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I, Aaron Wagner, hereby submit this original work as part of the requirements for the degree of Master of Arts in Anthropology.

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The Evolution of Risk Perspectives among Former Fernald Employees

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From Plant to Park:
The Evolution of Risk Perspectives among Former Fernald Employees

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Abstract

This exploratory case study of differences in risk perspectives among former nuclear weapons production workers, site management, and DOE employees uses oral interviews and analyzes how each population receives, interprets, and responds to information regarding risk over a long term “milling process”. Thematic analysis of semi-structured interviews from ten former workers, management, and DOE involved with the Fernald Feed Materials Productions Center reveal distinct changes in risk perception over time, conflicting views between worker vs. supervisor, and strong emotional responses to events at the Fernald site. The information gathered in this study provides a view of lived experiences of those involved with the nuclear weapons production complex during the Cold War and subsequent years. Additionally, it documents current attitudes of workers toward the government and provides a framework for analysis of the impact of other disasters and associated responses over the long term.
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Participants were recruited using data contained in the Fernald II Workers’ Medical Monitoring Program “Day et al v NLO et al, United States District Court, Southern District of Ohio, Case Number 90-CV-67, Judge Arthur Spiegel.”
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Chapter 1 Overview

From 1951 to 1989, the U.S. Government used a 1,050 acre plot located in a rural Ohio community eighteen miles northwest of Cincinnati to refine uranium ore and other key components vital to the production of nuclear weapons. Known as the Fernald Feed Materials Production Center (FMPC, hereafter ‘Fernald’), the site provided the first step in refining uranium ores into high grade radioactive cores and enriched materials for the production of nuclear weapons.

Production at Fernald existed within a culture of secrecy driven by concerns for national security and the nuclear arms race of the Cold War. Members of the surrounding community were not informed of the nature of the operations, and Fernald workers themselves had limited understandings because they were restricted to certain plant areas and to specific, discrete tasks. Despite the secrecy, environmental and safety oversight at the plant remained relatively lax until the Department of Energy (DOE) confirmed the existence of contaminated residential wells and releases of uranium dust in 1984. This sparked an outcry from residents and eventually led to a congressional investigation in 1986 (Gerhardstein and Brown 2005: U.S. House 1986). Further investigations of the site confirmed prior releases of radioactive contaminants, disregard for worker safety, and falsification of records (U.S. House 1986).

After extensive litigation, both workers and area residents received compensation for emotional distress and the option to participate in a comprehensive medical monitoring program (Wones et al. 2009). This program has collected data indicating a higher prevalence of kidney and bladder disease in participants of the program when compared to the national average (Pinney et al. 2003, 153). An excess number of cancers have also been documented among Fernald workers, leading to a compensation program that currently pays for care of illnesses,
wages lost, and disabilities (O’Farrell 2006). The Fernald site was permanently closed in 1991 and renamed the “Fernald Environmental Management Project” to reflect the transition from nuclear production facility to remediation site. Completion of the environmental cleanup of the site occurred in 2006 (Wones et al. 2009).

When the Fernald plant opened in 1951, residents of this rural community welcomed the hundreds of jobs that came with it; and those that worked at the plant felt proud to be an integral part to our nation’s defense network (O’Farrell 2006). Many of the workers had served in the military during World War II and Korea. Accustomed to serving their country, they trusted the government to look out for their best interests. But as the subsequent litigation suggests-- and this thesis further explores-- a very different set of feelings and attitudes replaced pride and trust when workers began to experience health problems and learn about the environmental impacts of the materials they worked with. The plant many considered to be an animal feed plant because of the familiar red and white checkered patterns on its water towers, and its designation as a “feed material production center,” suddenly became known as a source of potentially harmful radioactive materials. The working and residential populations of Fernald presumably underwent abrupt changes in trust in government, sense of security, and in perceptions of safety and risk exposure; but there is little published research into this important dimension of the events.

While the radiation releases and lack of oversight frightened and outraged the surrounding community, they most directly affected residents employed at the Fernald plant. Working with radioactive materials for years using inadequate protective equipment, many workers developed various cancers and other health issues, and in 1990 they filed a class action lawsuit claiming they had been unknowingly subjected to radiation exposure (Williams 2002, 52). Discovery of the mistakes at Fernald became a tipping point locally—because it suddenly
and drastically brought into question key assumptions about the structure of relations and it required acceptance of a very different and troubling reality for a whole community—and nationally, because it led to the investigation of all DOE sites by the Federal government and to the eventual decommissioning of several nuclear weapons production facilities.

