labor nor the labor of Nature can be exploited without both being exploited simultaneously. As Foster demonstrated in his various works, to exploit labor, capitalism must exploit Nature in order to obtain the raw materials required for production. At the same time, those raw materials cannot be extracted from Nature without the application of labor. Drawing from Marx, Foster argued that the co-joined exploitation of Nature and labor is enabled by unequal ownership of the means of production. It is also transformed into differential access to Nature through the product of laws regulating the ownership of, and access to Nature. Finally, the exploitation of labor and Nature are linked through the (re)organization of work. Technological innovations that speed up the work process increased the amount of labor performed in a period during which labor has been purchased, and the amount of labor applied to the extraction of resources from Nature. In this way, intensifying labor increased its exploitation, and intensified labor also accelerates the degree to which Nature can be exploited.

Given the historical discrimination against Native Americans, it is evident that they have faced a variety of forms of social, political, and economic inequality. Unfortunately, Native Americans continue to endure unequal and unjust treatment due to the interplay of poverty and race. Native Americans are the poorest racial group. According to the U.S. Census Bureau (2016), over 40% of Native Americans live below the poverty threshold. Further, 26.2% of single-race American Indian/Alaska Native (AIAN) people were in poverty in 2016; the highest rate of any race group and almost twice that of the nation as a whole (14.0%, respectively) (U.S. Census Bureau, 2016). Poverty increases their vulnerability to environmental racism, which occurs when the poor and people of color endure the burdens of environmental degradation and the nation's pollution problem (Chavis & Lee, 1987; Pellow, Weinberg, & Schnaiberg, 2001; Steady, 2009). In addition, environmental racism includes discrimination in the application of environmental laws, practices, and policies by inducing several concepts (Steady, 2009). For example, human rights violations, social injustice and inequality, and the ideology of "structural expendability" – or the idea that some groups are expendable – are fostered by environmental racism (Steady, 2009, p. 48).

This problem of environmental racism perpetuates social and environmental inequality by deliberately targeting the poor or people of color, as evidenced by waste disposal sites and transportation routes in these communities (Steady, 2009). The disproportionate exposure of Native Americans to toxins is the result of the historical efforts to eradicate Native Americans (i.e., genocide) and its intersections with social, political, and economic factors that influence the production, consumption, and distribution of natural resources. A 1987 study on toxic waste and race in the United States found that 50% of Native Americans lived in communities with one or more uncontrolled toxic waste sites (Chavis & Lee, 1987; Reed, 2009). As of 2018, 1,972 of the 21,557 reporting facilities included in the Environmental Protection Agency's (EPA) Toxic Release Inventory (TRI) were located on or within 10 miles of tribal land (EPA, 2019). Six of these facilities were located on the list of top 100 facilities for total on- and off-site disposal or other releases (in pounds), and all six facilities were within the top 50 (EPA, 2019). In addition, approximately 40% of the 1,300+ Superfund sites – the most serious toxic waste sites – were located on tribal land (EPA, 2018b). While a large percent of Superfund sites is located on tribal lands, Native American reservations comprise only about 2.3% of total U.S. land area. On its face, this unequal distribution would seem to suggest some level of bias in the location of Superfund sites and hazardous activities in the U.S. that adversely impact Native Americans.

Uranium mining operations in the Southwest U.S. also have implications for Native American health and well-being. Over 90% of the uranium mines and mills that ever existed in the U.S. were located on or near tribal lands (Lewis, Hoover, & MacKenzie, 2017). Although the location of uranium mines was determined by geological indicators, the failure to clean up abandoned mines after decades since their last use is indicative of environmental injustice. For example, there are currently over 500 abandoned uranium mines (AUM) located on Navajo Nation that have yet to be cleaned up because the government continues to ignore protests and legal claims regarding contamination from the AUM (EPA, 2017). Further, the siting of uranium processing facilities (mills), waste disposal sites, and transportation routes are less determined by geological factors than mine siting, yet the location choices in relation to Tribal communities seem to be determined by social and economic factors. Here, it can be argued that uranium mining is a form of toxic colonialism in the U.S. and has genocidal impacts for Native Americans.

As previously mentioned, a traditional Native American lifestyle is intertwined with the environment through several factors. It is therefore possible that their traditional lifestyle puts them at a higher risk of exposure to toxins compared to those with non-traditional lifestyles under certain circumstances (i.e., through subsistence hunting and fishing on polluted lands; Harris & Harper, 2001). Several additional routes of exposure include older housing on reservations (lead-based paints), mining sediments or tailings on or within close proximity of native lands (sediments in land and waterways), and soil, wild game and fish contamination (Harris & Harper, 2001).

Environmental justice attempts to address environmental issues faced by minority groups by shedding light on environmental conservation and protection, as well as environmental connections to human rights violations associated with unequal exposure to environmental hazards. Environmental justice materialized as a social movement in the 1980s in the United States, calling attention to the disproportionate and/or deliberate exposure of minority groups to unequal environmental quality in their communities and the exclusion of minority groups in environmental decision-making (Bullard, 1993; Steady, 2009; Lynch & Stretesky, 2012). For example, several studies have demonstrated the link between the distributions of hazardous waste facilities/dumping sites and minority communities (see Barrett, 2013; Boone & Fragkias, 2013; Bullard, 1993; Bullard, Mohai, Saha, & Wright, 2007; Lynch & Stretesky, 2012; Malcoe, Lynch, Kegler, & Skaggs, 2002; Pellow et al, 2001; Reed 2009; Steady, 2009). In other words, this literature suggests that poor people and racial/ethnic minority groups are more likely to live in communities infected by adverse environmental conditions due to capitalist and colonial neglect for human beings and the environment at the hands of multinational corporations (MNC). While the field of criminology has delved into environmental justice issues in black communities through the exploration of urban exposure to toxins (see Ash, Boyce, Chang, & Scharber, 2013; Barrett, 2013; 2017; Lersch & Hart, 2014; Stretesky & Lynch, 1998; 1999; 2004), it has failed to expand this research orientation to examine issues affecting peoples in different locations, which in the U.S. draws attention to environmental harms experienced by Native Americans.

The Present Study

Given the above, and the literature in criminology, it can be argued that the existing criminological research has largely ignored the social, economic, and environmental injustices experienced by Native Americans. In addition, there has been a reluctance in criminological research to equate genocide to homicide, resulting in neglect in the field. The purpose of this dissertation is to address this research gap and advance scholarship with regard to these issues. To be clear, this study addresses environmental justice issues as they relate to the ways toxic colonialism affects Native Americans. Specifically, this study confronts historic and current struggles endured by Native Americans in their resistance to capitalism, and as a consequence, ecocide and genocide. In doing so, this study makes the following contributions to the literature.

First, this study explores these issues as they relate to environmental law and environmental crime. While international law recognizes the concept of toxic colonialism, U.S. law does not. Therefore, the concept of toxic colonialism needs to be modified in order to be applied in a U.S. context. Toxic colonialism was introduced during the Basel Convention of 1989, when issues with transboundary hazardous waste was first addressed. More recently, scholars have noted that the issue of hazardous waste dumping is not limited to underdeveloped/poor nations; rather, the issue is relevant to all poor communities globally (Adeola, 1994; Bullard, 1990; Bullard, 1993; Clapp, 2002; Faber & Krieg, 2002; Pellow, 2004). By identifying such toxic activities as crimes against the environment, toxic colonialism can be extended to include similar actions that have taken place in the U.S., even though they are not recognized in current U.S. environmental regulations or laws. In addition, these activities can then be categorized as green crimes, which places them within the context of green criminology and allows them to be analyzed through a criminogenic lens.

Second, this study applies the concept of toxic colonialism to a theoretical perspective relevant to assessing environmental harms affecting Native Americans. Prior work referencing environmental justice and the green victimization of Indigenous/Native Peoples (INP) utilized the capitalist treadmill of production theory (Lynch, Long, Stretesky, & Barrett, 2017; Lynch, Stretesky, & Long, 2018; Stretesky, Long, & Lynch, 2013a). This study expands upon the importance of that topic while identifying its relevance to green criminology.

Finally, this study focuses on environmental injustices against Native Americans by exploring uranium mining in the Southwest U.S. Typically, studies focusing on environmental justice and INP struggles against MNC involve INP in “Third World” or underdeveloped nations. This study, however, argues that these same issues and concerns have happened – and continue to happen – in our own backyard. For example, over 90% of the uranium mines and mills that ever existed in the U.S. were located on or near tribal lands, yet how that circumstance creates an unequitable distribution of ecological harms, and environmental and social injustices for Native Americans has been ignored (Lewis, Hoover, & MacKenzie, 2017).

Based on the summary argument presented above, the following research questions are proposed for analysis in this dissertation:

RQ1: How is the environment impacted by uranium mining?

RQ2: How does exposure to uranium affect human health?

RQ3: How do the ecological effects of uranium mining impact Native Americans?

RQ4: How is the ecocide-genocide nexus further facilitated by uranium mining?

This dissertation will be structured in a way that allows for the exploration of these inquiries. To investigate these questions, data on uranium mining will be examined. Specifically, data highlighting the impacts of uranium mining on the environment and the associated effects of Native American health and well-being will be reviewed. The data collection process and analytic plan of study are described later in the dissertation.

Overview of Chapters

This dissertation is organized into six chapters. Chapter two provides a conceptual framework for the dissertation by reviewing the concepts and research on toxic colonialism, ecocide, and genocide. In addition, that chapter details the intersectionality of these concepts and how they apply to Native Americans. Specifically, chapter two reviews the research on environmental injustices experienced by Native Americans at the hands of MNC. Because tribal lands are targeted for capitalistic corporate agendas, the environmental harms produced by these actions and the government's disregard for Native American life become clear.

Chapter three introduces environmental regulations and laws, and those behaviors that are recognized as environmental crimes. The growth of industrialization and the capitalist economy resulted in an anthropocentric approach wherein natural resources were exploited, and land was protected for economic interests rather than for its intrinsic value. Here, environmental crimes and the expansion of the global economy is reviewed. Specifically, the political-economic perspective of the treadmill of production (ToP) theory is discussed in order to highlight the connection between environmental crimes and green victimization, including violations of Indigenous human rights.

Chapter four outlines the critical incident method, which is a methodology used primarily for exploratory research (Weatherbee, 2010). The primary goal of this method is to determine the causal antecedents of an event and those critical actions or inactions taken that contributed to the event's occurrence (Weatherbee, 2010). This dissertation will employ this method to investigate Native American exposure to toxins by way of uranium mining.

Chapter five introduces a discussion of uranium mining and chronicles its production and uses from past to present. In doing so, this chapter examines the impacts of uranium mining on the environment and the adverse effects of uranium exposure on human health. The procurement of heavy metals through mining contributes to the exposure of radioactive materials (man-made and naturally occurring) and carcinogens. Moreover, the mining process produces bulk waste material (e.g., tailings) which contains technologically enhanced naturally occurring radioactive materials (TENORM), amplifying the probability of exposure through contaminated water and airborne dust. This chapter details the location of uranium mines, mills, and waste disposal sites in relation to Native American communities and discusses how the quest for uranium has contributed, and continues to contribute to, the poor health of Native Americans residing in communities near active and abandoned uranium mines and mills. To be clear, this chapter illuminates the argument that Native American exposure to radioactive materials is twofold. First, Native Americans are exposed to radioactive materials due to the proximity of reservations to uranium mines and mills. Second, because traditional Native American lifestyle is intertwined with the environment, their risk of exposure is heightened. Lastly, chapter five argues how the ecocide-genocide nexus is further facilitated by the ToP and how uranium mining is part of the form of toxic colonialism that Native Americans face.

Chapter six provides a summary and discussion of the research findings. Following this summary, this chapter addresses relevant implications for environmental justice, environmental policy, and criminological theory. Next, limitations of the study are discussed. Lastly, this chapter concludes the dissertation by outlining directions for future research.

CHAPTER TWO:

CONCEPTUAL FRAMEWORK

This part of the dissertation reviews research on environmental injustice and how it applies to Native Americans. Prior to exploring the literature, however, the terms/phrases *human rights*, *genocide*, *ecocide*, and *toxic colonialism* will be defined in order to provide a framework for the literature being reviewed. These terms/phrases are the core concepts that led to the creation of international laws and doctrines which highlight the need to protect humankind, Indigenous peoples, and the environment. In addition, this chapter demonstrates how these terms/phrases are related, and how the intersection of these concepts is relevant to the study of environmental injustices that Native Americans face. In doing so, these concepts can be used to address environmental and health effects associated with uranium mining, with respect to Native Americans. That is, the intersectionality of these four concepts will be explored throughout this study in order to demonstrate how uranium mining adversely impacts Native American culture, health, and well-being.

What are Human Rights?

It is important to define human rights in order to understand how ecocide and toxic colonialism have affected and continue to affect the human rights of Native Americans, resulting in a centuries-long battle involving genocide and resistance. According to the United Nations (UN), human rights are the fundamental rights of all human beings, regardless of nationality, sex, race, religion, or ethnicity (UDHR, 1948). However, Freeman (2011) is one of several scholars who argued that human rights are a *concept* rather than a specific practice. Freeman claimed that although human rights may be perceived as an object, they are an ideal, a set of aspirations, "a device for thinking about the real, and for expressing our thoughts" (Freeman, 2011, p.3). Human rights are not things that we possess; rather they are perceived entitlements derived from moral and legal rules.

The origin of the concept of human rights remains a controversial topic in academia, and many contend that the origin of this concept stemmed from Western ideals during the Enlightenment era, such as John Locke's *Second Treatise of Government* (1690) and Thomas Paine's *Rights of Man* (1791). However, it wasn't until the atrocities committed by Nazi Germany in World War II that the concept of human rights resurfaced and became a pertinent issue needing attention. One result of renewed interest in human rights was the creation of the Universal Declaration of Human Rights (UDHR). The UDHR was proclaimed and adopted in December of 1948 by the General Assembly of the United Nations (UN) with the intentions of preventing a repetition of the horrendous crimes committed by the Nazis. The UDHR consists of 30 articles which outline what are supposed to be *universal* human rights that acknowledged the humanity of all people and regarded all humans as free and equal (O'Connor, 2014). For example, some of the rights included in the Declaration are the right to life and well-being, the right to free choice of employment, and the right to education. Some, however, have suggested issues with the practicality of the UDHR (Dolinger, 2016; O'Connor, 2014). For instance, the UDHR does not grant the UN, or any group, the authority to interfere in order to protect peoples against genocide or acts of persecution (Dolinger, 2016). Further, the UDHR failed to address whether the UN could protect any person, group, or tribe from future persecution, therefore the aspect of prevention is ineffective (Dolinger, 2016, p.176).

Although the UDHR has received criticisms and is not a legally binding document, it has, since its inception, had great influence on international human rights law. However, until the 1970s, the majority of human rights research was performed by lawyers, which is problematic because the legal approach to studying human rights lacks the holistic analyses employed by social scientists seeking to understand and explain human rights, how they are respected, enforced, and how they are violated. For example, international human rights law is highly criticized by human rights scholars (Freeman, 2011; Koh, 1999; Simmons, 2009) because it falsely claims universal equality, and conceals and legitimates power rather than abolishing it. In other words, there is often a lack of accountability for violations committed by those in power in human rights legal approaches (e.g., government and state actors), and therefore minimal consequences to their actions.

Another debate within human rights research is the idea of universality. Some human rights are universal while others can be perceived as situational or contextual; some human rights are only necessary in certain situations, after meeting a certain criterion, or exist to protect a member of a special category. In addition, the definition of human rights varies culturally, as do interpretations of human rights, thus contradicting claims concerning its universality. By claiming human rights are universal, cultural differences that exist throughout the world are ignored and undermined (O'Connor, 2014). Human rights are a set of minimum standards, ideals, aspirations for all humanity to abide by; however, aspects of some cultures are incompatible with certain human rights objectives or claims. That is, some cultural practices violate human rights. For example, the act of female genital mutilation (FGM) that occurs in some African countries (see Banks et al., 2006; WHO, 2008) violates a number of human rights standards, such as the principles of equality and non-discrimination on the basis of sex (FGM is rooted in gender inequalities and exemplifies power imbalances between men and women); the right to life (when the procedure results in death); and the right to freedom from torture or cruel, inhuman or degrading treatment (WHO, 2008, p.9-10). Here, two dimensions of human rights come into conflict: the ideal of human rights protecting people from harm, and the recognition that human rights practices should not be imposed in ways that destroy cultures. Remedying these contradictions when there are clear harms involved is recognized as difficult.

The literature indicates that we cannot claim that human rights are a universal concept when the definition of human rights, and the document created to promote them, stemmed from a Western, First-World perspective. Some have asserted (Clapham, 2007; Freeman, 2011; Mutua, 2002) that there is a Western bias within human rights arguments suggesting that human rights are not needed in Western societies, because those societies already contain the rules and forms of social organization that allow those rights to be defined, obtained, and defended. Here, the argument has been made that the concept of human rights has been strongly dictated by Western nations and the UDHR is an attempt to impose Western values on the rest of the world. As a result, the Western human rights concept is consistent with the context of Western nations, and consistent with forms of economic, social, and legal development found in those nations. Whether non-Western (less developed) nations have the economic, political, and legal resources to meet Western standards has, therefore, become an issue. For example, historical violations of human rights in the United States were often omitted in human rights research. Freeman (2011), briefly mentioned Native Americans when discussing the rights of Indigenous Peoples, but failed to discuss how their rights were, and continue to be, violated. Here, it becomes evident that the concept of human rights promotes a bias against non-Western lifestyles, and that human rights rules are not equally applied in Western nations. Further, indisputable historical and contemporary accounts in the United States demonstrate how Western standards do not correspond with the definition of universal human rights. Until there is a true all-encompassing definition of human rights, cultural relativism and universality of human rights will remain incompatible.

Additional international regulations have attempted to define the concept of human rights in specific situations, with the development of several conventions and declarations for the specification and protection of human rights. These declarations include, among others, the International Covenant on Economic, Social and Cultural Rights (ICESCR, 1976) and International Covenant on Civil and Political Rights (ICCPR, 1976). In terms of the current research, the most important of the human rights documents addresses the rights of Indigenous Peoples.

Fifty-nine years after the UDHR was introduced, and after 20 years of preparatory work, negotiations, and compromises among and between Indigenous Peoples and states/governments, the UN adopted the Declaration on the Rights of Indigenous Peoples (UNDRIP) in 2007 (Engle, 2011). UNDRIP was the first human rights instrument to acknowledge the collective rights of Indigenous Peoples, as well as their right to self-determination – "autonomy or self-government in matters relating to their internal and local affairs.." (UNDRIP, 2007, Art.4). Unsurprisingly, the right to self-determination was the underlying reason four historically colonial countries (Canada, Australia, New Zealand, and the United States) ultimately voted against its final adoption. Those nations were concerned that this kind of right could be misinterpreted to "include the right to statehood" (Engle, 2011, p.145) and that the level of autonomy recognized in the UNDRIP would "undermine the sovereignty of their own states, particularly in the context of land disputes and natural resource extraction" (Hanson, 2011, p.2). These four countries have since endorsed the UNDRIP (in 2009 and 2010, respectively), albeit clarifying that the document is non-legally binding and does not reflect international law (Engle, 2011).

In addition to their right to self-determination, the UNDRIP recognizes Indigenous Peoples' rights to equality (they are free and equal to all other people and have the right to be free from discrimination), culture (the right to practice their customs and traditions), education (the right to establish and control their educational systems), and land (the right to own, use, develop, and control the lands which they have traditionally owned and occupied) (2007, Art. 2, 11, 14, 25). Specifically, the UNDRIP outlines the need to respect Indigenous Peoples' rights affirmed in treaties or agreements with states, and that Indigenous Peoples should be allowed to control external developments affecting them and their lands (UNDRIP, 2007). However, while it provides a framework for political Indigenous advocacy, emerging laws concerning Indigenous Peoples, application in courts, and policymaking, none of the rights mentioned in the UNDRIP are enforceable in international law since this is not a legally binding document. Thus, Indigenous rights are only addressed indirectly, and nations cannot be held accountable for any violations thereof.

Despite significant advances in recognition from the UNDRIP, Indigenous Peoples still face numerous violations of their human rights. For example, Indigenous Peoples are denied protection of their cultures (e.g., religion, language); protection of their lands, specifically from development activities; consultation between other Indigenous Peoples and states; and political recognition (OHCHR, 2017). The UNDRIP has, however, improved the monitoring of Indigenous Peoples' rights through the ten UN treaty bodies (Committee on the Elimination of

Racial Discrimination; Convention on the Rights of the Child; Committee on Economic, Social, and Cultural Rights; Convention on the Elimination of all Forms of Discrimination against Women; Human Rights Committee; Convention on the Rights of Persons with Disabilities; Committee Against Torture; Committee on Migrant Workers; Committee on Enforced Disappearances; Special Political and Decolonization), wherein some treaties have explicit reference to the rights of Indigenous Peoples (OHCHR, 2017). Yet, Indigenous Peoples' knowledge of the UNDRIP and treaty bodies' existence is limited, therefore restricts their access to protection and justice.

However, some countries have specifically recognized Indigenous Peoples' rights in government instruments. For example, the Constitution of the Federative Republic of Brazil passed in 1988 includes fundamental principles the country is founded on and governed by, such as: sovereignty, the dignity of the human person, the prevalence of human rights, and self-determination of the peoples (Art. 1-4). In addition, this Constitution outlines several fundamental rights; Brazilians and foreigners residing in the country are guaranteed their individual and collective rights, social rights, nationality, political rights, and political parties (Art. 5-17). Further, some Constitutions emphasize the link between environmental protection and human rights. For example, in 2008, the new Constitution of Ecuador recognized Indigenous Peoples' land rights and livelihoods; guaranteed their rights in observation of the law, human rights, and collective rights; and provided a legal foundation upon which they can engage in traditional practices (Art. 84). Moreover, this Constitution is the first in the world to recognize legally enforceable rights of the environment, prohibiting the extraction of non-renewable resources in protected regions of the country, and preserving Indigenous rights to their natural environment (Art. 71-74; see also, Australia's Yarra River Protection Act of 2017, which granted the Yarra River human rights).

Genocide

While genocide studies have greatly advanced in contemporary academia, scholarship has mostly been historical and legal, specifically with reference to the Holocaust, or Rwandan and Bosnian Genocides. However, the meaning of the term genocide remains a central debate within genocide studies, where old and new concepts are deemed inadequate in providing a sufficient foundation for understanding this phenomenon (Shaw, 2007).

Raphael Lemkin coined the term genocide in 1944, stemming from the Greek *genos* (race) and the Latin *cide* (killing), for the purpose of describing a general class of violent actions. Lemkin's (1944) original concept of genocide aimed to define a general crime; a collection of planned violent and destructive actions against a specific group, comprised of acts constituting specific crimes when taken separately. Using the ideas of 'barbarity' and 'vandalism,' Lemkin introduced his definition in his 1944 book, *Axis Rule in Occupied Europe*, as "the destruction of a nation or of an ethnic group" (p.79). Further, he explained the term genocide was intended to "signify a coordinated plan of different actions aiming at the destruction of essential foundations of the life of national groups, with the aim of annihilating the groups themselves," rather than simply mass killings, although the latter was a means by which genocide could occur (Lemkin, 1944, p.79).

Nonetheless, the term genocide has become synonymous with mass killings, due in part to the dearth of documentation and research revolving around the Holocaust. The Holocaust is perceived as a 'maximal standard' for genocide, resulting in ad hoc comparisons of cases such as

Rwanda, Bosnia, or Darfur paling in comparison or even failing to be recognized as an act of genocide simply because the exterminatory methods employed were not as advanced as those used by the Nazi regime. However, it is important for scholars to abandon their negative idealizations surrounding the Holocaust and avoid comparing other genocides to the Holocaust, because it is a specific case of genocide itself, not the threshold of how genocides should be defined (Shaw, 2007).