As an event that not only polluted the environment but also posed long-term threats to the health and well-being of the community and clearly damaged trust in the government, the Fernald situation and others like it led to community outrage in the form of protests and organization of workers and residents alike. Lobbying groups were formed to get answers and hold the DOE accountable for their operation of the nuclear weapons production facility at Fernald. As emotions toward the government and the perception of risk evolved information was gathered, interpreted, and transformed into action as groups lobbied for compensation, full disclosure, environmental cleanup, and medical compensation. These groups, especially workers, had various views based on their experience at Fernald. What was it like to be a proud participant in the Cold War effort? How did it affect their safety procedures? How did workers come to terms and resolve betrayal? This study uses primarily oral history interviews to examine these questions and better understand how now-retired workers experienced their work at Fernald, both before and after, the disclosures of harmful working conditions and how they came to terms with it.

As this research is exploratory I have three primary questions or goals.

To describe how workers depict their changing perceptions of risk and safety prior to, during, and following employment at Fernald.

To describe reactions to the nature of “official” responses to worker concerns.

To understand the change in worker risk perspectives, if any, accompanied by completion of environmental remediation and what they feel is an appropriate response by the government.
Chapter 2 Background and Review of the Literature

This chapter reviews the literature on social processes of risk perception in the context of disaster and “milling process” theories of how long-term sense or meaning making occurs in affected communities. In particular, I highlight the differences between how experts and the public formulate or construct risk through social discourse and how these differences shape expectations of a government’s response to disaster. At the end of this chapter I provide a justification for this thesis and how it can contribute to the literature.

Technological Disaster and the “Milling Process”

As events that involve natural or technological destructive agents acting on a population, disasters occur at the interface of environment and social structure (Oliver-Smith 1996, 305). In many ways, disasters demonstrate the failure of a society to adapt successfully to certain environmental features and they are an integral part of human systems rather than random events (Oliver-Smith 1996, 303). From this perspective, disasters reveal the behavioral, social, and political arrangements of society, and they can create radical shifts in worldview often changing the social fabric of the communities that experience and respond to them (Button 1995, 242).

In the aftermath of disasters affected populations struggle to interpret and establish meaning in an uncertain atmosphere. Traditional norms that guide behavior are disrupted and new behavioral norms are created (Schneider 1992, 137). Individuals may suddenly face previously unknown health hazards, or environmental contamination of resources critical for individual and community wellbeing. These abrupt changes prompt questions about how to best deal with the new circumstances and why they happened in the first place. This search for meaning is referred to as “the milling process” (Turner and Killian 1972).
In the milling process, construction of reality can be altered through social discourse between individuals, groups, and organizations (Button 1995). Individual accounts and media coverage provide key bits of information that individuals must piece together to form a coherent picture of the situation. A “keynoting” process creates new norms based on the collective dominant ideas that emerge as specific ideas are emphasized or discarded through discourse (Schneider 1992, 137; Turner and Killian 1972). These new social expectations of the affected population are referred to as “emergent norms” (Schneider 1992, 135). Groups responsible for responding to disaster, usually governments, engage in a similar process to create “bureaucratic norms” that outline what they are prepared to do in the event of a disaster occurring (Schneider 1992, 136). The gap between emergent and bureaucratic norms reflects the success or failure of a disaster response with larger gaps resulting in failures (Schneider 1992, 135). A critical component in the development of bureaucratic and emergent norms is the milling process involved in the formation and assessment of risk. This varies over time and among populations.

In many cases of disaster, a discrepancy exists in perspectives between government officials and the affected populations with regard to risk (Button 1995). This is because risk is a social process. Each culture has a different set of shared values and supporting social institutions. These values and institutions create bias by highlighting or downplaying certain risks (Douglas and Wildavsky 1983, 8). Government officials, viewing risk as an administrative problem, focus on managing reactions and diminishing uncertainty. The public view risk as a personal threat, and focus on managing the hazards themselves (Button 1995). By objectifying risk, government officials do not incorporate public perspective into risk management and attempt to control public evaluation of risk by reducing access to information about hazards (Button 1995, 243). Critical information about hazards and risk may be withheld from the public altogether in some
cases. Withholding critical information undercuts the relationship between a governing body and its citizens, bringing into question public trust and responsibility after a disaster. These breakdowns in communication facilitate public distrust of government. Recovery is more difficult as citizens struggle to assign meaning, prolonging the milling process (Button 1995, 243; Schneider 1992, 138).