Lemkin's (1944) definition of genocide has been the topic of debate since its introduction. Debate over the definition has been inconsistent, with several scholars criticizing it as both narrow and broad (Katz, 1995; Power, 2013; Schabas, 2000; Shaw, 2007), and offering their own definitions. For instance, Shaw (2007) attempted to redefine genocide as "a form of violent social conflict, or war, between armed power organizations that aim to destroy civilian social groups and those groups and other actors who resist this destruction" (p.154). This definition, however, is problematic. While historical cases have proven genocides to be violent conflicts, Lemkin's original concept of genocide included violence as a *method* of committing genocidal actions. Shaw's (2007) inclusion of the word "violent" suggests the exclusion of non-violent conflicts as relevant to the study of genocide. Yet, non-violent conflicts that destroy resources (e.g., land, burning of villages, desecration of sacred areas) can be just as destructive to social groups as direct violence against humans. Further, Shaw (2007) proposed the use of the word "civilian" to describe all victims of genocide rather than a particular group or identity type, because he argued that the "civilian character is the common feature of both group targets and individual victims across all genocides" (p.117). The issue here, however, is that not all victims of genocide are the same, and the term civilian downplays the importance of culture and identity, reduces the uniqueness of victims' suffering, and implies unidimensionality across genocide cases. Lastly, his definition implies that cases where groups do not resist the violent conflict *should not be* considered genocide, which then excludes a number of cases. In some cases, victims cannot react since they may lack the opportunity or resources to do so, and the inability to respond does not seem to be an appropriate characteristic upon which to base a definition of genocide.

For the purpose of this dissertation, Lemkin's original concept will be used, as it remains the most accurate and coherent definition of genocide (see, Crook and Short, 2014). To be clear, Lemkin's (1944) concept provides the most comprehensive definition of genocide, addressing the physical (derived from barbarity) and cultural (derived from vandalism) genocide of groups. In particular, his definition identified direct, and indirect factors associated with the destruction of a group, such as ecocide (Crook & Short, 2014; Lemkin, 1944).

Ecocide

The term ecocide was first proposed in 1970 by Arthur Galston at the Conference on War and National Responsibility, referring to environmental destruction (Crook & Short, 2014). Galston likened the term to genocide, suggesting that the destruction of the environment was as equally unsettling as the destruction of humankind, and should be recognized in international law (Crook & Short, 2014). Following the environmental damage in Southeast Asia inflicted by chemical warfare (specifically Agent Orange), the Prime Minister of Sweden, Olaf Palme, referred to the Vietnam War as an ecocide at the United Nations Stockholm Conference on the Human Environment 1972 (Gauger, Rabatal-Femel, Kulbicki, Short, & Higgins, 2012). Despite other heads of State agreeing that the Vietnam War was detrimental to the environment, there was no mention of ecocide in the official Stockholm Conference documentation. Conversely, the Convention on Ecocidal War resulted in Richard Falk, expert on international law of war crimes, drafting and publishing the International Convention on the Crime of Ecocide in 1973 (Crook & Short, 2014; Gauger et al., 2012). Falk's draft convention called for ecocide to be recognized as an international war crime, although Falk acknowledged that ecocide was often a consequence of human economic activity, where damage to the environment was consciously and unconsciously inflicted by man, rather than solely being the result of intentional attacks (Crook & Short; Gauger et al., 2012; Mehta & Merz, 2015).

Unfortunately, Falk's draft convention was never adopted by the UN. The effort to recognize ecocide as a crime have, however, continued over the decades. Advocates of environmental rights have noted that while the UDHR did not explicitly address environmental protection, the right to a healthy environment exists as a component of the right to life (Art. 3) and therefore the concept of ecocide should be recognized as a violation of international human rights law (Lytton, 2000). In addition, environmental lawyer, Polly Higgins, proposed an international law of ecocide in 2010, wherein she defined ecocide as "the extensive damage to, destruction of or loss of ecosystem(s) of a given territory,…" and identified two types of ecocide; human caused and naturally occurring; placing its utility within a legal framework (Higgins, Short, & South, 2013, p.257). Further, Higgins suggested that the law of ecocide should recognize human-caused ecocide as a crime of strict liability (i.e., without intent) since environmental damage is typically a consequence of corporate activities and "very rarely do corporations *intend* to cause mass damage and destruction" (emphasis in original, Higgins et al., 2013, p.262). However, by recognizing ecocide as a crime without intent, it overlooks responsibility and the extent to which corporate actions damage the environment.

Later, Higgins' campaign, *Eradicating Ecocide*, highlighted the impact of ecocide on Indigenous Peoples (2012). Traditional Indigenous lifestyles are intertwined with the environment; they depend on the environment for their physical, cultural, and spiritual health; therefore, ecocide can have a genocidal impact on Indigenous Peoples (Crook & Short, 2014; Higgins, 2012). Yet, criminological discourse fails to recognize these issues as cause for concern. Although criminologists have addressed social and economic justice issues, environmental justice has received little attention (see Lynch & Stretesky, 2012). In doing so, criminologists ignore the extent of harms associated with these crimes and by extension, ignore the underrepresented populations (e.g., Indigenous groups) who are affected by these crimes.

Toxic Colonialism

The phrase "toxic colonialism" – also, "toxic waste colonialism" – was coined by Jim Puckett of Greenpeace in the early 1990s to describe First World dumping of industrial hazardous wastes in developing/Third World countries (Pratt, 2010). As the phrase implicates, toxic colonialism represents disproportionate economic development between nation states, with developed nations dominating underdeveloped nations specifically with respect to the dumping of hazardous industrial waste. Due to capitalistic economic expansion, an increase in hazardous waste production results in developed nations running out of territories for disposal, thus transboundary movement of hazardous waste is increased, and toxic colonialism perpetuated. This process is related to the structure of the capitalist world system and is tied to processes such as metabolic rift and ecological unequal exchange. That is, developed nations excessively consume natural resources from less-developed nations, and the mobilization of resources and wealth from less-developed nations to developed nations exacerbates the appropriation and unequal use of these resources for capital gain (Crook, Short, & South, 2018; Foster & Clark, 2004; Lynch et al., 2019).

It has been estimated that the generation of hazardous waste in industrialized, developed nations will increase annually by 60% to 194 million tons by 2020, with approximately 4% (7.8 million tons) of the generated hazardous waste actually travelling across international borders (Hunter, Salzman, & Zaelke, 2007; Pellow, 2007; Pratt, 2010). To be clear, the remaining 96% (186 million tons) of the annually generated waste is disposed of within the nation it was originally produced. Nevertheless, while these data indicate that "only" 4% is exported, the exported quantity of waste is still a large volume of waste. To place the 7.8-million-ton figure in further context, that number represents 56% of the volume of toxic waste the U.S. produced in 2017 according to the U.S. Toxic Release Inventory.

Hazardous waste disposal began to be regulated by domestic environmental laws in the 1970s, with the Resource Conservation and Recovery Act (RCRA) in 1976, which regulates the "collection, transport, separation, recovery, and disposal practices and systems" of hazardous waste (Hunter et al., 2007; Pratt, 2010, p.593). International hazardous waste disposal later gained international attention in the 1980s, resulting in the Basel Convention on the Control of Transboundary movements of Hazardous Wastes and their Disposal being adopted in 1989 (hereafter, the Basel Convention). The Basel Convention regulates the transboundary movement of hazardous wastes. It attempts to ensure that hazardous wastes are managed and disposed of in an environmentally sound manner (ESM). It also attempts to prevent illegal international waste disposal through the punishment of illegal trafficking in hazardous wastes, and through the prevention or minimization of the generation of hazardous wastes (UNEP, 2011).

A decade after the Basel Convention, the Basel Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal (i.e., the Protocol on Liability and Compensation) was adopted, with the goal of imposing stricter and fault-based liability for damages to human health and the environment as a result of transboundary movements of hazardous wastes (Pratt, 2010; UNEP, 2011). Despite domestic and international laws and regulations, improper disposals of hazardous wastes continue in developed and developing countries. It should be noted that the United States has yet to ratify the Basel Convention, which negatively impacts its global effectiveness. The lack of ratification from the largest global producer of hazardous waste portrays the U.S. as non-partisan and unsupportive of the Basel Convention, resulting in the possible dissuasion of other countries to ratify the Convention themselves (Pratt, 2010).

Toxic Colonialism and the Ecocide-Genocide Nexus

The terms/phrases discussed above are at the core of international laws and doctrines created for the protection of humankind and the environment, yet the application and advancement of these documents are thwarted by industrial activities and economic expansion. Here, it becomes evident that government and corporate agendas are carried out despite negative consequences that often involve environmental spoliation and disregard for human life. The processes of exploitation and injustices against Native Americans are rooted in historical and contemporary accounts of colonialism. For example, land agreements written into Native American treaties are strong enough to block corporate goals of power and profit; however, state and corporate actors then bypass treaty agreements by unethically "quietly leasing" portions of tribal lands (Robyn, 2002, p.90). In other words, the state and corporations will attempt any means necessary to elude treaty agreements that otherwise prevent their profit-making agendas. For example, provisions in the 1955 amendments (Statute 540) to the General Allotment Act of 1887 related to Indian Reservation lands, allows the Secretary of the Interior to lease the land of a deceased reservation land allottee for mining purposes. Although state and corporate violations of treaties are nothing new, their methodological efforts to "quietly lease" tribal lands despite protective agreements demonstrates the exploitation, discrimination, and victimization that Native Americans continue to face.

In addition, Native Americans are often pressured into "colonial-style" agreements with corporations, where they are coerced with promises of jobs or monetary offers if they allow corporations to explore their lands (Robyn, 2002, p.90). Likewise, some tribes have considered corporate proposals to host commercial hazardous and solid waste facilities on their lands since many are without major sources of external revenue. It should be noted, however, that most tribes decide not to host the facilities following risk and benefit analyses (Brook, 1998; Crow, 1994). Further, tribal lands are targeted for unauthorized and illegal waste dumping by corporations that dump their waste without tribal permission (Brook, 1998). These acts that damage the environment impact Native American health, safety, and tribal sovereignty, which contribute to the genocidal threats against Native Americans (Brook, 1998, p.108-109).

The link between environmental protection and human rights was outlined in several international doctrines, constitutions, and laws, yet the right to a healthy environment is increasingly violated by development projects where corporate earnings are subsidized at the expense of Native health and safety (Brook, 1998). As development projects continue to destroy the prospects of a quality environment, the human rights of Native Americans are threatened and violated by toxic colonialism and the genocidal impact of its environmental destruction. The following section further explores the intersection of toxic colonialism, ecocide, and genocide and their implications for environmental justice.

Native Americans and Environmental Injustice

Environmental justice issues have seldom been discussed within criminological research, especially when these issues concern populations such as Native Americans (Lynch & Stretesky, 2012). The majority of environmental justice studies involving Native Americans are drawn from the disciplines of public health and sociology, and the few studies within criminology have only been addressed by green/radical criminologists. That being said, several scholarly works have examined the environmental injustices endured by Native Americans as a means of protecting their culture, land, and quality of life against ecological destruction (Angel, 1991; Brook, 1998; Crook & Short, 2014; Crook, Short, & South, 2018; Hooks & Smith, 2004; Kuletz, 1998; Lynch, Stretesky, & McGurrin, 2002; Lynch & Stretesky, 2012; Lytton, 2000; Reed, 2009; Robyn, 2002; Ruggiero & South, 2013; Short, 2010; Steady, 2009; Stretesky & Lynch, 1999; Vickery & Hunter, 2016). Perusal of the literature has revealed a range of social and economic inequalities and injustices for Native Americans that indicate they (as a group) are more likely than any other racial group to live in unequal and unjust conditions (see Lynch & Stretesky, 2012). The disproportionate production and distribution of environmental toxins on or near tribal lands contributes to these inequalities and affects Native American quality of life. This section provides a brief review of the literature exposing a variety of environmental injustices faced by Native Americans due to ecocide and toxic colonialism.

Native Americans have been the victims of "environmental genocide" since the dawn of "economic advancement" and industrialization (Brook, 1998, p.105). Specifically, the destructive actions carried out by the U.S. government and multinational corporations (MNC) in pursuance of economic gain consequently produce harmful toxins/hazardous waste which threaten the health and safety of humans and the environment (Brook, 1998). The prevalence of poverty and unemployment among Native Americans increases their vulnerability to environmental racism, as well as their perceived expendability, thus their lands are targeted by the U.S. government and large corporations. In 1987, approximately 50% of Native Americans lived in communities with one or more uncontrolled toxic waste sites (Chavis & Lee, 1987; Reed, 2009). Undoubtedly, this percentage continues to grow, with over 15,000 hazardous sites and facilities identified on or near tribal lands in 2004 (Zender, 2004); over 2,500 TRI facilities located on or within 10 miles of tribal land in 2016 (EPA, 2016); and approximately 40% of the 1,300+ superfund sites located on tribal land in 2018 (EPA, 2018b).

While some Tribal Nations with limited economic opportunity have, in the past, considered and signed agreements with the government and corporations for the use of tribal land as hosts to waste disposal facilities, many proposals were approved without tribal consultation or consent (Angel, 1991; Brook, 1998; McKenna, 2016). For example, the Standing Rock Sioux Tribe in South Dakota was never granted the opportunity to discuss or participate in the cultural resource surveys necessary to assess potential culturally significant sites along the proposed pipeline route, conducted for the Dakota Access Pipeline (DAPL) project. Instead, the surveys were conducted for DAPL by unqualified, non-Tribal consultants, and the Tribe was later provided with copies of partial surveys following their completion (*Standing Rock Sioux Tribe v. U.S. Army Corps of Engineers (USACE)*, 2016). When corporations exploit tribal lands for industrial activities, it exhibits blatant disregard for Native American culture and health.

Despite the presence or absence of consensual agreements between the two parties, tribal lands house unwanted industrial waste, which not only presents detrimental health and safety risks, but affects the tribes' tribal sovereignty. Federally recognized tribes, as established through governmental treaties, are self-governing and self-regulating, which allow them to establish their own enforceable environmental regulations for their lands, and the EPA is required to enforce these regulations (Bureau of Indian Affairs, 2014; Vickery & Hunter, 2016). However, with little to no government oversight, and few tribal environmental regulations and laws, tribal lands are attractive to industrial corporations because they offer a deviation from the permit process and environmental review necessary for proposed operations (Angel, 1991). Tribal sovereignty is then exploited and threatened by these corporations because it creates conditions increasing the likelihood of government intervention, wherein the government can then use this issue in attempt to gain control over Native American affairs.

Since Native Americans rely on their environment to meet their material and cultural needs (e.g., such as access to wild flora, deer, fish, and their spiritual connection to the rivers and mountains), contamination from toxic waste, pollution from crude oil spills, pollutants from mining, or other external environmental hazards directly affect the culture and well-being of Native American tribes (Brook, 1998). The cultural and physical existence of Indigenous groups is increasingly threatened by the environmental destruction at the hands of the government and MNC. Crook and Short (2014) described culture as the "primary adaptive mechanism" for the human species; culture has been relied upon to evolve, adapt, and survive; but it is threatened by "global capitalism and its path of accumulation" (Crook & Short, 2014 p.310-311). These culturally destructive processes experienced by Indigenous Peoples are violations of core Indigenous rights, as identified by the UNDRIP (Short, 2010; UNDRIP, 2007). Specifically;

military operations (Hooks & Smith, 2004), industrial farming and mining (Kuletz, 1998; Lynch & Stretesky, 2012; Robyn, 2002), extractive industries (Lynch et al., 2002; Lynch et al., 2018; Lynch & Stretesky, 2012), and other corporate agendas bring environmental degradation and pollution to tribal lands, diminishing the lifestyle and traditions of Indigenous Peoples. For example, in their continuing battle against DAPL, the Standing Rock Sioux Tribe expressed their concerns of how a pipeline leak would contaminate their main source of drinking water and fish, and would damage their "spiritual continuity," since they perform a sacred spiritual ceremony on the banks of the Missouri River (*Standing Rock Sioux Tribe v. U.S. Army Corps of Engineers*, 2016). Yet, industrial expansion and financial gain supersede the rights of the disadvantaged, and profits are maximized at the expense of Native American health and the environment.

Summary

This chapter defined human rights, genocide, ecocide, and toxic colonialism in order to provide a framework for a review on the research on Native Americans and the environmental injustices they face. Defining these terms, and tracing their historical roots, highlighted the lengthy and arduous mission employed by nations, advocates, and scholars over the years to develop an all-encompassing means to protect humankind and the environment. Despite decades of efforts, humankind and the environment remain threatened by greed and the reliance on natural resources, driven by capitalist agendas. The imbalance between humanity and the environment results in a progressive decline in quality of life – while the population increases, so does the need for natural resources – creating a rift between the two. Thus, the relationship between man and nature becomes a vicious cycle of languish and defeat, with the few powerful parties being the only beneficiary.

CHAPTER THREE:

ENVIRONMENTAL CRIMES AND THE TREADMILL OF PRODUCTION

The following discussion provides a detailed description of environmental law and crime. In doing so, it explores environmental crimes within the realm of orthodox criminology, yet finds they are better suited when analyzed through a green criminological lens. In the green criminological literature, the focus is on crimes generated by structural forces, such as capitalism and mechanisms within capitalism, rather than on the individual, which is the analytic level taken in much of the orthodox criminological literature. Moreover, the green view also explains crime by describing the factors that influence the formation of law and the definitions of environmental crime. In that view, crime is seen as an intersection between the behaviors of people, laws, and law enforcement. In that approach, it becomes clear that explanations outside of traditional criminology offer a more comprehensive perspective for studying the holistic nature of environmental crimes. In exploring environmental crimes, it is also useful to address the role of corporate and power structures in committing green victimization against Native Americans.

Environmental Law and Regulation

The underpinnings of environmental laws can be traced to the late 19th century when capitalistic agendas and industrialization boomed. Those laws, however, emerged for anthropocentric reasons. That observation means that in the 19th century, environmental laws were passed to protect human interests, especially human economic interests, rather than to protect the environment for its intrinsic value (Petersmann, 2018), or as an independent living entity (Lynch, Long, & Stretesky, 2019). With the exception of the Refuse Act of 1899, it was not until the 1970s when environmental crimes prompted the passage of several environmental laws and regulatory agencies containing criminal sanctions (Situ & Emmons, 2000).

A number of notable environmental laws were enacted in the 1970s. In the U.S., such laws included: the Clean Air Act (CAA) of 1970; the Federal Water Pollution Control Act and Amendments of 1972, also known as the Clean Water Act (CWA); the Safe Drinking Water Act (SDWA) of 1974; the Resource Conservation and Recovery Act (RCRA) of 1976; the Toxic Substances Control Act (TSCA) of 1976; and the Surface Mining Control and Reclamation Act (SMCRA) of 1977. International environmental laws (IEL) stemmed from the Stockholm Declaration of 1972, which highlighted the concern for environmental protection. In addition, this was the first document to establish a link between environmental protection and human rights by acknowledging the human right to live in a quality environment. Similar to other human rights instruments, however, the Stockholm Declaration was legally non-binding (Petersmann, 2018). Subsequent legally binding documents that emphasized the link between human rights and environmental protection included the UN Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution of 1979; the African Charter on Human and Peoples' Rights (ACHPR) of 1981; the Protocol of San Salvador to the American Convention on Human Rights of 1988; the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal of 1989; the Rio Declaration on Environment and Development of 1992; the Arab Charter on Human Rights of 2004; the Constitution of Ecuador in 2008; and the European Union Charter of Fundamental Rights of 2009.

The increase in legislation promoted the belief that the government would responsibly control big businesses. New developments and research in the 1980s, however, revealed more damaging threats to the environment that were not addressed in the prior legislation (Situ & Emmons, 2000). For example, the discovery of toxic waste sites across the U.S., which received heightened public concern after the disaster at Love Canal in 1978, when some 80 different chemical compounds leached through corroding disposal drums and into the backyards and basements of the nearby community, as well as a public school (Beck, 1979). Shortly following the disaster, there was a notable increase in birth defects, miscarriages, and individuals with elevated white-blood cell counts (a precursor of leukemia), yet the environmental laws at the time failed to address liability regarding waste disposal accidents (Beck, 1979). This disaster led to the development and passage of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, also known as the Superfund Act. CERCLA provided requirements and responses to concerns associated with closed and abandoned hazardous waste disposal sites; provided liability of persons (corporations) responsible for hazardous waste releases at these sites; and created a trust fund (i.e., Superfund) to be used to pay for cleanup and enforcement costs (EPA, 2018b; Situ & Emmons, 2000). In addition, CERCLA supplemented RCRA, which regulates the production, management, and disposal of hazardous waste (EPA, 2018b; Situ & Emmons, 2000). Although environmental laws provided a regulatory framework for enforcement, most environmental offenders received civil, rather than criminal, sanctions for environmental law violations. However, amendments of the laws in the 1980s and 1990s led to the increased use of criminal prosecutions for environmental offenders (Situ & Emmons, 2000).

The Environmental Protection Agency (EPA) is responsible for enforcing environmental regulations and protecting public health. Specifically, the EPA is charged with overseeing corporate and facility compliance to environmental laws (EPA, 2018a). In doing so, the EPA is supposed to assess the nature and magnitude of risks to human health, as well as ecological receptors (e.g., birds, fish, plants), from chemical contaminants present in the environment (EPA, 2018a). However, actions of the EPA are often restricted by political interference that prevent it from doing what it was created to do. In other words, the role of the EPA is restricted by a reduced budget, corporate lobbying, and by the priority of the EPA Administrator appointed by the President (e.g., recently appointed EPA Administrator under the Trump Administration, Andrew Wheeler, is a recognized climate change denier, and whose history in polluting industries demonstrates his lack of care for the environment).

Despite the recent shift in the effectiveness of the EPA and its duties, the EPA's Toxic Release Inventory (TRI) program continues to monitor the toxicity of chemicals released into the environment and the route of exposure for human and nonhuman species. The TRI was created in 1986 under the Emergency Planning and Community Right-to-Know Act (EPCRA) as a response to several environmental disasters that raised public concern about preparedness for such emergencies (EPA, 2019). The TRI tracks and records the management of over 650 toxic chemicals that may pose a threat to human health and the environment. It is mandatory for facilities that meet specific criteria in different industry sectors to report annually how much of each chemical is released to the environment (via air, water, or land) and/or managed through recycling, energy recovery and treatment (EPA, 2019). However, when facilities are found to be non-compliant under the EPCRA, they are only issued civil penalties (e.g., monetary fines) and are required to correct the violation (EPA, 2019). In addition, facilities that do not meet the criteria for monitoring are omitted from the program; therefore, the numbers recorded by the TRI cannot fully encompass the extent of toxic pollutants released into the environment. As previously mentioned, over 2,500 TRI facilities were located on or within 10 miles of tribal land in 2016 (EPA, 2016), yet research exploring the green victimization of Native Americans is often limited to sociological (Brook, 1998; Ruggiero & South, 2013) or public health (Kegler & Malcoe, 2004; Malcoe et al., 2002) literature, and has only recently garnered attention from green criminologists (see Lynch & Stretesky, 2012; Lynch et al., 2017; Lynch et al., 2018; Stretesky et al., 2013).

Green Criminology and Environmental Crimes

The following section introduces the subfield of green criminology and explores its utility in examining environmental/green crimes. In doing so, it identifies environmental/green crimes as a form of corporate crime and explains why these types of crime deserve more attention in criminological scholarship. Finally, it provides the foundation for theories used to analyze these crimes and their application to the victimization of Native Americans.

Green criminology emerged in the early 1990s as a means of addressing environmental crimes, which, at the time, were largely neglected in the criminological literature (Lynch, 1990). Lynch (1990) observed that orthodox criminological explanations of crime omitted environmental harms because they relied on the narrow definition of crime as a violation of criminal law. The issue with this definition is twofold; first, it limits the scope of criminological focus to common street crimes committed by lower-class individuals; second, it ignores the social economic factors that influence law-making and power relations (Lynch, 1990; Lynch & Stretesky, 2011; Stretesky et al., 2013). To be clear, this definition lacks an inquiry of behaviors not defined by the social construct of law. In addition, laws often ignore harms committed by the powerful, because these are the groups responsible for creating the laws. This draws attention to the construction of environmental laws, which insufficiently address the extent of environmental harms that occur in society and often ignore those harms that result from corporate agendas (Lynch, 1990; Lynch & Stretesky, 2011; Lynch et al., 2017; Lynch et al., 2018; Situ & Emmons, 2000; Stretesky et al., 2013). For example, in the late 1970s and mid-to-late 1980s, the world saw a number of large-scale environmental disasters caused by negligent and criminal behaviors that were ineffectively sanctioned (e.g., fines) by the existing environmental laws. Specifically, cases such as the pollution disaster of Love Canal in New York in 1978, the Union Carbide gas leak in India in 1984, the nuclear meltdown of the Chernobyl power plant in the Ukrainian Soviet Socialist Republic (USSR) in 1986, and the *Exxon Valdez* oil spill in Alaska in 1989, resulted in low fines for those involved. Moreover, it took several years for legal remedies to unfold (see Lynch et al., 2018).

Following these disasters, and at a time when the public was becoming more aware and concerned with the environmental crisis, Lynch (1990) called on criminologists to focus on crimes against the environment. Originally proposed as an extension of radical criminology, employing a political-economic focus, green criminology has since expanded to encompass a number of issues that emphasize environmental harms (see Lynch et al., 2017). Within the realm of green criminology, the focus is on those "human behaviors that cause ecological destruction and ecological disorganization," also referred to as environmental crimes or green crimes (Lynch et al., 2017, p.10). Specifically, green crimes were defined as "acts that cause or have the potential to cause significant harm to ecological systems for the purposes of increasing or supporting production" (Stretesky et al., 2013, p.2). This definition encompasses acts that result in ecological harms whether or not they are recognized by environmental regulations and laws. Iit is important to address why some of these harms are recognized as crimes by the law while others are not. By employing a political economic lens to examine environmental harms, criminologists can better conceptualize how the economic power structure facilitates ecological destruction and has implications for environmental injustice against certain groups (e.g., the poor). Then, within the context of orthodox criminology, green crimes can be identified as a form of corporate crime.

White-Collar Crime and Corporate Crime

Until Sutherland (1949) shed light on white-collar crimes in the late 1940s, the scope of criminological research focused on crimes committed by lower class individuals. White-collar crime is a term that describes illegal and/or immoral actions committed by an individual in power/of high social status committing crime “in the course of his occupation” (Sutherland, 1949, p.7). These individuals engage in criminal behaviors for the purpose of financial gain while hiding behind the façade of professionalism. The term “white collar” became a representation of successful professionals, referring to the white collars that they wore, as opposed to the blue collar sported by working-class employees (Michel, Cochran, & Heide, 2016). White-collar crimes were economic offenses committed by the upper-class/elite that caused greater social harm than traditional street crimes (e.g., property offenses, burglary, non-negligent manslaughter). For example, fraud, negligence, toxic waste dumping, and antitrust violations result in greater annual losses and deaths every year compared to traditional street crimes (Michel et al., 2016). However, Sutherland’s arguments were based on data about the law violations of corporations rather than individual workers. Accordingly, a distinction between individual and corporate white-collar crime emerged.

Several scholars (Clinard & Quinney, 1973; Clinard & Yeager, 1980; Geis & Meier, 1977) disentangled the differences between individual, or occupational, and corporate white-collar crime. Occupational crimes are violations committed by an individual during work for self-benefit, whereas corporate crimes are committed by individuals on behalf of the corporation where they are employed (Clinard & Yeager, 1980). To be clear, corporate crimes are committed by an aggregate of employees and emphasize corporate gain rather than individual benefits (Situ & Emmons, 2000). Further, these employees do not hold low-level positions. Instead, they are the executives who have the power and control the decision-making of the corporation to further corporate goals. Environmental/green crimes, then, are a subset of corporate crimes that involve situations where the environment is polluted or destroyed as part of an occupational activity that benefits the corporation (Payne, 2016, p.257; Situ & Emmons, 2000).

Expanding upon this perspective, Kramer and colleagues (2002) applied a state-corporate crime approach to cases involving environmental harms and crime. State-corporate crime is defined as, "illegal or socially injurious actions that result from a mutually reinforcing interaction between policies and/or practices in pursuit of the goals of one or more institutions of (1) political governance and (2) economic production and distribution" (Kramer, Michalowski, & Kauzlarich, 2002, p.271). In other words, this perspective draws attention to ecological destruction as a result of corporate agendas, such as pollution and disposal of toxic waste, and its impact on the quality of life for those living in these areas (i.e., poor/minority communities). Several studies have demonstrated the link between the distributions of hazardous waste facilities/dumping sites and minority communities (see Barrett, 2013; Boone & Fragkias, 2012; Bullard, 1993; Bullard et al., 2007; Lynch & Stretesky, 2012; Malcoe et al., 2002; Pellow et al, 2001; Reed 2009; Steady, 2009). In addition, people living in areas targeted for economic production are exposed to substantial health risks via contaminated drinking water, air pollution, and the degradation of soil (Kramer et al., 2002; Walters, 2010). In the literature, these actions have also been referred to as toxic crimes. Lynch and colleagues (2002) defined toxic crimes as "corporate behaviors that unnecessarily harm or place humans and the environment at risk of harm through the production and management of hazardous waste in the course of a legitimate business enterprise" (Lynch et al, 2002, p.111). To be clear, toxic crimes describe the corporate actions that impact the environment and human health through economic production, specifically ecological withdrawals and ecological additions. Here, attention is drawn to green victimization associated with ecological destruction generated by political-economic forces.

Theoretical Implications

Several orthodox criminological theories have been applied to green crime, specifically; differential association theory/social learning theory (Sutherland, 1949; Burgess & Akers, 1966; Akers & Jennings, 2019), deterrence theory (Becker, 1968; Zimring & Hawkins, 1973), routine activities theory (Cohen & Felson, 1979), general strain theory (Agnew 1985; Agnew, 2001; Agnew, 2012), and self-control theory (Gottfredson & Hirschi, 1990). However, most of these perspectives were created to explain street crimes, and are often only applied to poor, undereducated individuals from socially disorganized neighborhoods. As a result, they fail to adequately explain green crimes and fully capture the scope and extent of the harms associated with green crimes (Stretesky et al., 2013). As previously mentioned, economic offenses cause greater social harm than traditional street crimes and comparatively result in greater annual losses and deaths every year (Michel et al., 2016). For instance, a single green crime can victimize upwards of thousands of human victims compared to traditional street crimes. In fact, some victims suffer repeated victimization since green crimes often extend over long periods of time (Hillyard & Tombs, 2004; Lynch et al., 2017; Stretesky et al., 2013; White, 2013; Williams, 1996). Further, the victims of green crimes include non-traditional victims that are not typically examined by criminologists, such as Native Americans and nonhuman victims (e.g., plants, animals, ecosystems) (Ellefsen, Sollund, & Larsen, 2012; Hall 2013; Lynch et al., 2017; Lynch et al., 2018; Stretesky et al., 2013). Therefore, it is necessary to move beyond orthodox criminological theories and explore structural explanations of crime that sufficiently address the widespread effects of green crime and the environmental harms associated with them.

Treadmill of production (ToP) theory (Scnaiberg, 1980) provides a political-economic explanation of how environmental harms are a consequence of production and focuses on the intersection between capitalism and ecological disorganization. ToP has become the basis for extending the political economic approach to green criminology (Lynch 1990), and emphasizing that focus, one portion of green criminology has now been labeled as PEG-C or political economic green criminology (Lynch et al., 2017). The next section will describe the ToP theory and illustrate its capability for analyzing green crime, environmental law and harms, and environmental justice. To that end, this section will demonstrate how the ToP theory surpasses orthodox criminological explanations of green crime.

Treadmill of Production (ToP) Theory

Developed by Schnaiberg (1980), treadmill of production (ToP) theory focused on explaining forms of ecological disorganization produced by capitalism. Specifically, the ToP theory illustrated the conflict between capitalism and nature; as capitalism expands, more natural resources are needed for production, and thus increasing ecological destruction and disorganization follow as capitalism accelerates its growth (Foster, 2000; Gould, Pellow, &

Schnaiberg, 2008; Lynch et al., 2017; Lynch et al., 2018; Schnaiberg, 1980; Stretesky et al., 2013). Schnaiberg (1980) identified two concepts to explain the capitalism-nature conflict: ecological withdrawals and ecological additions. Ecological withdrawals involve the extraction of raw materials for production. These activities include, for example, oil extraction, water extraction, mountaintop removal mining and other forms of strip mining, hydraulic fracturing, and timber removal (Lynch et al., 2017). Ecological additions are the by-products of economic production that disrupt the stability of the ecosystem, including, for example, air, water, and land pollution. Ecological additions can also occur as the result of ecological withdrawals, such as toxic waste from the production process, or oil contamination from drilling (Lynch et al., 2017). Not only do these effects harm the ecosystem, but they can directly and indirectly harm humans and animals (Lynch et al., 2017).

Following World War II, there was an increase in ecological disorganization perpetuated by economic expansion in the contemporary world (Lynch et al., 2018; Schnaiberg, 1980). Driven by capitalism, the global economic system relies on the growth of the treadmill of production (Foster, 2000; Lynch et al., 2017; Lynch et al., 2018; Schnaiberg, 1980; Stretesky et al., 2013). Here, an increase in natural resource extraction for production – ecological withdrawals – results in ecological destruction and disorganization (Lynch et al., 2018; Schnaiberg, 1980; Stretesky et al., 2013). The removal of raw materials, and the processes involved in their removal, can cause serious ecological disorganization, wherein the ecosystems become unstable and are unable to recreate the balance necessary for a fully functioning ecosystem, impacting the human and nonhuman species that live in them. In addition, ecological withdrawals often produce contaminated waste and other forms of pollution (e.g., air, water) which are forms of ecological additions (Lynch et al., 2018; Schnaiberg, 1980; Stretesky et al., 2013).

A second effect of economic production in the ToP are ecological additions, where pollutants and by-products are discarded into the environment as a consequence of corporate behaviors and the actions of the powerful (Lynch et al., 2017; Lynch et al., 2018; Schnaiberg, 1980; Stretesky et al., 2013). Similar to withdrawals, ecological additions impact the stability of nature and can have negative implications for human and nonhuman health. However, such harms are often ignored in criminological research although other scientific disciplines have extensively demonstrated a link between ecological additions (exposure to toxins) and negative health effects, such as cancer or birth defects (see Lynch et al., 2018, p.98). In doing so, orthodox criminology fails to address the significant crime and justice issues associated with ecological disorganization highlighted by green criminologists.

Green Victimization of Native Americans

There has been little discussion of harms to Native Americans in general, and until recently, research exploring the negative health effects associated with ecological withdrawals and ecological additions was largely excluded in the criminological literature (see Lynch & Stretesky, 2012). The majority of studies concerned with harms to Native Americans are limited to public health, medical, and sociological literature. Such harms occur as an extension of environmental, social, and economic injustices included in more radical definitions of crime (Kramer, 1985; Schwendinger & Schwendinger, 1970), yet the criminological discipline continues to ignore injustices faced by underrepresented populations such as Native Americans (Brooks, 1998; Lynch & Stretesky, 2012).

By employing a political-economic perspective to study green crimes, the ways in which environmental laws are defined and shaped by the power structure become clear – such laws and regulations are created by the actors and beneficiaries of the ToP who disregard the negative impacts perpetuated by economic production due to the belief that it will advance public welfare (Gould, Schnaiberg, & Weinberg, 1996; Gould et al., 2008). This unequal power relationship is historically tied to the colonization of Native Americans, specifically, where "ecologically induced genocide" is generated by the political economic structure of capitalism (Crook & Short, 2014, p.299). To be clear, the process of ecocide, as it is carried out by the capitalist ToP, can create conditions with a genocidal impact (Crook & Short, 2014; Lynch et al., 2018). In particular, these conditions threaten the physical and cultural existence of Native Americans in situations where tribal land is targeted for economic production. In short, because Native Americans rely upon their land for survival, genocide is facilitated by the ToP as it promotes the ecological destruction and disorganization of tribal lands. In this way, genocides are facilitated by ecocides.

As previously mentioned, tribal land has been seized and utilized by the government and other power structures for military operations (Hooks & Smith, 2004), natural resource extraction (Lynch et al., 2002; Lynch et al., 2018; Lynch & Stretesky, 2012), pipeline routes (*Standing Rock Sioux Tribe v. U.S. Army Corps of Engineers*, 2016), and toxic waste dump sites (Chavis & Lee, 1987; EPA, 2018b; Reed, 2009; Zender, 2004). Each of these processes produce ecological withdrawals and/or ecological additions that directly and indirectly affect the Native Americans who rely upon these lands for subsistence. Examples of the capitalism-genocide experience for Native Americans range from historical actions, such as the slaughtering of buffalo (Moloney & Chambliss, 2014) or burning of crops (Brook, 1998), to contemporary injustices associated with the ToP, such as industrial pollution (Lynch & Stretesky, 2012), exposure to hazardous waste (Brook, 1998; Burger & Gochfeld, 2011; Lynch & Stretesky, 2012; Ruggiero & South, 2013), elevated blood-lead levels (Harris & Harper, 2001; Kegler & Malcoe, 2004; Malcoe et al., 2002; Petersen et al., 2007), and oil spills (Lynch & Stretesky, 2012; Ruggiero & South, 2013).

In addition, Native Americans are victimized by the "treadmill of destruction," a phrase coined by Hooks and Smith (2004, p. 562) to explain the environmental dangers generated by militarism, and the geopolitical influence of the location of certain residential communities. Hooks and Smith argued that the treadmill of destruction (ToD) reflects (1) how militarism uses and damages tribal lands, and (2) how the location of tribal lands was dictated by the government. As part of that process, coercive policies were employed to constrain Native Americans to these regions. Those policies reflected institutional racism and social, economic, and political inequalities. Due to the interplay of poverty and race, Native Americans reside in regions viewed as undesirable by the government. Coincidentally, their lands are ripe with natural resources, and are targeted for profit by industrial and extractive companies. Here, corporate entities ignore and abuse land treaties, and tribal lands are utilized for industrial expansion that yields ecological withdrawals and additions, resulting in Native Americans' prolonged exposure to toxins (Hooks & Smith, 2004). Thus, the ToD has systematically placed Native Americans in regions that are disproportionately affected by the ToP and spatially overlap with a variety of government and corporate activities. The intersection of state-corporate actions generates green corporate and green state crimes (Moloney & Chambliss, 2014) that further facilitate the ecocide-genocide nexus.

Here, the victimization of Native Americans is highlighted by the human rights violations associated with ecocide. Government and corporate actions with ecocidal consequences deny Native Americans access to a healthy environment, violating a number of their fundamental human rights that exist in international laws. For example, environmental destruction directly affects Indigenous Peoples' rights to health, life, and security of person – as stated in the Inter-American Commission on Human Rights (IACHR) – since they depend upon the environment for survival (Crook & Short, 2014; Higgins et al., 2013; Wagner, 2001).

Likewise, ecocide can lead to cultural destruction, directly affecting human rights to culture, religion, and land outlined in the UDHR (1948) and elaborated upon in several articles (see Art. 8, 11-15, 24, 25, 29, 31, and 32) of the UNDRIP (2007). Further, damage to or the destruction of culture reflects Lemkin's "vandalism" component of genocide, which occurs by undermining a group's way of life (Crook & Short, 2014, Lemkin, 1944). Ecological destruction and disorganization, then, directly impact Native Americans' way of life since all aspects of their traditional lifestyle are associated with a quality environment. To be clear, Native Americans rely on the environment for hunting and fishing, gathering of plants for diet and medicine, spiritual and ceremonial activities, education, water, and economic sustainability. In addition, harm to tribal lands may violate Indigenous Peoples' rights to property, freedom of residence, and freedom of movement (Wagner, 2001). Therefore, any type of ecological disruption will have negative consequences for Native American survival.

In the contemporary period, extensive evidence of how ecocide affects Native Americans has emerged. For instance, in 2004, the Tribal Hazardous Sites Registry (THSR) identified over 15,000 hazardous sites and facilities on or next to tribal lands across the EPA regions that were associated with potential risks to tribal lifestyle (Zender, 2004). For comparison, Superfund sites accounted for 979 of these hazardous sites, when the total number of Superfund sites located throughout the United States at this time was 1,529 (EPA 2005; Zender, 2004). Other types of sites and facilities included in the THSR were hazardous waste facilities (RCRA sites), open dumps, mines, Leaking Underground Storage Tanks (LUST), Formerly Used Defense sites (FUD), and Brownfields, a former industrial site contaminated with hazardous waste. In addition, a number of sites were newly identified by tribes at the time of this project. Table 1 shows the breakdown of the number and types of THSR sites by EPA region. EPA regions are designated areas of the U.S. monitored by the EPA. For instance, the region with the largest number of THSR identified sites is EPA Region 9, which includes Arizona, California, Hawaii, Nevada, Pacific Islands, and 148 Tribes. Although tribes in different regions dealt with different site types, the presence of the hazardous sites substantially impacted tribal practices, such as hunting and fishing, gathering/using of plants, farming, and ceremonies/activities. In particular, approximately 71% of tribes reported that traditional activities take place on, or within close proximity to, a hazardous site. However, because tribes value their traditions and traditional lifestyles, they are less likely than their non-tribal counterparts to abandon these traditions, inadvertently increasing the likelihood of suffering from health risks associated with the sites (Zender, 2004).

In another example, the Dakota Access Pipeline (DAPL) was rerouted due to its proximity to municipal water supply wells and a predominantly White residential area (Figure 1) (Dalrymple, 2016; Thorbecke, 2016). Instead, the new route cut through Sioux land established under the 1851 Treaty of Fort Laramie and bordered several Native American Reservations (Figure 1). Later, officials at the Environmental Protection Agency (EPA), the Department of the Interior (DOI), and the Advisory Council on Historic Preservation (ACHP) expressed

Table 1. THSR sites in each EPA region.

	EPA Region											
	1	2	4	5	6	7	8	9, Ex. NN*	NN*	10, Ex. AK**	AK**	
Site Type												**Total**
Superfund	12	8	6	14	166	4	105	111	235	175	143	979
RCRA	3	56	16	85	56	1	15	213	36	101	0	582
Open dumps	1	25	34	8	156	28	73	319	242	67	151	1,103
Mines	16	21	75	260	719	5	1,609	2,806	701	1,300	372	7,884
LUST	280	28	97	907	83	59	229	1,236	27	658	471	4,705
FUD	8	10	4	20	9	3	26	149	4	74	13	320
Brownfields	0	0	1	4	5	0	7	7	1	4	4	33
Other	23	17	0	1	8	0	12	11	0	115	26	213
Tribal-notified	2	0	0	10	28	2	3	3	0	5	36	88
Total	345	165	233	1,309	1,230	102	2,079	4,855	1,246	2,499	1,216	15,279

NN*=Navajo Nation

AK**=Alaska

Source: Hazardous Waste Sites on Tribal Lands. Zender, 2004. http://www.zendergroup.org/docs/hazsites.pdf concerns regarding the environment and safety of the Standing Rock Sioux Tribe, citing the potential impacts to their Reservation and insufficient environmental justice analyses (McKenna, 2016). Despite recommendations from the EPA, DOI, and ACHP to redraft the environmental assessment and consider alternate routes reducing risk to water supplies, the USACE dismissed these concerns and published their assessment which claimed, "the anticipated environmental, economic, cultural, and social effects" of the pipeline project were "not injurious to the public interest" (McKenna, 2016, np). In other words, not injurious to the White, economically powerful's interests. For centuries, Native Americans have been disproportionately affected by institutional and environmental racism due to the ideology that they are expendable (Steady, 2009). Forced to reside in desolate regions deemed undesirable by the government, and constrained by policies and poverty, Native Americans continue to face social and environmental inequality when their lands are chosen for disposal sites and transportation routes (Steady, 2009). In addition, the intersectionality of social, political, and economic forces produces environmental injustices for Native Americans when the ecological destruction of their lands has genocidal impacts. Natural resources are being consumed at an accelerated rate by humans, leaving the ecosystem unstable, which increases and perpetuates green victimization against those who rely on the ecosystem for sustainability and survival.

This issue warrants greater attention and concern from criminologists and policy makers. The ecological crisis has worsened since the implementation of environmental laws in the 1970s and will continue to worsen if the conditions leading to ecological destruction and disorganization are not adequately addressed. Overreliance on fossil fuels exacerbates the ecological crisis, which threatens the potential extinction of mankind if fossil fuel energy is not substituted with clean energy (Crook & Short, 2014).

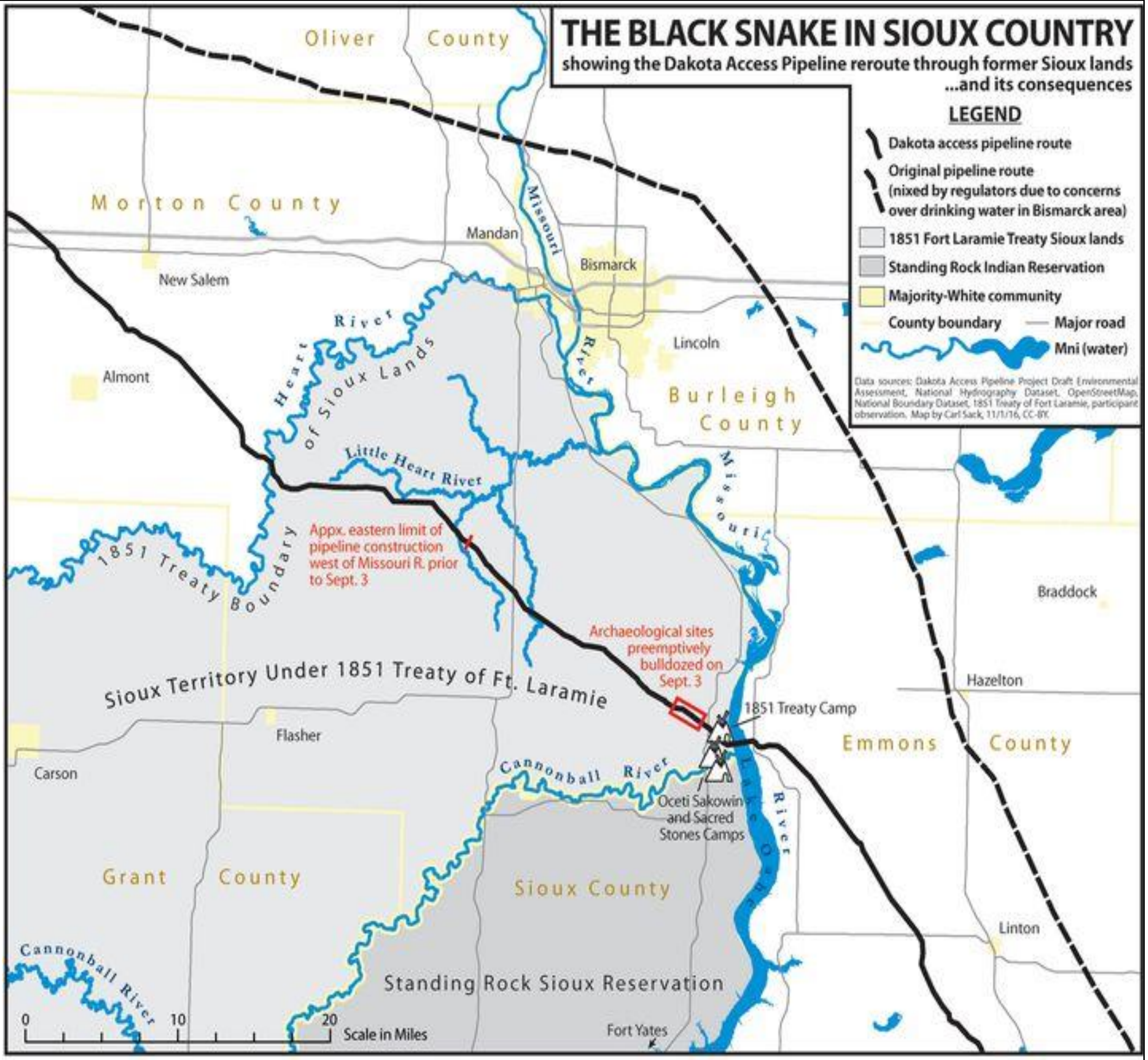

Figure 1. Dakota Access Pipeline (DAPL) – Original and new proposed routes.