**Key Determinants of Risk**

The milling process highlights the formation of risk perception before and after disaster. It is highly subjective, but deals primarily with the possibility of harm versus the expected benefits of the activity or technology. It is necessary to examine how risk is determined at a fundamental level to understand the meaning making process involved in shaping risk perception. A variety of research disciplines generated numerous efforts to identify key determinants in the construction of perceived risk and benefits. Originally, theoretical models of risk determinants offered two standards for how risks were perceived: the degree to which the risk was dreaded and the degree to which the risk was unknown (Finkel 2008, 123).

Cognitive science suggests this reflects the two fundamental ways through which human beings formulate risk: the experiential system being intuitive and hard to access consciously, and the analytic system being calculated, conscious, and void of emotional associations (Slovic et al. 2004, 311). The experiential system is dependent upon emotion or affect, how positive or negative something feels, and relies on images or associations embedded in experience (Slovic et al. 2004, 312). Risk analysis based on this system is traditionally considered “irrational,” while the analytic system, more measurable and accommodating to scientific deliberation, has been favored. However, numerous studies have shown rational decisions must integrate the two systems (Slovic et al. 2004, 311).
For example, using bipolar scales to measure the positive and negative affect toward pesticide use, it was determined that the strength of affect was linked to the relationship between perceived risk and benefit of that activity (Slovic et al. 2004, 315). The higher the perceived risk, the more negative feelings were associated with it and pesticide use was viewed as less beneficial (Slovic et al. 2004, 315) This suggests that people base judgments of risk on how they feel about an activity or technology in addition to how they think about it (Slovic et al. 2004, 315).

The emotional processes involved in risk assessment play a crucial part in understanding how risk assessment occurs because feelings, such as anger, often indicate moral aspects about a situation. For example, people react to man-made risks and disasters caused by human error more strongly than comparable natural disasters because there is an aspect of trust in the groups responsible for the activity or technology to mitigate risks. When this trust is broken, anger towards responsible individuals is often projected (Sjöberg 1998, 3). Examining the connections between emotions, morals, and rationality, it is possible to see that risk is a combination of individual judgment linked to cultural values.

Douglas and Wildavsky emphasize how connections between family, friends, and interest groups shape perceptions and how some risks are prioritized while others are relegated out of shared values rather than individual ones (Finkel 2008, 123). They identify several key determinants of risk in their research. For example, control is a major determinate of risk in that there is a distinction between risks that are imposed verses risks that are voluntary. This is because imposed risk may have been avoided if known (Douglas and Wildavsky 1983, 16). Perceptions are further complicated if others profit from the imposed risk or if it was imposed by a governing body that subjects trusted to mitigate hazards, or if the risks are irreversible such as
health risks (Douglas and Wildavsky 1983, 17). Additionally, many studies in risk assessment have found that perceived risk is more influential than expected benefit (Sjöberg 1998, 2). For example, people are typically unwilling to incur health risks in exchange for financial rewards because health issues may be more costly to quality of life in the long term when the money has already been spent (Kunreuter et al. 1990).

Communications research in the context of risk examines the role of cultural institutions, like the news, in shaping risk perception and leading to the formation of the social amplification of risk theory (Finkel 2008, 123). The content of media coverage and type of medium conveying information heavily influences the meaning making process associated with risk. Information reported is always selective, and journalists may seek to exaggerate risks to produce a story more newsworthy by attempting to elicit emotional and moral connections (Begley 1991). This can lead to public misconceptions about risk making it difficult for experts to adequately address a situation as the public may feel the response is not thoroughly addressing the risk at hand (Sjöberg 1998). This difficulty of communicating risks and the type of media used to persuade populations to increase protective measures is well documented (Perry 1985; Smith et al. 1990).

**Risk and Nuclear Discourse**

Nuclear discourse “encompasses a broad set of symbolic activities surrounding military and civilian nuclear technologies; the organizations and institutions that produce, utilize, operate, and regulate these technologies; and the social, political, and cultural consequences of these technologies (Kinsella 2001, 278).” Nuclear discourse provides an ideal subject in which applied risk research and theoretical model evaluation can be conducted. For example, the meltdown of the Chernobyl nuclear power plant in 1986 affected nearly seven million people in Belarus, the
Ukraine, and Russia and has been the subject of many studies on risk analysis including the relationship between perceived risk and subjective health (Bay and Oughton 2005; Havenaar et al. 2002). In this case, the rate of self-reported health problems, psychological distress, and medical service use near Chernobyl is much higher than in unexposed regions (Havenaar et al. 2002). These indicate emotional responses such as apprehension, caused by radiation exposure, may stimulate increased awareness of physical health and make individuals more likely to attribute unrelated physical illnesses to exposure and increase perceived risk of radiation (Havenaar et al. 2002, 569). The short and long term health risks from such disasters have been well documented (Christodouleas et al. 2011).