Source: A #NoDAPL Map. The Huffington Post, 2016.
https://www.huffpost.com/entry/a-nodapl-map_b_581a0623e4b014443087af35

Summary

This chapter provided a description of environmental law and crime and explained how a structural perspective is better suited for studying environmental crimes compared to traditional criminological theories that tend to focus on individual levels of criminal behavior. In doing so, the capitalist political-economic treadmill of production (ToP) theory was applied to analyze environmental crimes within the realm of green criminology. Finally, this chapter reviewed how the ToP generates green victimization against Native Americans.

CHAPTER FOUR:

METHODS

This chapter outlines the critical incident method, a methodology used primarily for exploratory research to determine the causal antecedents of an event and those critical actions or inactions taken that contributed to the event's occurrence (Weatherbee, 2010). Here, the "event" being explored is the toxic colonialism of Native Americans and the causal antecedents are the ecological destruction and ecological disorganization associated with uranium mining. The critical actions or inactions taken reflects on the prior chapter that discussed environmental laws and the green victimization of Native Americans. In addition, evidentiary materials drawn from several sources provide the data for this study. The analysis of these materials is employed to answer the following research questions:

RQ1: How is the environment impacted by uranium mining?

RQ2: How does exposure to uranium affect human health?

RQ3: How do the ecological effects of uranium mining impact Native Americans?

RQ4: How is the ecocide-genocide nexus further facilitated by uranium mining?

These research questions, addressed in the previous chapters theoretically and through the use of literature reviews, will be examined further in this dissertation using a broad case study approach of uranium harms affecting Native Americans.

Case Study Approach

A number of definitions, criteria, and types of case studies have been identified by researchers over the years (Bromley, 1990; Feigin, Orum, & Sjoberg, 1991; Grandy, 2010; Mariano, 2000; Stake, 1995; Weatherbee, 2010; Yin, 1994; Zucker, 2009). The purpose of the case study, however, is ubiquitous: it is a "systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest" (Bromley, 1990, p.302). Specifically, a case study approach is the preferred method when the nature of the research questions requires exploration (Stake, 1995). For instance, questions that begin with *how* or *why* often warrant the use of a qualitative approach so the researcher can gain an in-depth understanding of a particular phenomenon (Dodge, 2011; Patton, 1987; Seidman, 2006).

Yin (2003; 2009) listed five components of effective case study research design: (1) research question(s); (2) purpose of study; (3) unit(s) of analysis; (4) logic that links data to propositions; and (5) specific criteria for interpreting the data. The research questions of interest and the purpose of the study were previously reviewed (see Chapter One and above). In short, this dissertation seeks to explore how Native Americans are impacted by uranium mining. The unit of analysis is the area of focus that a case study analyzes and is directly tied to the research questions (Yin, 2003; 2009). This study's unit of analysis is uranium mines in the Southwest U.S. that are on or near tribal lands. Due to the lack of availability on information pertaining to tribes and/or tribal communities, analyzing mines is expected to produce the most information on the environmental and health effects associated with uranium mining operations. As the data are analyzed, patterns or themes that emerge in the data will be linked to the propositions of the case study. This process is explained further in the following section on the data analysis process. Finally, the criteria should reflect unbiased interpretation of the data collected (Yin, 2003; 2009).

For this study, data are drawn from a number of sources in attempt to eliminate any biases; a process in the social sciences called triangulation. Essentially, in qualitative methods, triangulation is an approach that uses multiple data sources to get information that yields a more robust conclusion because the information comes from numerous sources. The convergence of multiple data sources about the same phenomenon allows researchers to construct meaningful explanations of a social phenomenon (Flick, 2017; Gibson, 2017; Mathison, 1988). Thus, triangulation is a strategy of validation where the findings are not the result of a single data source, rather the convergence and corroboration of several sources (Flick, 2017; Gibson, 2017; Mathison, 1988).

In addition, triangulation contributes to the saturation of data (Fusch, Fusch, & Ness, 2018). Saturation is reached when data observation no longer leads to the discovery of more data related to the research questions (Lowe, Norris, Farris, & Babbage, 2018). In other words, data saturation is the point at which no new information can be found and applied to the study. Once data saturation is met, the data collection and analysis processes are complete.

Data for case study analysis can be drawn from numerous sources of evidentiary materials, such as interviews, documentation, archival records, and physical artifacts (Yin, 1994; Zucker, 2009). As indicated by its name, most case study approaches focus on a specific case, where the unit of analysis is an individual, group, occupation, department, or organization (Grandy, 2010). Further, the type of case study depends upon the purpose of the inquiry. For example, some approaches focus on the details of a specific case to better understand a particular phenomenon, whereas others may use a case as a tool for extending theory or generalizing across cases (Grandy, 2010; Stake, 1995).

Critical Incident Method

For this dissertation, the critical incident method is used. This method investigates particular events or incidents that are perceived to be critical and of interest to the researcher (Weatherbee, 2010). The purpose of critical incident case studies is to determine the causal antecedents of an event and those critical actions or inactions taken that contributed to the event's occurrence (Weatherbee, 2010). Further, the focus of this method moves beyond the individual and includes factors at the individual, group, or organizational levels. In doing so, this method is applied to explore the actions or inactions that contribute to the toxic colonialism of and environmental injustices against Native Americans. To be clear, this method is used to explore how uranium mining adversely impacts the environment; how uranium mining affects human health; how the ecological effects generated by uranium mining impact Native Americans (physically and culturally); and how uranium mining further facilitates the ecocide-genocide nexus for Native Americans.

As with most case study approaches, the critical incident method employs a post hoc analysis, and thus relies on a combination of evidentiary materials (Weatherbee, 2010). Any form of documentation used as case evidence is gathered from multiple sources and integrated. The following section provides an overview of the data collection process.

Data Collection

When conducting case study research, multiple sources of evidence should be used to ensure the case study is as robust as possible (Green, Camilli, & Elmore, 2006; Yin, 2009). Data for this study come from a variety of existing source materials, including government agencies, scholarly works, media reports, Tribal codes, treaties and agreements, legal declarations and claims, international laws and doctrines, nonprofit organizations (NPO), videos, and maps. As indicated above, the use of multiple sources validates the data and enables the saturation of data.

Sample

This study's sample is the collective data of evidentiary information obtained from the sources collected. One mechanism used for data collection was the snowball method. That is, the review of one document led to the discovery of other usable documents. For example, a document retrieved from the Environmental Protection Agency on the uranium mining process referenced another document about the environmental effects of uranium mining. Then, this document referenced another document about the health effects associated with uranium mining, and so on. While this method typically led to other usable documents, it also revealed removed, altered, or non-existent documents. Here, it became evident that over time, not all documents remained available. As a result, documents could not be randomly sampled because of the inability to discover the entire universe of relevant documents. Instead, criteria were developed to determine which information was relevant for inclusion in this study. Table 2 shows the criteria used to assess each document. At least one criterion needed to be met for the document to be collected for further analysis.

All the documentation was drawn from public domains and should not include any individual identifiers. If individual identifiers were included, they were excluded from the present study even though they were available in the public domain. In addition, no interviews were conducted for this case study; therefore, Institutional Review Board (IRB) approval was not required.

Table 2. Inclusion Criteria for Data Collection of Documents	
Documents must discuss at least one of the following:	
Uranium	Production on tribal lands
Uranium mining/processing	Waste on tribal lands
Radiation	Green-state-corporate crime
Environmental effects of uranium mining	Human rights
Health effects associated with uranium mining	Genocide
Location of uranium mines	Ecocide
Native Americans	Toxic Colonialism

A comprehensive list of the documents is provided in Table 3. This table provides an inventory of each document reviewed for data collection. Here, the title of the documents, the sources from where they were obtained, and the rationale for inclusion in the analysis are highlighted.

Data Analysis Process

Qualitative research is a creative process that involves a continuous interplay between data collection and data analysis (Denzin & Lincoln, 2000; Strauss & Corbin, 1998). Here, data analysis is the process of making meaning from the data collected. Since case studies are qualitative in nature, they require an interpretive analysis of the data. Creswell (2005, p.185-189) identified six steps for analyzing qualitative data: (1) organize and prepare the data for analysis; (2) read through the data; (3) code the data, if necessary; (4) generate descriptions and

Table 3. Document Inventory			
Document Resource	**Document Title**	**Source**	**Rationale for Inclusion**
Abandoned Mines	About Uranium Mines	https://www.abandonedmines.gov/about_uranium_mines	Information about Uranium mines; cleanup efforts, cost, priorities, case studies, images, maps
Agency for Toxic Substances and Disease Registry (ATSDR)	Natural & Depleted Uranium - ToxFAQs™	https://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=439&tid=77	Factsheet with answers to most frequently asked questions about uranium exposure and its effect on human health
Agency for Toxic Substances and Disease Registry (ATSDR)	Support Document to the 2017 Substance Priority List (Candidates for Toxicological Profiles), 08/2017	https://www.atsdr.cdc.gov/	Determination of frequency, toxicity, and exposure
Amnesty International/ Greenpeace Netherlands	The Toxic Truth, 09/2012	https://www.greenpeace.org/international/publication/7245/the-toxic-truth/	Corporate crime, human rights abuse, and governments' failure to protect people and the environment
EcoFlight	Utah – White Mesa Uranium Mill	http://ecoflight.org/issues/detail/Utah---White-Mesa-Uranium-Mill/	Information about the White Mesa Uranium Mill
EPA	Environmental Radiation Protection Standards for Nuclear Power Operations, 01/1977	https://www.epa.gov/sites/production/files/2015-08/documents/190.pdf	Summary of Rule 40 CFR Part 190 that limits the releases of radiation
EPA	Evaluation of EPA's Guidelines for Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM), 06/2000	https://www.epa.gov/sites/production/files/2015-04/documents/402-r-00-001.pdf	Technical report reviewing the guidelines for TENORM

Table 3 (Continued)			
Document Resource	**Document Title**	**Source**	**Rationale for Inclusion**
EPA	Federal Guidance Report No. 13: Cancer Risk Coefficients for Environmental Exposure to Radionuclides, 1999	https://www.epa.gov/radiation/federal-guidance-report-no-13-cancer-risk-coefficients-environmental-exposure	Radiogenic cancer risk coefficients for the U.S. population based
EPA	Federal Guidance Report No. 15: External Exposure to Radionuclides in Air, Water, and Soil, 2018	https://www.epa.gov/radiation/federal-guidance-report-no-15-external-exposure-radionuclides-air-water-and-soil	Updates and expands the 1993 version – tabulates age-specific reference person effective dose rate coefficients for 1,252 radionuclides based on external exposure
EPA	Policy on Environmental Justice for Working with Federally Recognized Tribes and Indigenous Peoples, 07/2014	www.epa.gov/environmentaljustice/	Environmental Justice Principles
EPA	Potential for Radiation Contamination Associated with Mineral and Resource Extraction Industries, 2003	https://www.epa.gov/sites/production/files/2015-04/documents/mineguide.pdf	Memorandum to Regional Radiation Contacts, Regional Superfund Staff, National Hard Rock Mining Staff, and On-Scene Coordinators
EPA	Radiation Protection	https://www.epa.gov/radiation/radiation-regulations-and-laws	Radiation regulations and laws
EPA	Radioactive Waste from Uranium Mining and Milling	https://www.epa.gov/radtown/radioactive-waste-uranium-mining-and-milling	Information about radioactive waste from Uranium mining and milling and what you can do to limit exposure
EPA	RadTown	https://www.epa.gov/radtown	Information on depleted uranium

Table 3 (Continued)			
Document Resource	**Document Title**	**Source**	**Rationale for Inclusion**
EPA	Section 313 of the Emergency Planning and Community Right-to-Know Act, 01/1999	https://www.epa.gov/epcra	Reporting requirements for facilities and threshold determinations of chemicals
EPA	Technical Report on TENORM from Uranium Mining Volume 1: Mining and Reclamation Background, 04/2008	https://www.epa.gov/sites/production/files/2015-05/documents/402-r-08-005-v1.pdf	Report about Uranium mining and extraction facility reclamation
EPA	Technical Report on TENORM from Uranium Mining Volume 2: Investigation of Potential Health, Geographic, and Environmental Issues of Abandoned Uranium Mines, 04/2008	https://www.epa.gov/sites/production/files/2015-05/documents/402-r-08-005-v2.pdf	Geographic analysis on the location of Uranium mines, cancer risks from on-site exposure, risk from Uranium mining waste, potential ecological impacts from Uranium mines
EPA	Uranium and Radiation on the Navajo Nation: Basics, 12/2014	https://www.epa.gov/navajo-nation-uranium-cleanup/health-effects-uranium	Quick facts about uranium, health effects, and why it is a problem on Navajo Nation
EPA	Uranium and Radiation on the Navajo Nation: Reduce Your Contact, 12/2014	https://www.epa.gov/navajo-nation-uranium-cleanup/health-effects-uranium	Steps to take to reduce exposure to radiation
EPA	Uranium and Radiation on the Navajo Nation: Your Health, 12/2014	https://www.epa.gov/navajo-nation-uranium-cleanup/health-effects-uranium	Chemical and radiological effects on the body from Uranium

Table 3 (Continued)			
Document Resource	**Document Title**	**Source**	**Rationale for Inclusion**
EPA	Uranium Location Database Compilation, 08/2006	https://www.epa.gov/radiation/uranium-mines-and-mills-location-database-0	Technical report that examines the potential hazards of wastes generated by uranium mining and processing
Grand Canyon Trust	Active Mining Claims within the Grand Canyon Withdrawal Area	https://www.grandcanyontrust.org/sites/default/files/maps/resources/gc-grand-canyon-withdrawal-active-claims-march2018.pdf	Map
Grand Canyon Trust	Radioactive Waste Shipments Approved for White Mesa Mill: 1993-2018	https://www.grandcanyontrust.org/white-mesa-uranium-mill	Map
Grand Canyon Trust	Uranium	https://www.grandcanyontrust.org/colorado-plateau-uranium	Information about Uranium and Uranium mining
Grand Canyon Trust	White Mesa Uranium Mill	https://www.grandcanyontrust.org/white-mesa-uranium-mill	Information about the White Mesa Uranium Mill
Greater Grand Canyon Heritage National Monument	Proposed Greater Grand Canyon Heritage National Monument: A Landscape Deserving Protection	https://www.greatergrandcanyon.org/explore-the-area/	Map
Greenpeace	The Toxic Threat to Indian Lands, 1991	https://www.ejnet.org/ej/toxicthreattoindianlands.pdf	Exploitation of tribal lands
Idaho Department of Health and Welfare	Uranium in Your Well Water	http://www.cdhd.idaho.gov/pdfs/eh/Water%20Quality/Uranium_Labs_.pdf	Uranium in well water: associated health concerns, testing, removal efforts, and maintaining water systems

Table 3 (Continued)			
Document Resource	**Document Title**	**Source**	**Rationale for Inclusion**
Navy and Marine Corps Public Health Center	Depleted Uranium (DU)	https://www.med.navy.mil/sites/nmcphc/Documents/environmental-programs/risk-communication/posters/DU.pdf	Factsheet on sources and uses of depleted uranium (DU), and its associated health risks due to radiation and chemical exposure
New Mexico Environmental Department of Health	Understanding Exposure and Health Effects: Uranium and Human Health, 11/2016	https://nmtracking.org/view/pdf/about/resources/publications/Uranium_and_Human_Health.pdf	Addresses sources of exposure in soil and water in New Mexico, as well as associated health effects, and actions to take if exposure has occurred
Protect Your Canyon	Protect Your Canyon from Uranium Mining	https://protectyourcanyon.org/native-american-impact/	Video
Protect Your Canyon	Uranium Mining Near the Grand Canyon Position Paper and Fact Sheet	https://protectyourcanyon.org/uranium-mining-near-the-grand-canyon-position-paper-and-fact-sheet/	Risks of Uranium mining near the Grand Canyon
The Journal	Protestors march to White Mesa uranium mill, 05/2019	https://the-journal.com/articles/139099	Article about protests at the White Mesa Uranium Mill
The Journal	White Mesa Mill accepts Cherokee Nation radioactive waste, 12/2018	https://the-journal.com/articles/120721	Article about the transfer of radioactive waste from Cherokee Nation to the White Mesa Mill
The Salt Lake Tribune	The water around a Utah uranium mill is growing more polluted. What does it mean for the nearby town?, 10/2018	https://www.sltrib.com/news/environment/2018/10/21/ute-tribal-members-living/	Ponds surrounding the White Mesa Uranium Mills contain radium waste and are emitting radon gas
Tox Town	Uranium	https://toxtown.nlm.nih.gov/chemicals-and-contaminants/uranium	Information about Uranium and risks associated of Uranium exposure

Table 3 (Continued)			
Document Resource	**Document Title**	**Source**	**Rationale for Inclusion**
University of Arizona	Superfund Research Program	https://superfund.arizona.edu/hazards-emphasized#Mine%20Tailings	Hazards associated with Uranium mine tailings
U.S. Department of Energy	Defense-Related Uranium Mines Report to Congress, 08/2014	https://www.energy.gov/sites/prod/files/2014/09/f18/Defense-RelatedUraniumMinesReporttoCongress-FINAL.pdf	Location of defense-related abandoned uranium mines, extent of radiation hazards, environmental degradation, status of mine reclamation and remediation efforts
U.S. Department of Energy	Defense-Related Uranium Mines FY 2017, Annual Report, 09/2017	https://www.energy.gov/sites/prod/files/2018/08/f55/2017_DRUM_Annual_Report_1.pdf	Risk scoring assessment of 113 mines on federal public land in CO and UT
U.S. Department of Energy	Defense-Related Uranium Mines Program Fact Sheet, 09/2017	https://www.energy.gov/sites/prod/files/2017/10/f37/DRUM_Fact_Sheet.pdf	DRUM program overview
U.S. Department of Energy	Department of Energy Office of Legacy Management Progress on Defense-Related Uranium Mines Program, 03/2018	https://www.energy.gov/sites/prod/files/2018/07/f53/WMS%20DRUM%20Paper.pdf	Conference report on the management progress of DRUM
WISE Uranium Project	Issues at White Mesa uranium mill (Utah), 05/2019	https://www.wise-uranium.org/umopwm.html	Production, compliance, and protests at the White Mesa Uranium Mill
Zender	Hazardous Waste Sites on Tribal Lands, 08/2004	http://www.zendergroup.org/docs/hazsites.pdf	Summary of results from the Tribal Hazardous Waste Sites Project

categories for analysis; (5) demonstrate how the descriptions and categories will be represented in the qualitative narrative; and (6) interpret the meaning of the data.

This dissertation applies these six steps to the data being collected in order to provide a straightforward analytic procedure. Step 1: As demonstrated in Table 3, data came from multiple sources and each document for review was cataloged for easier analysis. Step 2: As documents were collected, they were briefly reviewed to identify themes and confirm appropriateness for inclusion in the analysis. Step 3: Coding was not necessary for this study; however, the data were separated into categories based on their content. Step 4: The categories generated include Environmental Impacts, Health Effects, Ecological Impacts for Native Americans, and Ecocide-Genocide for Native Americans. Here, the data can be easily associated with the respective research question(s) to which they apply. For instance, the data in the Health Effects category are used for research question two, which inquires how exposure to uranium affects human health. Step 5: A table will be created to demonstrate how each document was used for the research inquiries. To be clear, this new table will provide each document listed in Table 3 and its relevance to one or more of the research questions. In addition, subsequent tables will be created for the reader to easily interpret the results of the analysis. For example, the health effects associated with uranium mining will be presented in a table and further expanded upon in the text. These tables will be presented in the following chapter. Step 6: Following the categorization and analysis of the data, the results will be thoroughly discussed. Here, inferences will be made regarding the research questions.

As discussed above, four categories were generated for easier analysis of the collected documents: Environmental Impacts, Health Effects, Ecological Impacts for Native Americans, and Ecocide-Genocide for Native Americans. Using these categories, the author was able to determine which of the collected documents (shown in Table 3) contained evidentiary information for answering the research questions. In doing so, exclusion criteria were also identified. Documents were excluded if they did not include information pertaining to one of the four categories. For example, if a document did not contain any information about the environmental impacts of uranium mining, the health effects associated with uranium mining, the ecological impacts of uranium mining for Native Americans, or examples of how uranium mining perpetuates the ecocide-genocide nexus for Native Americans, it was excluded from the sample. This resulted in the exclusion of seven of the 43 inventoried documents. Table 4 shows the documents that were retained for analysis and the specific research question(s) the evidentiary data from the documents were used to answer.