In addition to the health risks posed by nuclear technologies the effect of time on perceptions of risk associated with nuclear materials has also been explored. In their study of nuclear waste management Gomez et al. indicated that there is significant change in risk perception when individuals are exposed to the stream of information about nuclear risks for a long period of time (1992, 2). As political and cultural ideologies that reflect the benefits, safety, and economic impact of nuclear technology become more defined overtime individuals are better able to integrate these beliefs into the assessment of perceived risks associated with nuclear waste in a milling process (Gomez et al. 1992, 3). In other words, the more defined an ideology is the less individuals have to assume the worst about potential risks with nuclear technology because they are more educated about the topic.
**Justification for the Study**

Nuclear discourse has evolved over a substantial amount of time since nuclear technology was invented and has spanned such cultural events as the Cold War. This length of time, the changing role of nuclear weapons production sites, and the sheer volume of information that has been analyzed and interpreted by field experts, the public, and the media make nuclear discourse an ideal subject for research on risk and the milling process.

Additionally, while the public and government largely consider the response to environmental and health hazards posed by the Fernald site as a success, the workers who were subjected to these hazards on a daily basis over many years have become more polarized about the topic than ever. Through personal conversations with other Fernald researchers and officials responsible for administering the workers medical monitoring program, I have gathered that some workers express anger about their compensation and treatment by the government. As previous studies have shown that emotional feelings are connected to risk exposure I contend that former Fernald employees can offer insight as to how the milling process shapes the perception of risk over time. This research seeks to contribute to scholarly discussions on risk analysis and has practical implications for those responsible for long term disaster response.

**Analytical Framework**

This thesis evaluates how an affected population and government officials perceive risk throughout the milling process and how these perceptions shapes bureaucratic and emergent norms. This has been accomplished by examining nuclear discourse between former Fernald workers and DOE officials in historical documents and interviews. Nuclear discourse is examined both within and across three time periods that reflect cultural changes. The first time period from 1951 to 1985 represents the height of the Cold War mentality and production capacity as well as a time when formal recognition of hazards by plant managers and risk
communication to workers was lacking. The second time period, began in 1986, represents Congressional investigation into plant hazards and involved formal disclosure of risks posed to workers, and ultimately site closure and remediation. Also, during this time frame reparations to workers for imposed risks were implemented. The third time frame, ranging from 2006 to present, represents the DOE’s successful environmental cleanup of the site and the continuation of the medical monitoring and worker compensation programs.

In examining stakeholders’ discourses I adopt a sociocultural theory presented by Kenneth Burke that suggests the labels people use to assign meaning to their experiences reflect their worldview, and by examining the language a person uses to express themselves a researcher can identify that individual’s perspective (Burke 1984). For the purpose of this thesis, a risk perspective represents a system of meanings and emotions by which individuals characterize and construct the possibility of harm.

To understand the risk perspectives of Fernald workers and DOE officials I employ a method that is similar to the one used by Tarla Rai Peterson in her exploration of the meaning systems associated with risk and safety among Texas farmers (Peterson et al. 1994). To detect patterns in the farmers meaning making systems Peterson conducted thematic analysis on the transcripts of public meetings and qualitative unstructured interviews with farmers (Peterson et al. 1994, 203). In a similar fashion I conduct thematic analysis on the transcripts of interviews with former Fernald workers, Fernald management, and DOE employees.

Understanding the meaning making systems associated with risk in these groups will allow for a native perspective on the experiences of workers at the Fernald Feed Materials Production Center. By examining the impact of the larger cultural events at the time this research will offer critical analysis from an outsider’s perspective and provide a holistic view of the
milling process that these populations have experienced. This type of research which emphasizes the conversation between native and outsider perspective is a hallmark of Anthropological theory; and it stands to make a significant contribution when it comes to analyzing risk and the emotional response to disasters by bridging the gap between government officials and the affected populations (Button 1995: Oliver-Smith 1996, 309). I am particularly interested in exploring the following questions:

- How did the end of the Cold War have an affected on risk assessment and modify emergent norms, if at all? The concern on particular dangers is a reflection of the type of society that makes them and people who are concerned about attack from abroad tend to be less worried about local risks (Douglas and Wildavsky 1982, 28). During the Cold War the focus on national security and the duty to serve the good of the country may have made workers less concerned about their personal safety making them less critical of hazard control and government accountability.

- Is there a distinction between known and imposed risks, and is this applicable to the formation of risk perspectives among the populations involved with Fernald? People become angry when they are subjected to risks they might have avoided if known and this damage is done by others profiting from their ignorance (Douglas and Wildavsky 1982, 17). The formal disclosure of risk by government officials occurred only after a long period of denial and deception and could be responsible for increased worker expectations of government accountability and larger reparations.