Table 4. Document Relevance to Research Questions

Document Resource	Document Title	Research Question(s)
Abandoned Mines	About Uranium Mines	1, 2, 3, 4
Agency for Toxic Substances and Disease Registry (ATSDR)	Natural & Depleted Uranium - ToxFAQs™	1, 2
Agency for Toxic Substances and Disease Registry (ATSDR)	Support Document to the 2017 Substance Priority List (Candidates for Toxicological Profiles), 08/2017	1
EcoFlight	Utah – White Mesa Uranium Mill	1, 2, 3, 4
EPA	Environmental Radiation Protection Standards for Nuclear Power Operations, 01/1977	1
EPA	Evaluation of EPA's Guidelines for Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM), 06/2000	1

Table 4 (Continued)		
Document Resource	**Document Title**	**Research Question(s)**
EPA	Federal Guidance Report No. 13: Cancer Risk Coefficients for Environmental Exposure to Radionuclides, 1999	2, 4
EPA	Federal Guidance Report No. 15: External Exposure to Radionuclides in Air, Water, and Soil, 2018	2, 4
EPA	Potential for Radiation Contamination Associated with Mineral and Resource Extraction Industries, 2003	1, 2, 3, 4
EPA	Radiation Protection	1, 2
EPA	Radioactive Waste from Uranium Mining and Milling	1, 2, 3, 4
EPA	RadTown	1, 2, 3, 4
EPA	Section 313 of the Emergency Planning and Community Right-to-Know Act, 01/1999	2, 3
EPA	Technical Report on TENORM from Uranium Mining Volume 1: Mining and Reclamation Background, 04/2008	1
EPA	Technical Report on TENORM from Uranium Mining Volume 2: Investigation of Potential Health, Geographic, and Environmental Issues of Abandoned Uranium Mines, 04/2008	1, 2, 3
EPA	Uranium and Radiation on the Navajo Nation: Basics, 12/2014	3, 4
EPA	Uranium and Radiation on the Navajo Nation: Reduce Your Contact, 12/2014	2, 3, 4
EPA	Uranium and Radiation on the Navajo Nation: Your Health, 12/2014	2, 3, 4
EPA	Uranium Location Database Compilation, 08/2006	1, 3
Grand Canyon Trust	Radioactive Waste Shipments Approved for White Mesa Mill: 1993-2018	1, 3, 4

Table 4 (Continued)		
Document Resource	**Document Title**	**Research Question(s)**
Grand Canyon Trust	Uranium	1
Grand Canyon Trust	White Mesa Uranium Mill	1, 3, 4
Greenpeace	The Toxic Threat to Indian Lands, 1991	3, 4
Idaho Department of Health and Welfare	Uranium in Your Well Water	2, 3
Navy and Marine Corps Public Health Center	Depleted Uranium (DU)	1
New Mexico Environmental Department of Health	Understanding Exposure and Health Effects: Uranium and Human Health, 11/2016	2
Protect Your Canyon	Uranium Mining Near the Grand Canyon Position Paper and Fact Sheet	1, 3
The Journal	Protestors march to White Mesa uranium mill, 05/2019	3, 4
The Journal	White Mesa Mill accepts Cherokee Nation radioactive waste, 12/2018	3, 4
The Salt Lake Tribune	The water around a Utah uranium mill is growing more polluted. What does it mean for the nearby town?, 10/2018	2, 3, 4
Tox Town	Uranium	1
University of Arizona	Superfund Research Program	1
U.S. Department of Energy	Defense-Related Uranium Mines Report to Congress, 08/2014	1, 2
U.S. Department of Energy	Defense-Related Uranium Mines Program Fact Sheet, 09/2017	1, 2
WISE Uranium Project	Issues at White Mesa uranium mill (Utah), 05/2019	1, 3
Zender	Hazardous Waste Sites on Tribal Lands, 08/2004	2, 3, 4

Next, data (evidentiary information) was pulled from the documents and sorted by topic. This allowed the author to synthesize the information to be used for answering the research inquiries. For instance, topics for research question one included water pollution, air pollution, soil disturbance and contamination, and plant and animal contamination. Once the author felt data saturation was met for each research question, the results were outlined and written. However, when additional information was required to meet saturation, the data collection and analysis process was repeated. This resulted in the acquisition of 15 additional documents. These documents are displayed in Table 5.

Summary

This chapter outlined the methods used in this dissertation to answer the proposed research questions. The collection and analysis of data from a variety of sources allows for an unbiased look at uranium mining. In particular, the data allowed the author to observe and report the ecological effects of uranium mining and its impact on Native Americans who share their land with uranium mines and mills. A presentation of the findings for the research questions are found in Chapter Five and a discussion of the findings will be provided in Chapter Six.

Table 5. Additional Documents for Saturation

Document Resource	**Document Title**	**Source**	**Research Question(s)**
Center for Public Integrity	While ‘Zombie’ Mines Idle, Cleanup and Workers Suffer in Limbo	https://publicintegrity.org/environment/while-zombie-mines-idle-cleanup-and-workers-suffer-in-limbo/	4
Earthworks	Mount Taylor	https://earthworks.org/stories/mount_taylor/	4
EPA	Summary Report of Radiation Surveys Performed in Selected Communities	Technical Report on TENORM from Uranium Mining Volume 2: Investigation of Potential Health, Geographic, and Environmental Issues of Abandoned Uranium Mines, 04/2008	2
Federal Geographic Data Committee	Map of Native American Reservations Located on the Colorado Plateau	https://www.fgdc.gov/grants/2005CAP/projects/05HQAG0140_map/view	3
Federation of American Scientists	Uranium Mining and the U.S. Nuclear Weapons Program	https://fas.org/pir-pubs/uranium-mining-u-s-nuclear-weapons-program-3/	4
International Agency for Research on Cancer	Ionizing Radiation, Part 2: Some Internally Deposited Radionuclides	World Health Organization	2
International Commission on Radiological Protection	2005 Annual Report of the International Commission on Radiological Protection	http://www.icrp.org/docs/2005_Annual_Rep_92_380_06.pdf	1
International Journal of Environmental Research and Public Health	Traditional sheep consumption by Navajo people in Cameron, Arizona	https://doi.org/10.3390/ijerph16214195	3

Table 5 (Continued)			
Document Resource	**Document Title**	**Source**	**Research Question(s)**
Johansen, B.	Resource Exploitation in Native North American: A Plague upon the Peoples	Book	3, 4
National Institute of Environmental Health Sciences	Tommy Rock – Exposing Years of Uranium Water Contamination in a Navajo Community	https://www.niehs.nih.gov/research/supported/translational/peph/grantee-highlights/2017/tommy_rock_exposing_years_of_uranium_water_contamination_in_a_navajo_community.cfm	3
National Research Council	Uranium Mining in Virginia: Scientific, Technical, Environmental, Human Health and Safety, and Regulatory Aspects of Uranium Mining and Processing in Virginia	https://doi.org/10.17226/13266	1, 2, 3
OSHA	OSHA Occupational Chemical Database	https://www.osha.gov/chemicaldata/	2
U.S. Energy Information Administration	Domestic Uranium Production Report - Annual	https://www.eia.gov/uranium/production/annual/	4
U.S. Government Accountability Office	Superfund: EPA Should Improve the Reliability of Data on National Priorities List Sites Affecting Indian Tribes	https://www.gao.gov/products/GAO-19-123	1, 3
VICE	Church Rock, America's Forgotten Nuclear Disaster, is still Poisoning Navajo Lands 40 Years Later	https://www.vice.com/en_us/article/ne8w4x/church-rock-americas-forgotten-nuclear-disaster-is-still-poisoning-navajo-lands-40-years-later	1, 2, 3

CHAPTER FIVE:

URANIUM MINES, MILLS, AND WASTE: IMPACTS ON THE ENVIRONMENT AND ITS IMPLICATIONS FOR NATIVE AMERICANS

This chapter presents the results of the analysis of this dissertation's research questions. However, before the research inquiries can be explained, this chapter discusses uranium mining and chronicles its production and uses from past to present. In doing so, the author provides the foundation for this study's objective of examining how uranium mining is part of the form of toxic colonialism Native Americans face.

Uranium

This dissertation argues that uranium mining is a form of toxic colonialism and has genocidal impacts for Native Americans. In order to understand how uranium mining adversely impacts Native Americans, it is important to discuss what uranium is, the industrial uses of uranium, and how the process of mining for and extracting uranium impacts the environment and human health.

Physical Nature and Industrial Uses of Uranium

Uranium is a naturally occurring element found in most rocks on Earth, and traces of uranium occur in plants, animals, soil, and water (EPA, 2008a). Uranium is ubiquitous in nature, and many of its natural occurrences can present radiation hazards, even when undisturbed by human activities, categorizing uranium as a naturally occurring radioactive material (NORM)

(EPA, 2008a). Further, wind and water erosion can redistribute uranium in the environment. Radon, a radioactive gas, forms from the decay of uranium in rocks and soil (ToxTown, 2017). When uranium or other NORM have been processed as a result of human activities (e.g., extraction), they are categorized as technologically enhanced naturally occurring radioactive material (TENORM), meaning that the properties of the radioactive material have been altered or disturbed, which increases the potential for environmental and human exposures (EPA, 2008a).

Natural uranium exists as three different isotopes: U-234, U-235, and U-238, and all three isotopes are radioactive to varying degrees. Almost all naturally occurring uranium (over 99%) is U-238 and is the least radioactive (ATDSR, 2013). Uranium is most radioactive when it is enriched; a process that separates the three isotopes to increase the concentration of U-235 relative to U-238. As a result, this process increases the fissionability of the element, meaning its nucleus can be split, releasing vast amounts of energy (EPA, 2008a). In addition, the enrichment process produces large amounts of remnant, known as depleted uranium. Depleted uranium is almost entirely made up of U-238 and is weakly radioactive with poor fission properties, limiting its uses (U.S. DOE, 2014).

The primary uses of uranium have been in the production of nuclear weapons and generation of electric power during World War II following the realization that uranium was fissionable (EPA, 2008a). However, a functional uranium-based atom bomb requires a high concentration of U-235, resulting in the need for more enriched uranium. While enriched uranium is also needed to produce nuclear energy, it does not require as much enrichment as the atom bomb (3% versus 90%) (EPA, 2008a, p. 1-7). Depleted uranium is most commonly used for military vehicle armor, military projectiles (that can penetrate armored tanks), and as counterweights on helicopter and airplane control surfaces and rotors. Uranium is also used in nuclear medicine to produce high-energy X-rays and as shielding from gamma radiation (ATDSR, 2013; EPA, 2008a).

Geological Distribution of Uranium

The chemical properties and large ionic size of uranium result in its concentration in particular rock types, primarily silica-rich magmas such as rhyolites and granites (Burns & Finch, 1999; EPA, 2008a). Uranium of economic interest is found in the ore body of four main types of geologic deposits: sandstone deposits, vein deposits, phosphate deposits, and disseminated deposits (EPA, 2008a, p. 1-8-1-9). There must be sufficient concentration of uranium in the ore body to be considered recoverable for economic purposes. In the U.S., sandstone deposits are the main source of uranium, with over 95% of reserves and production (EPA, 2008a). Sandstones deposits in the U.S. are primarily found in the Colorado Plateau, Wyoming Basin, Nebraska, and the Texas Coastal Plain. Vein deposits typically occur when uranium is mineralized and accumulated in cavities or other porous openings in or near geological structures, such as faults or fractures in the Earth's crust (EPA, 2008a). The primary source of uranium in phosphate deposits occurs in sedimentary marine phosphorite, with approximately 4 million tons of extractable uranium in U.S. phosphate deposits, making it a potentially significant source of uranium (EPA, 2008a, p. 1-9). Lastly, disseminated deposits are typically associated with granites, and are mostly found near Spokane, Washington, and Bokan Mountain in Alaska (EPA, 2008a).

Uranium Production

The search for uranium began in the late 1940s following the establishment of the Atomic Energy Commission (AEC) under the Atomic Energy Act (AEA) of 1946 (EPA, 2008a). As the designated sole purchasing agent of domestically produced uranium, the AEC announced financial incentives in 1948 and 1949 in an effort to increase the domestic uranium industry. In 1950, uranium ore was discovered by a member of Navajo Nation, which led to the subsequent mining boom in the Southwest U.S. Throughout the 1950s, demand for uranium was generated by the U.S. nuclear weapons program, which purchased more than 100 million tons of ore by the 1970s – half of which was produced domestically in the Colorado Plateau (Alvarez, 2013; EPA, 2008a). Due to the geologic forms of uranium ore bodies in the Colorado Plateau, thousands of small mines were developed in the region.

Figure 2 shows the general location of uranium mines within the Colorado Plateau – which includes parts of Utah, Arizona, New Mexico, and Colorado. This map provides a general overview of the geographic distribution of uranium mines in the Southwest U.S.; however, it does not include all known uranium mines in the region (EPA, 2008a). The majority of uranium production in this region stopped with the end of the AEC buying program in 1970 when hundreds of small mines were mined out or no longer considered economical and were then abandoned (EPA, 2008a).

The mid 1970s and early 1980s saw a revitalization of the uranium industry with the development of the nuclear power industry, resulting in the prices and production of uranium to increase. Shortly after the uranium industry peaked in the early 1980s, domestic demand for uranium fell due to the global dominance of lower-cost Canadian and Australian deposits (EPA, 2008a). Prices of domestic uranium were reduced, and the industry switched to lower-cost production sites. However, many mines were considered unprofitable during this time due to the high costs associated with heavy metal and TENORM waste management and mine site restoration, resulting in several hundreds of mines being abandoned (EPA, 2008a).

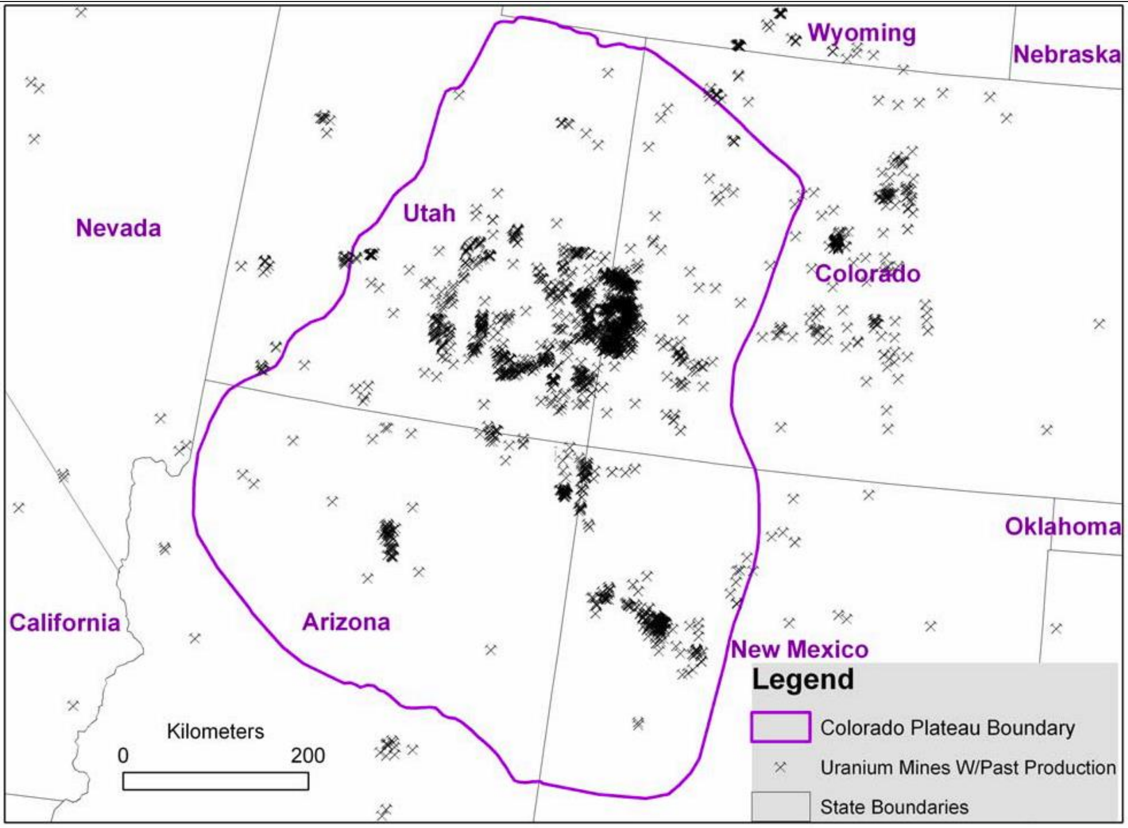

Figure 2. U.S. Geographic Areas Rich in Uranium

Source: Technical Report on Technologically Enhanced Naturally Occurring Radioactive Materials from Uranium Mining Volume 1. EPA, 2008a

The demand for uranium in the U.S. remained low throughout the 1980s and into the early 2000s, when the demand shifted once again. However, due to the limited number of operating mines that remained in the U.S. at the time, the price per pound drastically increased from $8 in 2000 to $40 in 2004, and several conventional mine sites reopened as a result (EPA, 2008a, p. 2-12). As of 2008, the U.S. remained one of the top eight uranium producing countries (also, Canada, Australia, Russia, Niger, Namibia, Kazakhstan, and Uzbekistan) and the demand and prices for uranium increased with nuclear energy emerging in China, India, and Russia. The demand and prices of uranium remained high until 2011 when an earthquake caused a tsunami that resulted in a nuclear accident at the Fukushima Daiichi plant in Japan (WNA, 2018). Demand and prices have slowly declined since the accident and remain unchanged. However, this could be altered by future reliance on nuclear power as fossil fuel resources continue to diminish (Environment News, 2020).

Uranium Mining and Extraction Process

With the changing trends in the uranium industry from the 1940s to the 2000s, the U.S. saw new methods for mining, which relied on chemical means for extracting uranium ore (e.g., heap leaching and *in situ* leaching (ISL)); however, most uranium was mined using conventional (physical) methods, such as open-pit (surface) mining and underground mining (EPA, 2008a; USNRC, 2011). The physical characteristics, location, and orientation of the ore body (i.e., deposit) are used to determine which extraction method and plan are most cost-effective and efficient for recovering and developing an ore body. For example, when ore deposits are located at or near the surface, the best method is open-pit mining. If there are deeper deposits, underground mining is used. More recently, however, chemical mining methods – specifically, ISL – replaced conventional methods due to lower associated costs and less surface disturbance (EPA, 2008a).

Open-pit (surface) mining. Open-pit mining is an open excavation involving the removal of topsoil and overburden (the material between the topsoil and uranium deposit) to recover shallow mineral deposits (EPA, 2008a). Overburden and protore – sub-economic mined uranium ore – are stockpiled at the mine sites for later site restoration. Due to the large size of the mine opening, equipment (e.g., trucks and shovels) size is not restricted as with other mining methods, allowing for faster production. Open-pit mining generally produces thousands of tons of ore per day, with lower costs per ton (EPA, 2008a; NRC, 2012). In addition, there is sufficient air flow with open-pit mines, thus ventilation systems are not required as with underground mining (NRC, 2012). Once ore is extracted, it is transported to a mill for processing into "yellowcake" – the final uranium product (NRC, 2012, p.106).

Underground mining. Underground mines can be an extension of an open-pit mine site or can be used individually to recover deeper uranium ore deposits (EPA, 2008a; NRC, 2012). These mines are generally smaller operations, producing less than 100 tons of ore per day, due to equipment size restrictions. In addition, underground mining requires ground control – the prevention of rock collapse – and an extensive ventilation system to provide miners fresh air and reduce exposure to hazardous components (NRC, 2012). As with open-pit mining, the extracted uranium ore is stockpiled at the mine site until it is transported to a processing mill.

Heap leaching. Heap leaching was an experimental extraction technique mostly used in the 1970s and 1980s (EPA, 2008a). This technique involved a leach solution sprayed on a mound (or heap) of crushed ore, which mobilized the uranium into a solution that was collected at the base of the mound (EPA, 2008a). Once the uranium solution was collected, it was sent to a mill where the uranium was extracted and turned into yellowcake (EPA, 2008a).

***In situ* leaching (ISL).** *In situ* leaching is another type of solution mining that is used for ore extraction when the ore is too deep to be recovered using conventional mining methods (EPA, 2008a). This method involves leaching the uranium ores underground through injection wells and does not require the physical extraction of the ore like the other methods. Similar to heap leaching, the solution that is injected into the ore body mobilizes the uranium into a solution which is then pumped to the surface through production wells for collection (EPA, 2008a). After the solution is collected, it is sent to a mill for processing.

Uranium Milling

Mills process uranium ore that has been extracted by conventional mining methods or has been collected by other techniques. Conventional milling involves grinding the ore to reduce its size and then adding water to create slurry – a mixture of the fine ore particles and water (EPA, 2008a). The slurry is mixed with lixiviant (a solvent solution) which releases the uranium for recovery. Once the uranium is recovered, it is produced into yellowcake (uranium oxide concentrate, U_3O_8) and then dried for packaging in approved drums that can hold up to 500kg of yellowcake (EPA, 2008a; NRC, 2012). Here, the yellowcake product is shipped only to licensed facilities for distribution.

Uranium Waste

Conventional mining, chemical extraction, and milling generate waste considered to be TENORM, such as overburden, protore, waste rock, liquid waste, and mill tailings (EPA, 2008a; NRC, 2012). Compared to other types of mineral mining, uranium mining, milling, and refining produces the greatest volumes of radioactive waste (Ewing, 1999). The amount of waste production and its environmental impacts depends on the mining operation. For example, open-pit mines generally result in hundreds of acres of disturbed areas covered in overburden and unclaimed protore that is sometimes used to backfill mined-out areas for later site reclamation. Underground mines generally produce 50 acres or less of waste rock that are stockpiled at the entry site of the mine; however, these types of mines may have tunnels that extend for several miles in multiple directions. Conversely, ISL methods produce minimal solid waste, and instead generate large volumes of liquid waste that requires deep wells and evaporation ponds, or shipping to licensed waste disposal facilities (EPA, 2008a; USNRC, 2011). Waste generated from the milling process is disposed of in tailings impoundments (EPA, 2008a, NRC, 2012).

When production ceases, mines and mills become abandoned, and large amounts of TENORM waste remains at the original mining location or is stored at nearby waste disposal pits/sites (EPA, 2008a). Here, waste becomes eroded over time from water and wind and can be carried away, leading to the spread of toxins throughout the environment, especially in arid and semi-arid areas such as the Southwest U.S. (University of Arizona, 2019). Water erosion (from precipitation) of mining waste produces runoff that can infill open-pit mines, resulting in large, contaminated pit lakes. For example, the Yazzie-312 Uranium Mine on the Navajo Reservation in Arizona contained a water-filled open-pit lake with high contamination levels from uranium, radium, arsenic, beryllium, chromium, manganese, iron, and lead (EPA, 2008a). This same pit lake had been used for recreational swimming and livestock watering by the Navajo (EPA, 2008a).

In addition, water erosion can lead to contaminated surface-water and groundwater, although this depends on several factors, such as precipitation rates, evaporation rates, and proximity to aquifers (EPA, 2008a). For instance, the Colorado Plateau has low precipitation and high evaporation, reducing potential contamination for open-pit operations. However, deep underground mines in the same region could result in radionuclides in the aquifer. Runoff from Orphan Mine located on the south rim of the Grand Canyon contaminated nearby Horn Creek, resulting in maximum contaminant levels of alpha radiation in the water (EPA, 2008a).

Moreover, wind dispersion can carry and spread dust particles from waste. The size of the dust particle affects its dispersion and suspension in the atmosphere and its effects on human health (University of Arizona, 2019). For example, dust particles that are smaller in size will stay airborne longer, can more deeply penetrate the respiratory system, and can more easily be transferred directly into the blood stream compared to larger, coarse particles (University of Arizona, 2019).

According to the EPA Uranium Location Database (ULD), the majority (over 80%) of uranium mines are located on federal or tribal lands (Figure 3). Approximately 20% of those mines are located on or within six miles of tribal land, yet Reservations encompass about 6% of the land in the Western U.S. (Lewis, Hoover, & MacKenzie, 2017). In addition, there are over 280,000 tribal residents within six miles of a recorded uranium mine considered at risk for exposure (EPA, 2006; 2008b; Lewis et al., 2017).

Uranium Regulation

In order to ensure protection of people and the environment, mining and milling operations and waste disposal are regulated by radiation protection standards developed by the Federal Radiation Council (FRC) (EPA, 2008a). With the establishment of the EPA in 1970, the role of developing standards was transferred from the FRC to the EPA, and the EPA became responsible for regulating radioactive materials including TENORM. The EPA regulates emissions and pollutants from radioactive materials through its authority under several environmental Acts, such as the Clean Air Act (CAA), Clean Water Act (CWA), and Safe Drinking Water Act (SDWA). In addition, the EPA is charged with tracking (Toxic Substances Control Act (TSCA)) and controlling (Resource Conservation and Recovery Act (RCRA)) hazardous waste as well as removal and cleanup of contaminated sites (Superfund Act) (EPA, 2008a).

Conventional uranium mining operations are regulated by the Office of Surface Mining (OSM) in the Department of the Interior (DOI), which was created by the Surface Mining Control and Reclamation Act (SMCRA) (EPA, 2008a). This Act also established the

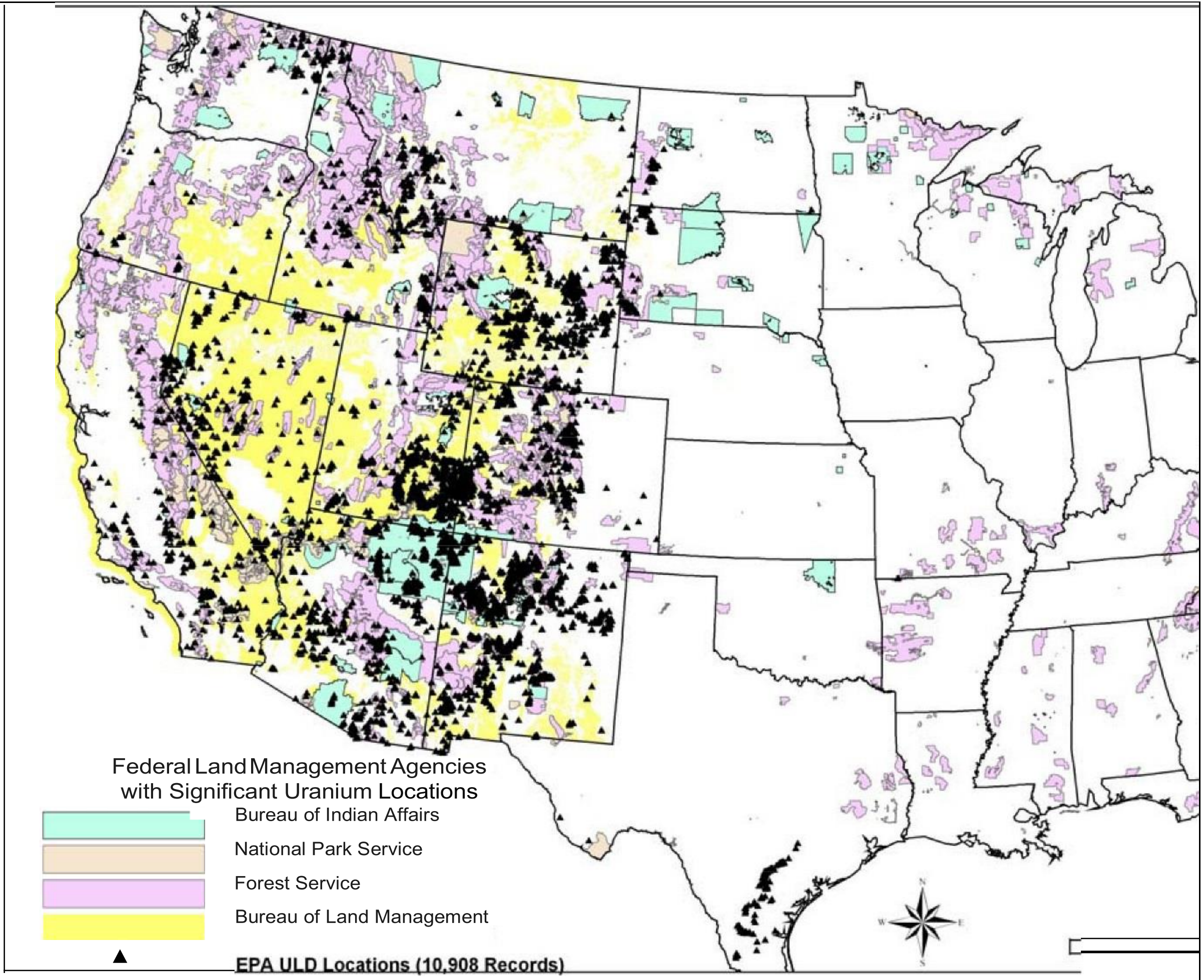

Figure 3. Uranium Locations from EPA Uranium Location Database

Source: Technical Report on Technologically Enhanced Naturally Occurring Radioactive Materials from Uranium Mining Volume 2. EPA, 2008b

Abandoned Mine Land (AML) program for the restoration of abandoned mine sites. Source materials generated by uranium mills and ISL operations are regulated by the Nuclear Regulatory Commission (NRC) under the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (USNRC, 2011). The NRC is also responsible for licensing mills and ISL facilities to ensure the safety of the environment and public health (EPA, 2008a).

Despite the several regulatory Acts and agencies in place, uranium mines, mills, and disposal sites continue to adversely impact the environment and human health. The following sections detail how uranium mining affects the environment and generates health risks for people who are exposed to uranium waste and abandoned uranium mine sites. In particular, the environmental effects and health risks associated with uranium mining are discussed with respect to Native Americans. Here, evidence will demonstrate that uranium mining is a form of toxic colonialism that Native Americans face.

Research Inquiries and Results from the Data Analysis

This part of the dissertation displays the results of the analysis of the research questions. The following sections restate each research question and provide results from the multiple sources analyzed. A summary of the findings and discussion demonstrating how uranium mining is a part of the form of toxic colonialism that Native Americans face is presented in the subsequent chapter.

Research Question 1

The first research question explored how the environment is impacted by uranium mining. In doing so, it was revealed that there are several environmental impacts associated with uranium mining and processing operations. Table 6 shows a brief summary of these environmental impacts. Although uranium is a naturally occurring element and traces are present in water, air, soil, plants, and animals, the radiation levels are minimal. However, when uranium is mined and processed, it generates large amounts of waste considered to be TENORM. In addition, there are several metals associated with uranium mining that can cause additional adverse effects depending on their concentration (EPA, 2008b). For instance, metals such as lead, copper, selenium, and the carcinogen, arsenic, have been noted in some abandoned uranium mine sites and can contribute to the contamination of water, air, soil, plants, and animals (EPA, 2008b).

Table 6. Environmental Impacts Associated with Uranium Mining and Processing Operations.

Water pollution	Plant and animal contamination
Air pollution	Abandoned mines and mill tailing sites
Soil disturbance and contamination	Failure of tailings dams

As previously mentioned, waste that is stockpiled and unreclaimed at mining sites during excavation erodes over time and can be spread throughout the environment from precipitation and wind. Runoff from precipitation can transport waste materials into on-site or off-site surface water and can also result in the leaching of waste materials into the ground and groundwater aquifer (EPA, 2008b). In addition, the dewatering process – removing groundwater from the mine – can affect surface water if the groundwater discharge is not treated, since the composition of the groundwater reflects the composition of the host rock (NRC, 2012). For example, the dewatering of an underground uranium mine located near Gallup, New Mexico resulted in the contamination of the Puerco River from 1967 until 1986, after treatment of the water in the mid-1970s reduced the radionuclide levels into compliance specified by the National Pollutant Discharge Elimination System (NPDES) permit program under the CWA (EPA, 2008b; 2020a; NRC, 2012). Further, highly acidic water, known as acidic mine drainage (AMD), can be produced from abandoned mines and is a risk to on-site and off-site surface water due to the radioactivity and co-occurring heavy metals associated with uranium mining and processing (Abandoned Mines, n.d.; EPA, 2008b; NRC, 2012). AMD makes surface water corrosive by lowering the pH level, resulting in its inability to support aquatic biota (plants and animals) as well as terrestrial flora in the surrounding area (Abandoned Mines, n.d.). ISL operations also pose a risk to water contamination due to the heavy metals and other hazardous elements that are mobilized during the processing of the ore (EPA, 2008b).

Air pollution and dust are generated during several stages of the mining process. During the excavation stage, dust is generated from the sites being bulldozed, blasting ore deposits for recovery, and when vehicles transport the recovered ore on dirt roads through and around the sites (NRC, 2012). Dust from waste stockpiles and unreclaimed protore at the mining site can be dispersed from wind, spreading contaminated particles through the atmosphere where it can remain suspended for long periods of time or will settle in nearby surface water, soil, or vegetation (NRC, 2012). In addition, during the milling process radioactive particles and gases could be released as the ore is ground into finer particles before it is leached. The leaching process could also have environmental impacts if the chemicals were released. However, several safety and environmental precautions are in place at milling facilities in attempt to monitor and minimize any potential hazards (NRC, 2012).

Uranium mining operations result in large surface areas of disturbed land that contain bulk waste. These operations can contaminate the soil through leaching, which has detrimental impacts for the plant and animal life on or around the mining site. For instance, when runoff carries contaminated sediment and clogs the flow of surface water – known as sedimentation – it can lead to flooding and have adverse impacts on aquatic life (e.g., fish) (Abandoned Mines, n.d.). In addition, soil properties and composition are affected by mining activities that involve the removal of topsoil and overburden. Due to the change in soil composition (e.g., structure and compaction) during removal, soil loses its permeability, ability to provide adequate moisture to support plant growth, and living organisms, such as earthworms, that are vital to healthy soils

(EPA, 2008b). Soil that is removed and stockpiled at the mine site is often used to refill the mine during reclamation, which is problematic for plants and crops because of biological, chemical, and physical changes that occur during stockpiling. For example, leaching of waste materials into the soil degrades the nutrients and fundamentally changes its properties, which can take decades or hundreds of years to recover (EPA, 2008b). These changes also have implications for soil water capacity and the microbiological (e.g., fungal and bacterial) functions, that impact the long-term success of plants and crops on reclaimed soil (EPA, 2008b).

Further, habitat disturbance from mining operations leads to the displacement of several species. In some instances, the species will return once the mine site is abandoned. For example, bats will make habitats in unreclaimed mine shaft entrances (Abandoned Mines, n.d.; EPA, 2008b). Of important note, the EPA does not have radiation dose standards for the protection of plants and animals. Although the Department of Energy (DOE) suggested levels of exposure for aquatic and terrestrial plant and animal life, it is unclear whether these levels are protective, and whether assessments are required to determine the potential or actual harm and effects on species populations, as well as the ecosystem (EPA, 2008b; ICRP, 2005).

The risk to the environment is prolonged by abandoned mines and mill tailing sites awaiting remediation and clean-up. However, sites must be evaluated and ranked to determine the potential threat of the hazardous waste to humans and the environment before remediation is considered (EPA, 2018b). Based on the Hazard Ranking System (HRS) criteria, a site is eligible for placement on the Superfund's National Priorities List (NPL) if it scores a 28.5 or higher, and only then are sites considered for remedial actions through the Superfund Trust (EPA, 2018b). In addition, many inactive mine and mill tailings sites are ineligible for the NPL because they fall under the authority of the AML program and NRC. As of 2013, uranium contamination was found at 67 of the 1,699 sites on the Superfund National Priorities List, including several mill tailings sites (ATDSR, 2014). However, only three uranium mines – two of which are outside the major uranium producing states (Colorado, Utah, Arizona, New Mexico) – are on the list: Midnite Mine in Washington, White King Mine in Oregon, and Jackpile-Paguate Uranium Mine in New Mexico (EPA, 2018b; USGAO, 2019).

Another example of how uranium mining impacts the environment is the failure of a tailings dam. Tailings dams are holes dug out of the earth used to contain and hold back the toxic waste and water produced by mines and mills. Dam failure can result from several factors, such as erosion, poor design, or natural disasters, making them the least predictable risk associated with uranium mining operations (EPA, 2008b). Standards for building them are minimal, such that often times the removed soil or rocks are used to create the impoundment walls, increasing their potential for leaking. Further, there is a lack of regulation on the design of the dams, during mining operations, and mine closure because the cost of monitoring is high (Lyu et al., 2019). Two notable tailings dam failures occurred in the U.S. in the late 1970s in Grants, New Mexico (1977) and in Church Rock, New Mexico (1979) (EPA, 2008b). The incident at Church Rock is the largest accidental nuclear disaster in U.S. history, and second in the world only to the Chernobyl disaster of 1986 (Gilbert, 2019). When the dam at Church Rock Uranium Mine failed, it released 1100 tons of radioactive sludge waste and 94 million gallons of toxic water that contaminated the Puerco River and nearby surface aquifers (EPA, 2008b; Gilbert, 2019). As of 2019, the water was still contaminated (Gilbert, 2019).

Research Question 2

The second research question investigated how exposure to uranium affects human health. Much of what was discussed in the prior section also has implications for human health, which will be expanded upon in this section. For instance, water contamination from uranium mining affects drinking water sources for nearby communities. Table 7 provides a brief summary of health effects associated with uranium mining that will be detailed in the text. Although uranium is a naturally occurring radioactive material to which people are exposed, the radiation levels are minimal and do not pose a threat to human health. However, when human activities result in uranium becoming TENORM, there are several associated health effects for miners and nearby communities.

Table 7. Chemical and Radiation Health Effects Associated with Uranium Exposure.

Chemical Effects	**Radiation Effects**
Lung function	Lung cancer
Bone cancer	Bone cancer
Kidney function/disease	Kidney function/disease
Reproductive function	
Liver function	

As previously mentioned, runoff can infill open-pit mines, creating an exposure pathway, especially when the open-pit lake is utilized for recreational or agricultural purposes, like that of the Yazzie-312 mine (EPA, 2008a). Runoff can also result in the transportation of waste materials into nearby water sources. Similarly, contamination can occur from waste materials leaching into the ground and groundwater. Groundwater contamination becomes a major issue when liquid wastes that seep into the ground end up in local aquifers. This is especially concerning at milling facilities, since waste is stored in tailings impoundments (EPA, 2008b). Water sources can also become jeopardized from mining operations that accidentally intersect the aquifer during the dewatering process, resulting in the contamination of surface aquifers, where the water could be transported to nearby communities (EPA, 2008b). According to the EPA, the maximum contaminant level (MCL) for uranium in drinking water is 30 micrograms per liter of water (μg/L), meaning it is the maximum permissible level of uranium in water that is used by the public (ATDSR, 2009).

When contaminated drinking water is ingested, the uranium is stored primarily in the kidneys and liver and can affect the normal function of these organs (EPA, 2008b; 2014b; 2014c; 2014d; IDHW, n.d.; NMEDOH, 2016). The greatest risk, however, is damage to the kidneys or kidney disease, since the majority (more than 60%) of uranium absorbed into the bloodstream is transported to the kidneys where it is then filtered and eliminated by urine (IARC, 2001; IDHW, n.d.). In addition, radionuclide concentration in drinking water from tailings can lead to an increased risk of bone cancer because ingestion of uranium may result in uranium deposition in the skeletal system (ATDSR, 2009; NRC, 2012). Approximately 66% of uranium that is retained in the body is deposited in bones, where it can remain for upwards of 20 years (IARC, 2001). In situations where large amounts of waste are discharged into water that is used by nearby communities, risk of ingestion is heightened, especially when the contamination remains decades after the initial pollution. For example, 40 years after the Church Rock disaster, the Puerco River and nearby surface aquifers still show increased levels of uranium contamination (EPA, 2008b; Gilbert, 2019).

The risk of inhalation of contaminated air and dust is greatest for mine workers. However, they can also be a source of exposure for the general population that reside near mining or milling sites, waste disposal sites, or transportation routes (ATDSR, 2009). There are several scenarios when radon and other radionuclides are released into the atmosphere: (1)

during mining, especially when it involves the enrichment of uranium ore; (2) during milling, when the ore deposit is ground into fine particles for processing; (3) at waste disposal, in particular dry uranium concentrate, mill tailings, or unreclaimed protore; (4) on transportation routes that involve driving to and from mine sites, milling facilities, and waste disposal sites (often laden with contaminated dirt roads); and (5) during remediation activities (ATDSR, 2009; EPA, 2008b). Inhalation exposure of uranium and other radionuclides can result in lung damage and can affect reproductive function; however, these effects are dependent upon the size of the inhaled uranium particles (ATDSR, 2009; 2013). For example, smaller particles can travel deeper into the respiratory tract and lungs and are more easily absorbed into the circulatory system. Although most of the uranium that is deposited in the respiratory tract will be excreted through mucociliary clearance – the clearing of the airways – some of the deposited uranium can remain in the lungs for several years (ATDSR, 2009; 2013; NRC, 2012).

Absorption from uranium inhalation also depends on the solubility of uranium. Soluble uranium compounds are absorbed into the bloodstream, where they are then transported to the kidneys, and more likely to have chemical effects on the body compared to less soluble or insoluble uranium compounds (IARC, 2001; NRC, 2012). Conversely, less soluble forms or insoluble uranium compounds are more likely to be retained in the lungs for extended periods of time, compared to soluble forms, increasing alpha particle exposure and risk of cancer (IARC, 2001; NRC, 2012). The Occupational Safety and Health Administration (OSHA) established the permissible exposure level (PEL) for airborne soluble and insoluble uranium compounds in the workplace per 8-hour work shift per 40-hour work week (OSHA, 2018). The PEL for soluble uranium is 0.05 milligrams per cubic meter (mg/m^3), which is five times lower than the PEL for insoluble uranium for the same exposure (0.25 mg/m^3), since soluble uranium has greater absorption rates and is more likely to have chemical effects on the body (OSHA, 2018). The National Institute of Occupational Safety and Health (NIOSH) considers soluble and insoluble uranium compounds to be potential carcinogens, even though the International Agency for Research on Cancer (IARC) has not formally classified uranium as a carcinogen (IARC, 2011; NRC, 2012). The IARC has, however, classified uranium as a carcinogen under the alpha-particle-emitting category (IARC, 2011; NRC, 2012).

Additional risk of severe health effects, such as bone cancer, associated with uranium mining is a result of uranium decay products, including uranium-234, radium (Ra), and thorium (Th) (NRC, 2012). These decay products are left behind during the milling/processing of uranium ore where they remain in the tailings due to long-lived half-lives – the amount of time it takes a substance to decrease by half. Because thorium has the longest-lived radioactive half-life of the decay products in tailings (77,000 years), it provides a constant source of radium which turns into radon during decay. The decay of radon can produce significant gamma radiation hazard in both the milling facility and near tailings impoundments, increasing the potential risk of cancer from exposure (EPA, 2008b; NRC, 2012).

Abandoned conventional uranium mines can also present a risk of inhalation since they often contain other hazardous metals, such as the carcinogen arsenic (EPA, 2008b). Further, abandoned mines may contain gases like carbon dioxide (CO_2) and methane (CH_4), which can lead to asphyxiation (ATDSR, 2013; EPA, 2008a; 2008b; 2014). In addition, there are several risks associated with ISL operations due to the large number of chemicals used during the leaching process. The primary risks are surface chemical and radiological hazards, and groundwater chemical and radiological contamination (EPA, 2008b). Surface chemical and radiological hazards are associated with accidents at the site and are a risk to workers. Chemical hazard examples include inhalation of ammonia or contact with corrosive acids, whereas radiological hazards include inhalation of dried yellowcake or inhalation of radon from exposure to lixiviant (EPA, 2008b). Conversely, groundwater chemical and radiological contamination would impact the environment and general public due to the large number of heavy metals and hazardous elements mobilized during the ISL processing of uranium ore. In addition, pipe system failure could result in groundwater contamination by lixiviant, posing a risk to the environment, public drinking water supply, and workers (EPA, 2008b).

Additional routes of exposure. Although ingestion of contaminated water and inhalation of polluted air or dust particles are the primary sources of uranium exposure, there are several other potential exposure pathways that are a risk to human health, especially for residents that live within close proximity to uranium mine sites. Overburden and protore that are stockpiled at the sites can result in additional routes of exposure through crop contamination, on-site recreation, and building materials. For example, root vegetables, such as potatoes and turnips, and leafy greens can contribute to elevated amounts of uranium in the diet in areas where concentrations of uranium in the soil and water are above the MCL. This is mostly a concern for those living near uranium mine sites that have gardens or grow crops (EPA, 2008b; IDHW, n.d.).

As previously mentioned, most uranium mines are located on federal lands. Therefore, the primary risk of exposure would be for people visiting these lands for recreational purposes, such as camping or hiking. However, these lands may also be used by nearby residents, especially if the sites are located near tribal lands. For instance, the pit-lake at the Yazzie-312 Uranium mine site was used by local Tribal members as a swimming hole until it was filled in during remediation 40 years after it was abandoned. Even though cancer risks from immersion, in general, have been found to be relatively low, long-term use of contaminated pit-lake water could pose risks, especially since pit-lakes contain a number of heavy metals, including arsenic (EPA, 2008b).

Another exposure pathway is the utilization of TENORM waste from uranium mine sites as building materials for homes. In a 1972 study by the EPA, over 500 homes near mine sites in the Southwest U.S. were found to have been built with contaminated materials and were the source of elevated gamma radiation levels (EPA, 1973; 2008b). This has been especially problematic on tribal lands and will be discussed in greater detail in the next section.

Research Question 3

The third research question evaluated how the ecological effects of uranium mining impacts Native Americans. Many Native American tribes in the Southwest U.S. reside in areas that contain uranium mine sites, or have sites located within one mile of their lands (EPA, 2008a; 2008b). Due to their close proximity to uranium mine sites, Native Americans are subject to a number of ecologically significant exposures associated with uranium mining operations (NRC, 2012). For instance, surface runoff, leaching, or potential spills can contaminate surface and groundwater, as well as nearby streams, that are the primary source of water used for drinking, washing, crop irrigation, and livestock (NRC, 2012). When the Church Rock disaster occurred in 1979, its proximity to Navajo Nation had severe impacts for their health and well-being. The disaster resulted in heavy contamination – 7,000 times the MCL of uranium in drinking water – of the Puerco River and other nearby surface aquifers that were used by the Navajo for domestic and agricultural purposes (EPA, 2008b; Gilbert, 2019; Johansen, 2016). Since the Navajo relied heavily on water from unregulated sources, contamination from the spill led to elevated rates of kidney disease among the Navajo population, due in part to long-term use of the contaminated water (Johansen, 2016). As of 2015, the public water supply from the Puerco River showed elevated uranium levels still above the MCL at 43 µg/L, and as of 2019, the water supply was still contaminated (Gilbert, 2019; NIEHS, 2017).

Contamination of fish, livestock, wildlife, and vegetation at or near uranium mine sites not only has adverse effects for Native American sustenance, but for their culture, resulting in several ceremonial and non-ceremonial activities becoming impacted by waste contamination. For example, following the Church Rock disaster, sheep in the area showed elevated levels of radiation (Gilbert, 2019). Sheep were traditionally consumed as part of Navajo diet, and of importance for some traditional ceremonies (Rock, Camplain, Teufel-Shone, & Ingram, 2019). A recent study exploring the consumption of sheep in a Navajo community demonstrated how contamination from uranium mining affected diet and had cultural implications. Although sheep were traditionally a staple in Navajo diet, the authors found Navajo consumption of sheep was mostly ceremonial. However, the Navajo suggested the contamination of sheep could alter or threaten traditional ceremonies (Rock et al., 2019).

Because traditional tribal lifestyle includes greater consumption of local game and fish, and use of local plants for medicinal and ceremonial purposes, the presence and concentration of contaminants in soil, water, and air pose a major risk to Native Americans (Harris & Harper, 2001; USGAO, 2019). In particular, the bioconcentration (uptake and retention) of uranium by aquatic and terrestrial plants is a primary exposure pathway for Native Americans. These plants are consumed directly by Native Americans, as well as aquatic and terrestrial animals, which are then consumed by Native Americans (ATDSR, 2017). In addition, plants are prepared and used for several ceremonial and non-ceremonial activities, such as medicine and other herbal remedies, dyes, basket making, instruments, and smoking or burning (e.g., smudge sticks).

Animals also have many uses, other than consumption, such as clothing, medicine, oils, and tools (Zender, 2004).

Another concern for Native Americans is using abandoned mine areas as long-term home sites. Abandoned uranium mines (AUM) have elevated concentrations of uranium, radium, thorium, and other heavy metals and contaminants, such as arsenic (Abandoned Mines, n.d.; EPA, 2008b; 2014a; 2014b; 2014c; 2014d; 2019c). Although most AUM are located on federal lands (Figure 4), there appears to be a significant overlap with Native American Reservations,

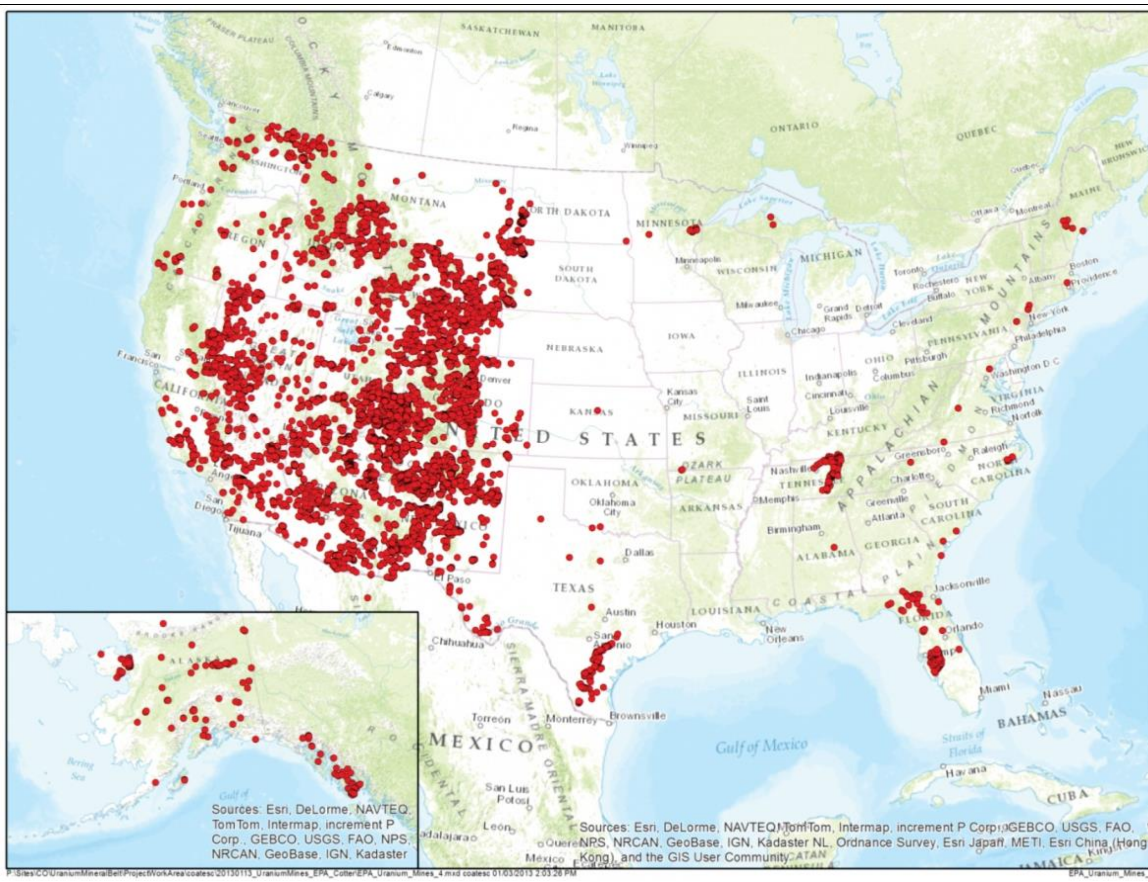

Figure 4. Abandoned Uranium Mines (AUM) Locations

Source: Abandoned Uranium Mines Report to Congress: LM Wants Your Input. DOE, 2013 increasing the risk for Tribal members as residents at or near AUM sites (EPA, 2008b). Figure 5 shows the 32 Native American Reservations located in the Colorado Plateau. In addition, building homes out of waste material found at or near AUM sites could have significant risks for Native Americans. Overburden and protore are highly radioactive due to the presence of sub-economic uranium ore and decay products (e.g., radium) in the waste material, resulting in external gamma exposure (ATDSR, 2013; EPA, 2019c).

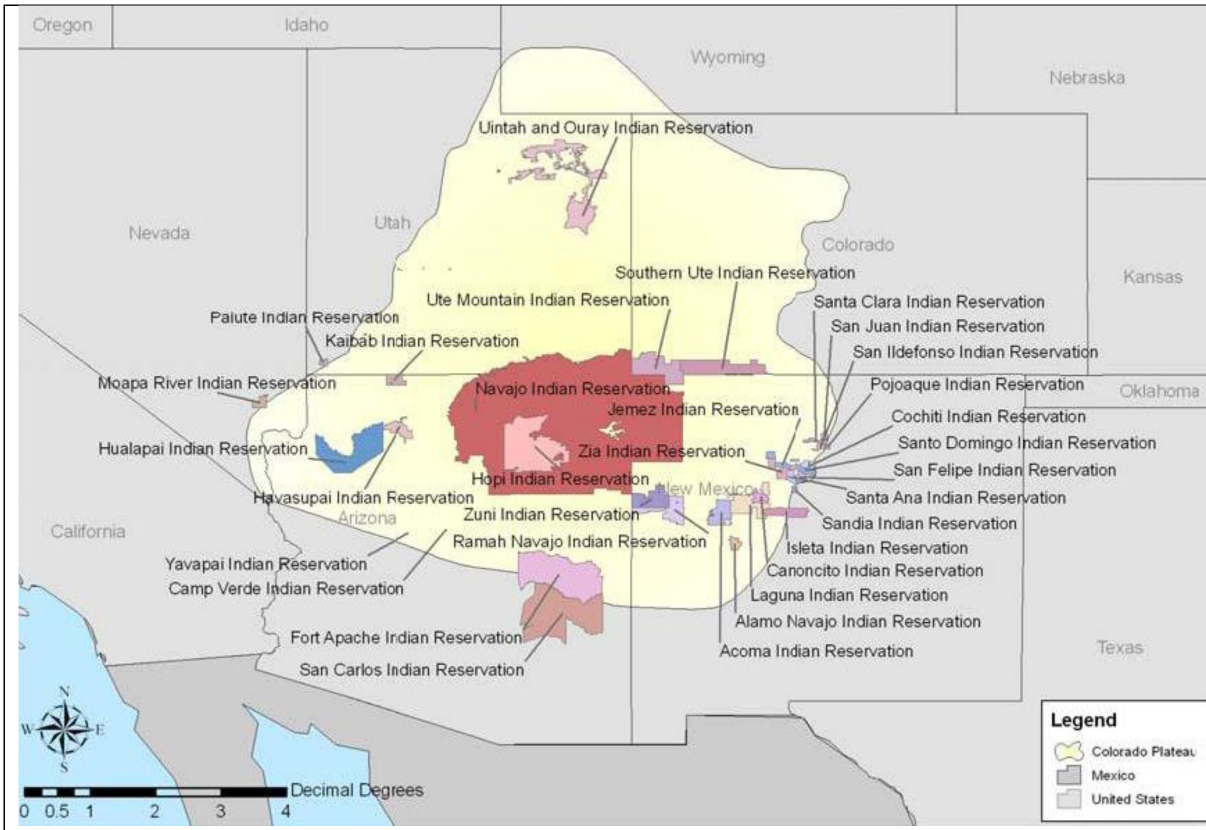

Figure 5. Native American Reservations Located on the Colorado Plateau

Source: Map of Native American Reservations Located on the Colorado Plateau. Federal Geographic Data Committee, 2005

For instance, the Pueblo of Laguna in New Mexico could be exposed to radon in their homes by using contaminated waste materials from the Jackpile-Paguate Uranium Mine site located on their land (USGAO, 2019). The site was operational from 1952 to 1982 and had detrimental effects on surface water. Although reclamation of the site took place from 1990 to 1995, the EPA was not involved until the mine site was placed on the NPL in 2013. The EPA's initial remedial investigation did not begin until 2017. Homes built with contaminated waste have also been located on Navajo lands and demonstrated elevated radiation exposures. Radiation dose rates in air in homes measured 325-525 microradians per hour (μrad/h); typical background dose rates in air are 1.2–16 μrad/h, and radiation dose rates in interior and exterior stone used in the homes measured 500-1000 microRoentgens per hour (μR/hour); typical background dose rates in stone are 9.8 μR/hour (EPA, 2008b; 2020b; USGAO, 2019). Further, contaminated rocks and clay could be used in ceremonial steam baths, fire pits, pottery, or jewelry (Zender, 2004).

Research Question 4

The fourth research question examined how the ecocide-genocide nexus was further facilitated by uranium mining. As previously discussed, there are several environmental and health effects associated with uranium mining that impact Native Americans physically and culturally. Based on the aforementioned information, this inquiry explored how the ToP generated ecocidal and genocidal impacts for Native Americans, with respect to uranium mining operations. Previously discussed in Chapter 3, during the colonial period in the U.S., Native Americans were displaced from their lands and relegated to areas thought to be unproductive (i.e., uneconomical) by the government. When uranium ore was discovered in 1950 on Native lands, the discovery subsequently led to exploration, Treaty negotiations, and exploitation. As the demand for uranium increased, the government sought to accelerate mine development on mineral-rich Native lands, specifically Navajo Nation in New Mexico, and did so through an "ad hoc mixture of land appropriation, population displacement, and side payments that were anything but fair" (Ali, 2009, p.7). Although mineral resource extraction limits were written into many Native Treaties, manipulation and disregard for Native Americans' rights by the government resulted in decades of exploitation that has left behind a legacy of environmental degradation and increased rates of cancer (Ali, 2009).

Native American miners. The boom in the uranium industry from the 1950s through the 1970s yielded over 100 million tons of uranium ore for use by the U.S. nuclear weapons program. Approximately half of the 12,000 miners employed in the U.S. during this time were Navajo, and they contributed greatly to the U.S. uranium production (Alvarez, 2013; Johansen, 2016). Initial extraction activities saw Navajo miners removing uranium ore similarly to coal or other minerals, in mines that lacked proper – if any – ventilation systems. Early mining companies and the government (specifically, the AEC) failed to tell Navajo miners of the hazards associated with mining uranium to further their profits and avoid demands for extra pay. For several hours a day, miners inhaled polluted air, drank radioactive water, and went back to their small homes covered in contaminated yellow dust, unknowingly exposing their families (Alvarez, 2013; Johansen, 2016).

Further, Navajo miners' health was not being monitored, and the death toll from various forms of cancer and other related diseases continued to rise, doubling from 1970 to 1990 (Alvarez, 2013). It was not until the Radiation Exposure Compensation Act (RECA) was passed in 1990 that miners (including non-Native miners), or other workers exposed to radiation (e.g., from nuclear weapons tests), received any form of compensation or apology for knowingly being put in harm's way. However, by the time these funds were released, many former Navajo miners (450) had already died from cancer. In addition, the approval rate of compensation for the former Navajo miners and family members that did apply was significantly lower than the approval rate in other cases of radiation exposure (Johansen, 2016). By 1993, the program ran out of money and the government issued IOUs to approved cases. In 2000, the law was amended, and the Energy Employees Occupational Illness Compensation Program Act (EEOICPA) was enacted; however, this program also lacked adequate funding (Alvarez, 2013; Johansen, 2016).

Remediation of abandoned uranium mines (AUM). The decline of the domestic uranium industry, and increased reliance on lower-cost uranium imports from Canada and Australia, resulted in the abandonment of more than 15,000 uranium mines across the Western U.S. (DOE, 2013; Lewis et al., 2017). Thousands of AUM are located on or near tribal lands, placing more than 280,000 Native American residents within six miles of at least one AUM (Lewis et al., 2017). Very few AUM have been remediated in the decades since their last use. Since 2008, the Department of Justice (DOJ), Bureau of Indian Affairs (BIA), Indian Health Service (IHS), DOE, DOI, and NRC have attempted to address contamination from AUM on Navajo Nation. The DOJ has gone after mining companies for remediation, however, several have either run out of money or shut down. After decades of loss, illness, and protest, the Navajo Nation won a $600 million settlement for the cleanup of over 200 AUM on their lands in 2017 (EPA, 2017). Evaluation and cleanup of 94 of the AUM will be performed by Cyprus Amax and Western Nuclear, the two companies responsible for those mines during their active operation. Over $300 million of the funds are designated for the remediation of the remaining

AUM by the DOI and DOE (EPA, 2017). It is unclear if and when the remediation of the mines will take place.

Current issues with uranium. The threats to tribal lands, however, are not only from AUM. As of 2018, there were six actively operating uranium mines (all ISL operations) in the U.S., and one operating conventional uranium mill. All six ISL plants are located in Nebraska and Wyoming, while the one mill, White Mesa Uranium Mill, is located in Utah (USEIA, 2019). White Mesa Uranium Mill, owned and operated by Canadian company Energy Fuels, is located three miles from the Ute Mountain Ute Tribe (Grand Canyon Trust, 2018b; 2019b). White Mesa Uranium Mill was built in the 1970s to process uranium ore from the surrounding area. Later it processed radioactive waste from contaminated sites throughout the U.S. and discarded all waste at the mill. In 2013, radon emissions from the mill's wastes were reported to exceed the limit under the CAA. This no doubt due to tailing impoundments containing radioactive and contaminated wastes from several sources, including defense facilities, rare-metals mining operations, and uranium-conversion plants where the yellowcake is turned into nuclear fuel (Grand Canyon Trust, 2018b; 2019b). Further, the uranium and waste were transported to White Mesa Uranium Mill along routes through communities (Figure 6) in the Colorado Plateau (i.e., Tribal communities) in canvas-covered haul trucks (Grand Canyon Trust, 2018b; 2019b).

In addition, new uranium mining claims have emerged in recent years, but continue to be fought by Native American communities. Several Tribes have taken legal actions to prevent and ban uranium mining on their lands. For instance, in 2005, the Natural Resources Protection Act banned uranium mining and processing on Navajo Nation. In 2019, petitions from the Havasupai Tribe resulted in the U.S. House of Representatives passing the Grand Canyon Centennial Protection Act, banning new uranium mines around Grand Canyon National Park forever. However, this Act has not yet been passed by the Senate (Grand Canyon Trust, 2018a; Lewis et al., 2017).

A previous 20-year ban on uranium mining at the Grand Canyon was enacted and affirmed in 2012 despite several attempts and appeals by the National Mining Association and

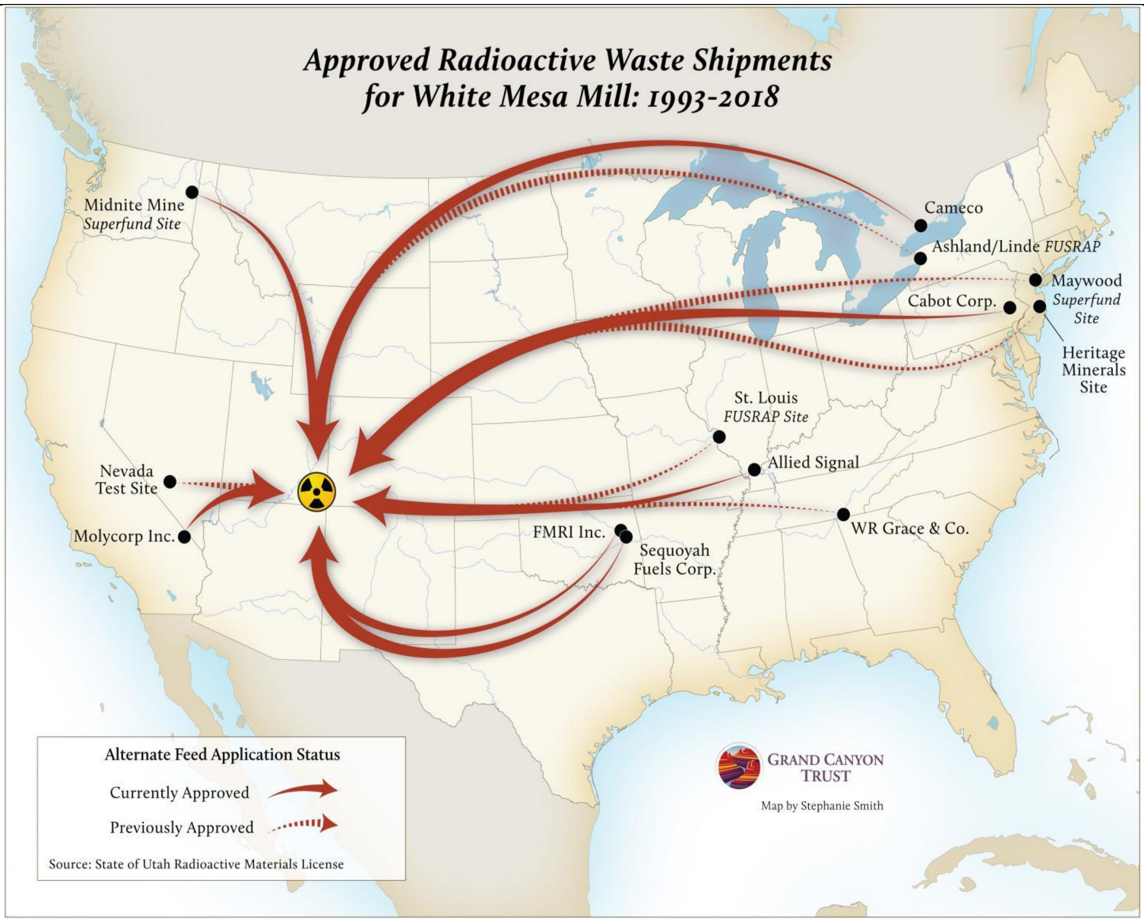

Figure 6. Approved Radioactive Waste Shipments for White Mesa Mill: 1993-2018
Source: White Mesa Uranium Mill. Grand Canyon Trust, 2019b.

other groups to overturn it (Grand Canyon Trust, 2018a). There are currently 831 active uranium mining claims within the Grand Canyon withdrawal area. For now, the ban still has support from Secretary of the DOI, Ryan Zinke, and the Grand Canyon withdrawal area remains protected from new claims (Grand Canyon Trust, 2018a).

Throughout the 2000s when the price per pound of uranium continued to fluctuate, Federal agencies allowed “zombie mines” – uranium mines that are inactive then come back to life – to open and close as needed without environmental review or the proper updated permits (Grand Canyon Trust, 2019b). Zombie mines are especially problematic in the Grand Canyon withdrawal area; since they are not new mining claims, they are exempt from the 20-year ban. Currently, activist groups and Tribes in the area are fighting for mine permits to have operational time limits, which would prevent the reopening of closed mines if their permits had an expiration (Grand Canyon Trust, 2019b).

In addition, states have their own regulatory agencies for imposing uranium mining permit limits; however, state regulators will often make accommodations in favor of mining companies, dismissing community concerns (Center for Public Integrity, 2019). For example, in 2009, Mount Taylor Mine in New Mexico exhausted its standby permit after 20 years of inactivity, yet the New Mexico Mining and Minerals Division approved the proposal for the mine to switch its status to active in 2017; however, it remained non-producing (Center for Public Integrity, 2019). Mount Taylor is a sacred pilgrimage site for many tribes in the area, and is situated near the Rio San Jose, which serves as the main water source for these tribes and also holds its own cultural significance (Earthworks, 2020). In addition, the milling facility associated with Mount Taylor Mine has a long list of toxic waste spills since its opening in 1958 that violated several of Colorado’s environmental regulations. After decades of inactivity, and protests from environmental groups and local Tribal communities, the owners of the mine announced its cessation of operations in January 2020 (Earthworks, 2020).

Summary

This chapter presented an overview of uranium and its production and uses from past to present. This summary provided necessary information for the research inquiries. In doing so, the author explained how uranium mining impacts the environment and human health, and its implications for Native Americans. Using data collected from multiple evidentiary sources, the author highlighted how uranium mining impacts Native American health and well-being. Based on these results, the next chapter will summarize the findings and discuss how uranium mining is a part of the form of toxic colonialism that Native Americans face. In particular, the author will discuss how the treadmill of production (ToP) and treadmill of destruction (ToD) facilitate Native American genocide. Following this discussion, the author will outline implications for environmental justice, as well as policy and theory. In addition, the limitations of the study and directions for future research will be discussed.

CHAPTER SIX:

DISCUSSION

The purpose of this final chapter is to summarize the research findings, as presented in Chapter five. Following this summary, the implications these results have for environmental justice, environmental policy, and criminological theory are presented. Next, the limitations of the study are acknowledged and discussed. Lastly, this chapter will provide directions for future research.

Summary of Research Findings

The purpose of this dissertation was to investigate whether uranium mining is a part of the form of toxic colonialism Native Americans face. In particular, how the treadmill of production facilitates ecocidal and genocidal acts against Native Americans, with respect to uranium mining. Recall that toxic colonialism is not recognized in U.S. environmental regulations or laws; however, toxic activities in the U.S. parallel those in other countries and should be considered as such. To be clear, extractive processes in the U.S. that generate toxic waste often dispose of this waste in or near poor communities, especially Native American communities. Native Americans are victims of historical and contemporary accounts of colonialism, where exploitation, violations of land agreements, and colonial-style coercion has resulted in irreparable environmental destruction and health disparities. Here, it can be argued that toxic colonialism for Native Americans results from the overlap of the treadmill of destruction (ToD) and treadmill of production (ToP). To be clear, the ToD explains how Native Americans were systematically placed in and constrained to regions dictated by the government and used by the government for military activities. These regions are also disproportionately affected by the ToP. The overlap of the location of uranium mining operations with tribal lands is evidence of geopolitical influence. Further, the failure to remedy and prevent Native American exposure to toxins from uranium mining reflects institutional racism and social, economic, and political inequalities. In this way, it can be argued that uranium mining is a part of the form of toxic colonialism that Native Americans face as a result of eco-genocide facilitated by the ToP. To this end, the following discussion will demonstrate how social, cultural, and economic discrimination against Native Americans by the uranium-related treadmill of production support the contention of toxic colonialism.

The quest for uranium development and procurement in the U.S. following World War II, and then again in the 1980s, has left behind a legacy of environmental degradation and health effects for many Native Americans. The most impacted were the tribes living in the Southwest U.S., especially those living in the Colorado Plateau region. The Colorado Plateau remains ripe with contamination from past uranium mining operations, despite modern environmental regulations, because the majority of Acts do not offer protection to activities that occurred prior to their enactment. For instance, the NRC is only responsible for the management of radioactive tailings from uranium mills that operated after the UMTRCA was enacted in 1978. Further, past contamination is viewed by mining companies and several regulatory agencies as a product of an era that lacked sufficient environmental protection. In the contemporary era, those outcomes are viewed as the product of past behavior and are dismissed. This is especially true of toxic contamination on and near tribal lands (Reimondo, 2019).

As demonstrated in the previous chapter, throughout the uranium industry boom, Native Americans were exploited both for their land and labor, and in exchange receive a lifetime of health disparities and contaminated land. Despite health reports in the early 1900s indicating the potential risks associated with exposure to uranium, mining companies and government agencies sent workers into mines without proper protective gear and ventilation systems. Further, they failed to share this information with the Navajo miners, and failed to monitor their health, and instead focused their efforts on the most efficient means of profitmaking. Even after the RECA was passed in 1990 offering miners compensation as an apology for their radiation exposure, the insufficient funds were too late for many Navajo miners who had already passed.

Contamination levels from uranium mining operations has remained relatively stable over the years, even though most mines and mills on tribal lands were last used in the late 1980s. Despite these conditions, water sources several miles downstream from the Church Rock Uranium Mine still tested well above the MCL in 2015, and still showed elevated contamination levels in 2019, some 40 years after the disaster occurred. A CDC study of 700 Navajo women found over 27% had levels of uranium in their urine exceeding levels found in the highest 5% of the total U.S. population (Morales, 2016). The same study also found high concentrations of uranium in Navajo infants.

Although the location of uranium mines was determined by geological indicators, the failure to remediate the mines after decades of abandonment suggests environmental racism. For instance, in 2014, only one of the 43 mines on Navajo Nation lands designated as high priority by the EPA had been "mostly cleaned up," and by 2019, the EPA had only begun assessing cleanup on eight more, and had removed a total of approximately 200,000 tons of contaminated waste (Neilson, 2019). In contrast, cleanup of the Mi Vida uranium mine in Moab, Utah removed nearly seven million tons of uranium contaminated waste from the banks of the Colorado River that supplies water to mostly non-Native peoples more than 760 miles away in Los Angeles, California. Further, the waste remove from these sites has been treated differently. Waste removed from the Moab site was buried in a dump with 2,400 feet of solid shale shielding groundwater from waste contamination, while waste removal from Navajo sites was piled onto tailings heaps (Loomis, 2014; Neilson, 2019). To be clear, waste that contaminated the main water source for a region composed of mostly White, high socioeconomic status individuals was removed in a timely manner and stored so future contamination would be avoided.

In 2017, the Navajo won a $600 million dollar settlement agreement for AUM cleanup. The EPA claims this settlement will provide enough funds to remediate approximately 200 of the 523 EPA-identified AUM located on Navajo Nation, yet the $110 million dollar budget for 2008-2012 Reservation cleanup turned out to be less than what it cost to cleanup just two mines (Loomis, 2014; Moore-Nall, 2015). In addition, the Navajo are one of two tribes in the region to receive delegated funds from the government for remediation of AUM on their land; the second is the Laguna Pueblo whose land houses the NPL Jackpile-Paguate Uranium Mine. However, initial remedial investigations did not begin until 2017 for the Laguna Pueblo and 2019 for the Navajo, respectively, indicating it will be several years before the cleanup process even begins. Further, the Navajo are one of 32 federally recognized AIAN tribes living in the Colorado Plateau impacted by the thousands of AUM in the region, yet one of the only tribes (the author could find) to receive any compensation regarding their long-term health effects associated with exposure to contaminated water and radiation. Even then, the funds were significantly lower than those released to non-Natives for the same claims or ran out before claims could be made (Johansen, 2016).

The location of uranium processing facilities (mills), waste disposal sites, and transportation routes in relation to Tribal communities is less determinate by geological factors than mining sites, and instead are primarily determined by social and economic factors. According to the NRC, mills are typically located in areas with low population density, and process uranium ore from mines within a 30-mile radius (USNRC, 2017). While the central location of mills to mines makes logical sense from a processing and cost perspective, over 90% of all uranium mills were located in the Southwest U.S. on or near tribal land, with four mills located on Navajo Nation alone (Moore-Nall, 2015). In addition, mining companies will often build their facilities without the approval of Tribal Council, as outlined in Treaties, Tribal environmental regulations, and human rights instruments. For instance, the tailings impoundments for the White Mesa Uranium Mill were built on sacred Ute Mountain Ute land, destroying over 200 culturally significant sites (Nukewatch, 2017). As of 2017, two spills had occurred on transportation routes to the White Mesa Mill since 2015. One of the spills resulted in the spread of radioactive sludge across US Highway 191, which is the main highway from Montana to Arizona, passing through seven Reservations, and which is also proximate to at least four others (Nukewatch, 2017). Likewise, after the Laguna Pueblo tribe rejected offers to host a uranium mill on their lands, the second-largest uranium processing facility in the U.S., Bluewater Uranium Mill, was built just a few miles down the road from their Reservation (Moore-Nall, 2015).

In sum, uranium mining operations have discriminated against Native Americans since they began during the first industrial boom of the 1950s. Although it can be argued that the geological distribution of uranium was coincidentally near or on tribal land, the mixture of land appropriation, bribery, and long-lived health effects that resulted from uranium development was intentional. Corporate and government agendas associated with uranium recovery have demonstrated their blatant disregard for Tribal culture, health, and well-being. Here, it is evident that the uranium-related treadmill of production facilitates eco-genocide for Native Americans and is a part of the form of toxic colonialism that Native Americans face. Failure to cleanup AUM on Reservations coupled with the deliberate placement of mills, waste disposal sites, and transportation routes has implications for environmental justice, environmental policy, and criminological theory, which will be discussed in the following section.

Implications of the Current Study

Based on the conceptual foundation, theoretical framework, and results of this study, several implications need to be addressed. First, the results pose implications for environmental justice for Tribal communities located throughout the U.S. In addition, this research suggests environmental justice issues for other poor communities (non-Native) in the U.S. Second, the results suggest implications for environmental policy, especially regarding the current administration. Lastly, there are a number of implications for criminological theory as it relates to state-corporate crimes, green victimization, and underrepresented populations.

Environmental Justice

The objective of this dissertation was to investigate whether Native Americans have historically and contemporarily fallen victim to toxic colonialism from uranium mining operations in the Southwest U.S. In doing so, it was revealed that uranium mining is problematic in other regions of the U.S., as well. Although the majority of uranium was recovered from ore deposits within the Colorado Plateau, and most AUM are located within the same region, Tribes residing in the Northwest and Northern Plains have experienced similar plights as those in the

Southwest. In particular, Tribes in Oregon, Washington, Wyoming, Montana, and the Dakotas have been affected. For instance, there are over 2,800 AUM located on land designated under the 1868 Fort Laramie Treaty for use by the Great Sioux Nation, yet the development of these mines were never consented to by the communities living in the area (Kline, 2013). Native Americans in the same region have the highest rates of lung cancer in the U.S., compared to Native Americans in other regions, and all other racial groups (CDC, 2019; Kline, 2013). In addition, Midnite Mine, located within the Spokane Tribe Reservation in Washington, was determined to be a Superfund site in 2000. Fish and plants gathered from the nearby Blue Creek tested for elevated uranium levels, as well as high levels of other heavy metals. Further, most of the workers during the mine's active years (1955-1981) operated without safety precautions. However, records indicated that no member of the Spokane Tribe received compensation from RECA (Cornwell, 2008).

Several other issues also emerged. Uranium mining is only one part of a myriad array of extractive industries that have detrimental effects for the environment and human health and are especially concerning for Native American communities. Plentiful coal reserves and other minerals of economic interest have been recovered on or near Reservations. In 2010, mine development of an underground nickel and copper mine located in Michigan a few miles from Lake Superior began. The development of the mine resulted in increased sedimentation of the Salmon Trout River, one of the main water sources for the Keweenaw Bay Indian Community. In addition, Eagle Mine, and its accompanying mill and disposal facility, will operate through at least 2023, discharging wastewater into the Escanaba River (Bienkowski, 2012). Nickel and copper mining methods involve extracting the metals from sulfide ores, which produces sulfuric acid and can result in acid mine drainage. The Tribe's main concern is water contamination, since it would impact the plants and wildlife they rely on for survival, as well as their spiritual connectivity to the rivers (Bienkowski, 2012).

Similar issues can also be extended to other poor communities in the U.S. Parallels can be drawn between coal mining in Appalachia and uranium mining in the Southwest. The leading coal producing region in the U.S., Appalachia is home to isolated communities that experience contaminated water, poverty rates higher than that of the nation as a whole, increased health issues (including lung cancer and mortality rates), and exploitation by corporate and government entities (Evans, 2019). The biggest difference, however, is that these communities are almost exclusively White (89%) (World Population Review, 2020). Here, it can be suggested that the economically powerful will undermine the lifestyle and health of any peoples living in profitable areas since the affluent powerbrokers do not have to endure the environmental degradation, pollution, and adverse health effects that inevitably result from their actions. For example, communities in West Virginia rank in the top third for worst water quality in the U.S., exceeded only by the country's most urban areas (with sizeable racial and ethnic populations), and most of the Southwest (Spencer, 2019).

In addition to the coal mining industry, West Virginia is also home to a major chemical industry. From the 1940s through the early 1970s, Agent Orange production took place in Nitro, West Virginia and left more than 4,500 homes in the area contaminated and without remediation until a settlement against Monsanto was won in 2012. Residents in Charleston, West Virginia have an increased cancer risk from toxic air pollutants, undoubtedly due in part to the 13 high-risk chemical facilities located within three miles of 70% of residents. Further, the Freedom Industries chemical spill in 2014 left over 300,000 residents with contaminated water that remains tainted and under boil advisories (Spencer, 2019).

Poverty, unemployment, and environmental threats often go hand-in-hand; however, until recently, these issues were seldom researched and discussed in criminology, especially for disadvantaged groups like Native Americans. Although environmental justice issues are evident in most low-income communities, regardless of racial composition, Native Americans are the most vulnerable group because all aspects of their traditions are reliant on the environment. They are continuously denied access to clean drinking water, quality healthcare, and permanent jobs because their land produces economically viable and profitable resources that justify their exploitation by powerful political and economic forces. Overall, Native American quality of life is ignored by the forces that benefit from capitalistic enterprises because they are viewed as expendable.

Environmental Policy

The goal of environmental policies is to maintain the balance between environmental protection and economic growth; however, more often than not, economic growth is the primary concern and benefactor. Despite the large number of laws and regulations created to manage and protect the environment from threats, most of the agencies charged with overseeing these functions are headed by the same powerful forces that violate them. Although these issues have increased under the current administration, they are not new. Several protections are insufficient, outdated, and inadequately enforced. For example, the General Mining Law of 1872 was enacted to promote development and settlement in the Western U.S. but contains no provisions for federal royalties or environmental protection. In other words, under this law, the mining industry can subsidize mineral extractions without paying taxpayers anything in return and is not held responsible for the associated environmental degradation. In addition, this law ensures that mining surpasses all other potential land uses (Earthworks, 2019; Spencer, 2019).

Equally important, the EPA has failed to adopt a new standard for unregulated contaminants in drinking water since 1996 and only regulates a small subset of possible contaminants (Spencer, 2019). Further, the Trump administration recently (January 2020) repealed the Clean Water Rule, declaring that several waterways across the U.S. "no longer count as waters of the U.S." as defined under the Clean Water Act (CWA) of 1972 (Bowe, 2020). The Clean Water Rule being undone by the Trump Administration was enacted in 2015 under the Obama administration to redefine "waters of the U.S." and provide science-based guidance for determining which waters were protected under the CWA. With Trump's repeal, the CWA would no longer apply to these waterways and prevent toxic waste dumping by polluting industries. Instead, by excluding a large proportion of waterways, Trump's repeal overturns protected drinking water sources for more than 30% of the U.S. To be clear, this would not only impact the drinking water sources of all Native American populations across the U.S., but the drinking water sources of more than 100 million other Americans as well (Bowe, 2020).

Likewise, the Trump administration has decimated two National Monuments so energy companies can recover natural resource deposits located within the areas. In 2017, President Trump modified the Bears Ears National Monument and the Grand Staircase-Escalante National Monument in Utah, significantly shrinking both areas by 85% and 46%, respectively (Penn-Roco, 2018). Despite claims of Tribal consultation from Interior Secretary, Ryan Zinke, the local tribal nations were not consulted prior to the issuance of the President's proclamations regarding the National Monuments. In fact, the President, Interior Secretary, Utah congressional delegation, and governor of Utah all failed to consult with the local Tribal Councils. Lawsuits have since been filed by the local tribes, as well as other interest groups and environmental protection foundations, challenging the proclamations for both Bears Ears and Grand Staircase-Escalante (Penn-Roco, 2018).

Furthermore, in 2017, President Trump reauthorized the construction and operation of two pipeline projects – which were halted by President Obama – that cross tribal lands: the Dakota Access Pipeline and Keystone XL Pipeline. These pipeline routes disturbed and destroyed sacred sites and were situated near or under main water sources for many Native American tribes. By 2018, both pipelines suffered numerous leaks spilling hundreds of thousands of liters of oil on or near Reservations (Penn-Roco, 2018). A recent proposal from President Trump to revamp the National Environmental Policy Act (NEPA) would limit environmental reviews for proposed highway or pipeline projects and would no longer require facilities to report cumulative impacts. In other words, polluting industries would not have to report the quantity or location of their waste emissions and dumping (Beitsch, 2020).

Lastly, in February 2020, President Trump waived the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 to blast Monument Hill, a sacred site to several tribes, to build his border wall. Again, the government failed to consult with the local tribes, especially the Tohono O'odham Nation, whose land the site is located on and contains buried warriors, 10,000 year old artifacts, and ancient saguaro cacti, which are seen as "the embodiment of their ancestors" (BBC, 2020). Under existing law, the President can waive any law perceived to conflict with national security policies under the 2005 REAL ID Act, including laws protecting the environment, endangered species, and Native American graves (BBC, 2020).

Although this study focused on uranium mining in the U.S., a global theoretical perspective was employed to analyze the consequences of its extraction and production for Native Americans. Since the treadmill of production (ToP) is global, we would expect to see similar outcomes in other countries regarding the treatment of Indigenous/Native Peoples (INP), not just from consequences associated with uranium mining. These outcomes would most likely parallel other production industries, such as, forest/wood, oil, coal, copper, and other natural resources. For example, the Ogoni peoples of Nigeria have been victims of eco-genocide facilitated by the oil-related ToP since the 1960s, and these consequences are perpetuated by a state governance dominated by the elite (Donatus, 2016; Lynch, Fegadel, & Long, *forthcoming*). For other global examples of INP victimization by the ToP, see Brook (1998), Crook and Short (2014), Crook, Short, and South (2018), Gauger and colleagues (2012), Huseman and Short (2012), Lynch and colleagues (2017), and Lynch, Long, and Stretesky (2019), for an introduction to these issues.

It is evident there is a need for legislative initiatives to ensure Tribal residents are included in decisions about their land, even though several laws, regulations, and human rights instruments already include these provisions. Marginalized groups, such as Native Americans, often lack the agency and social capital to combat the crimes and harms committed against them. We need to collaborate with Native Americans to provide a voice for those who are too often unheard and ignored. We need to assist them with self-empowerment through any means possible, such as websites, protests, and engagement with those who can advocate on their behalf and help them self-advocate. For instance, the UN developed the Declaration for the Rights of Indigenous Peoples in 2007; however, this human rights instrument lacks legal affirmation. Therefore, INP rights continue to be violated worldwide because there are no legal sanctions associated with these violations, and groups lack the empowerment and resources necessary to fight back.

It is clear that historical laws and regulations contain language and guidelines that need to be redefined and updated in order for them to properly protect the environment and human health. There is a lack of enforcement, punishment, and accountability for violations of environmental laws and regulations. Corporate self-policing and formal/criminal enforcement mechanisms for environmental offenses have shown minimal or no deterrent effects for reducing environmental violations (Stretesky, 2006; Stretesky & Gabriel, 2005; Stretesky, Long, & Lynch, 2013b; Stretesky & Lynch, 2009; Stretesky, Lynch, Long, Barrett, 2016). These effects are likely due to the fact that existing punishment for environmental offenses is more lenient compared to sanctions assigned to non-environmental offenses (Cochran, Lynch, Toman, & Shields, 2018), and there is low probability that environmental offenses receive criminal prosecution (Lynch, Barrett, Stretesky, & Long, 2016).

In addition, the geographic distribution of environmental offenses has implications for penalties imposed on corporations. To be clear, regions with high income and high White populations have less environmental crimes and greater likelihood of penalties imposed for violations compared to their counterparts (Lynch, Long, & Stretesky, 2020; Lynch, Stretesky, & Burns, 2004a; 2004b; O'Hear, 2004). Even large monetary fines fail to limit the treadmill of production through enforcement (Stretesky, et al., 2013b). Here, we see the need to increase the severity of punishment for environmental offenders as a way of making them accountable and reducing or preventing future offending. This relates back to Durkheim's theory of punishment, wherein punishment was used to establish order (authority), obedience, and deterrence (see Lynch, Newman, & Groves, 1993). Punishment, therefore, will reinforce authority, moral boundaries, and the moral social order, as well as deter the offender and social audience. In doing so, punishment results in the reinforcement of solidarity and moral boundaries (Lynch et al., 1993).

Current laws and regulations also need reformation to integrate issues and perspectives of community concern. Adding to this purview, it is necessary to ensure racial, social, and cultural equality are addressed so policies that were created to manage and protect people and the environment do not prioritize capitalist interests instead.

Criminological Theory

As previously discussed in Chapter Three, orthodox criminological explanations of crime omitted environmental harms, therefore ignoring the social economic factors that influence law-making and power relations (Lynch, 1990; Lynch & Stretesky, 2011; Stretesky et al., 2013). In doing so, these theories fail to address environmental harms associated with state-corporate crimes, green victimization of disadvantaged groups, and underrepresented populations. Although green criminologists have attempted the application of orthodox theories to environmental crimes, it is clear that current interpretations are insufficient in their explanations. Here, ToP theory has been utilized to extend a political economic approach for explaining green crime. Recently, Lynch and colleagues (2017) brought that focus to green criminology (PEG-C) to address theoretical limitations, such as green crime, environmental law and harms, and environmental justice, which are otherwise ignored in criminological scholarship.

Moving forward, given that green crimes cause greater social harm than traditional street crimes (Michel et al., 2016), and include non-traditional victims, they should be considered for integration with mainstream theoretical perspectives (see Agnew, 2012). In addition, future theoretical perspectives should incorporate harms that occur as an extension of environmental, social, and economic injustices, which were included in radical definitions of crime as early as the 1970s (Kramer, 1985; Schwendinger & Schwendinger, 1970). These perspectives should also address the failure of prior theories that not only ignored offenses committed by powerful forces, but the underrepresented populations and disadvantaged groups they victimized. Further, future theoretical explanations of crime should consider the victim-offender overlap of the disadvantaged groups they continue to blame for the majority of crime (i.e., low income minorities).

In sum, green perspectives of crime address offenses and victims that are often ignored within traditional criminological theory. Green criminology's focus on the impacts of power structures on the environment has important implications for the modern world, especially our reliance on fossil-fuel, the potential future of nuclear energy, and the climate crisis. That is, green criminologists are tasked with researching topics that fall under the purview of a society and administration driven by capitalism in a field that otherwise ignores them.

Limitations of the Study

This study is not without limitation. One limitation of this study is the reliance on evidentiary materials drawn from multiple data sources. Although this method (triangulation) is a strategy of validation, it questions the reliability of the sources collected and analyzed. For instance, several sources were retrieved from government agencies whose information reflects the beliefs of those in power and often goes against what the laws and regulations represent. To be clear, several sources drawn from the EPA website suggested biases of the current administration. For example, the EPA page that discussed the $600 million dollar settlement won by Navajo Nation in 2017 claims the settlement will be used to clean up over 200 mines on their land, but fails to mention how long the remediation process actually takes, and how that is not nearly enough money to cleanup 200 mines, especially considering it cost $110 million dollars to cleanup just two mines five years earlier.

Using these data sources, however, has several benefits. First, drawing materials from multiple sources allowed for the corroboration of the findings. Second, using multiple sources allowed for the convergence of several perspectives. Lastly, this allowed the author to put together a complete story. For instance, several sources were analyzed in order to exhaust all possible outcomes before the research findings were composed.

Another limitation of this study was the focus on uranium mining in one geographical region (the Southwest U.S). This may limit the generalizability of this study's results to other regions of the U.S. where uranium mining occurs. In particular, the environmental impacts will differ across regions. For instance, the Southwest is a desert region with low precipitation rates and expansive barren areas. Many of the wildlife and vegetation species that inhabit the desert are unique and play important roles in the ecosystem's stability. That is, adaptation to the severe lack of available water is vital for survival. Therefore, any threat of contamination can result in the collapse of the ecosystem. However, in other regions where uranium mining occurs, such as the Northwest, high precipitation rates can increase contamination due to runoff and the spread of toxic waste. Additionally, this study is limited to uranium mining in the U.S. and did not compare impacts for INP in the U.S. to INP in other countries.

Relatedly, this study focused on one type of polluting industry that impacts Native Americans. As previously mentioned, there are several other industries that exploit and pollute Native American lands. This study briefly described other economic activities that impact Native Americans, such as oil exploration and other heavy metal mining; however, it did not examine in detail the unique effects of these other activities on the environment and human health, especially as they relate to Native Americans.

Finally, most information from available sources focused on Navajo Nation and their battle with uranium mining. Navajo Nation is the largest tribe in the U.S., with the largest Reservation; however, they are one of 32 federally recognized tribes that inhabit the Colorado Plateau region and are impacted by uranium mining. That said, it is possible that since the other tribes are significantly smaller in population and land size, they lack the resources of Navajo Nation. Although it can be assumed that the neighboring tribes experience the same victimization as the Navajo, little is known about exposure and impacts from uranium mining for other tribes. For instance, use of land and its cultural significance differ across tribes. Therefore, it is unknown how environmental effects associated with uranium mining will impact traditions for tribes other than the Navajo and what implications these impacts will have for Native American quality of life.

Directions for Future Research

The findings of this study raised several issues that warrant future research. Although availability is limited, quantitative data could be used to analyze environmental impacts associated with economic offenses. Further, these impacts could be examined in tribal regions. For example, the EPA’s TRI for Tribal Communities data tracks toxic chemical releases on or within one mile of tribal land. This data may be well worth exploring for comparative analyses across industry sectors, regions, and race.

Additionally, future studies could replicate this study in different areas, or with different resource industries. In doing so, these studies could explain patterns of green victimization across regions, with respect to Native American tribes. This would strengthen the argument that toxic colonialism is not limited to international nations, but is also an issue in the U.S. Further, these results could investigate how green victimization in the U.S. compares to green victimization in other countries.

This study could also be replicated using a different unit of analysis. The current study looked at uranium mines, but future studies could look at tribes or communities to see if the same effects from uranium mining are evident. For instance, instead of looking at uranium mines in the Southwest U.S., researchers could explore the effects of uranium mining across tribes inhabiting the Southwest U.S. This would clarify the generalizability of the effects of uranium mining, and similar studies could then be done cross-nationally.

Likewise, impacts of uranium mining for INP in other countries could be an important direction for future research. When domestic uranium production decreased, the U.S. imported most of its uranium from Canada and Australia. What does this say for INP living in these countries? Results from this study could be used to compare the impacts of uranium mining on INP in the U.S. to INP in other countries. Further, this study could explore differences between U.S. and international environmental laws and regulations and the implications for INP. Does the same exploitation exist across all or most countries where there is uranium mining? Which countries, if any, are mining responsibly?

Moreover, future studies could employ spatial analysis to examine the impacts of uranium mining across geographical locations. For example, this technique could be used to compare cancer rates across regions where uranium was mined. Further, spatial analysis could be used to demonstrate the relationship between poverty and industrial facility distribution. This would support environmental racism claims for disadvantaged communities.

Lastly, future research should explore the future of nuclear energy. As fossil fuel resources continue to diminish, governments are searching for cheaper and cleaner alternative power sources. Nuclear power offers a cleaner, suitable alternative to fossil-fuel, and nuclear technology is currently available in 30% of the world's nations while renewable technologies are still being developed as a power source on a global scale (Environment, 2018). However, reinstating domestic production would increase environmental degradation and health effects that already plague uranium-rich lands and nearby communities. This research could add to the literature exploring how the ToP facilitates the ecocide-genocide nexus.

This study of the impacts of uranium mining in the Southwest U.S. for Native Americans revealed the inadequacy and insufficiency of environmental laws and regulations as they currently stand in the U.S. Additionally, this study demonstrated how Native Americans continually struggle with environmental and social injustices as a result of corporate and government actions. In doing so, this study offers criminologists a new population to address when examining crimes of the powerful and victimization. Further, the associations between environmental crimes and Native Americans provide policy makers with an important issue that requires confrontation. Future studies are necessary to broaden the scope of criminological theory and research. Specifically, criminologists need to remove the focus from street crimes and poor, minority offenders, and extend it to include more corporate crimes and powerful (i.e., White) offenders. This extension could help draw attention to underrepresented populations, such as Native Americans.

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