- Did the completion of environmental remediation at Fernald have any effect on worker risk perception? The completion of site remediation in 2006 signaled success in government and resident minds but workers still have a lingering distrust. While
the environmental risk has been eliminated the medical monitoring program is a reminder of continued health risks in the worker population. This is especially true with disorders associated with radioactive exposure, as they may take a long period of time to materialize (Wones et al. 2009). Government officials may have emphasized environmental risks and relegated worker health risks while workers have become increasingly concerned about their health.
Chapter 3: Research Design and Methods

Research Questions

This thesis uses a quasi-ethnographic, case study approach involving oral history interviews with former workers and managers to examine perceived changes in Fernald work protocols, perceptions of occupational risk, and emotional responses to hazardous material exposure. Here, I further describe these goals and the methods used in addressing them. For the aim of identifying and describing how workers depict their changing perceptions of risk, I interview former workers and managers of the Fernald plant and DOE. This research also relies on historical documents, including congressional records, to confirm and clarify topics discussed in interviews and paint a more detailed picture of events at the Fernald site.

This thesis uses interview transcripts from 10 semi-structured interviews in addition to congressional and historical documents to identify risk perspectives. Additionally, historical documents published by the DOE and congressional publications will be used to provide context for the political and cultural events that Fernald was subject to. These include Cold War weapons production, federal investigation of the nuclear weapons complex, and comprehensive medical monitoring programs. As such these documents provide a historical backdrop to influence cultural factors influencing worker risk perception.

A total of 10 participants were recruited on an opportunistic basis by mailings using data from the Fernald II Workers’ Medical Monitoring Program (Day et al v NLO et al, United States District Court, Southern District of Ohio, Case Number 90-CV-67, Judge S. Arthur Spiegel). A representative of the Fernald Medical Monitoring Program mailed information about the study to individuals with potential interest in participating. Those individuals that wanted to be involved then contacted me by phone to schedule a date and place to be interviewed. Participants’ duration of work experience at Fernald ranges from 16 to 52 years and covers the years 1951 to 2006.
The interviews collected serve as personal narratives for Fernald workers and DOE officials allowing them to express their experiences at the site and demonstrate their changing understandings of the risks associated with working there. All interview procedures were approved by the Institutional Review Board of the University of Cincinnati. The interviews were conducted in an open ended fashion that allowed each participant to focus on what they deemed relevant about their time at Fernald. A few questions were addressed in all interviews to provide some continuity. These questions included: How did the Cold War influence Fernald? What concerned you the most at Fernald and why? How do you feel about the medical monitoring program and compensation? What did you know about what you were working with? How do you view the DOE’s operation of the site and response to public outcry? Conducting the interviews this way limits assumptions and allows one to uncover cultural meanings by “stepping into the mind of another person, to see and experience the world as they do themselves” (McCraken 1998, 9). Interviews were conducted at the Fernald Preserve Visitors Center or at each participant’s residence. The majority of those interviewed lived in suburbs of Hamilton, OH or rural communities in nearby Indiana. Each interview lasted from 45 to 90 minutes and in some cases participants shared video or photographs while discussing events at Fernald.

Data Analysis

First, I identify the risk perspectives among each population for each of the three time periods. This is done through thematic analysis of 10 interview transcripts to determine themes regarding the meaning making processes involved with risk. Thematic analysis is a way to identify, analyze, and report patterns within data by coding and comparing texts (Braun and Clarke 2006). To develop themes I reviewed each transcript with particular attention to the terms used by each individual in their descriptions of risks and create codes for like terms.
possible each code was labeled with actual terms used by the participant. The prevalence of each code was tracked to their relationship across individuals to develop categories and identify patterns.

Thematic analysis of transcribed interviews revealed several common themes Fernald workers and management used to discuss their experiences at the Fernald plant. Themes were identified by combining codes that were similar in nature and could be grouped together under one collective label. For example, when discussing each code or subtheme associated with changes in time, participants used terms or phrases associated with chronology such as “back then” and “now.” Since each subtheme was associated with these phrases indicating time and some form of evolution or change they could be grouped together under a larger theme of “Evolutions in Perspective.”

Second, I compare and contrast the content and thematic patterns expressed by workers vs. management and DOE employees.

Finally, I examine the possible impact on risk perspectives of major cultural changes these populations have experienced during Fernald’s production years and after. These cultural events include the Cold War, the exposure of malpractice in the Nuclear Weapons Production Complex, and the change in Fernald’s role from nuclear weapons production to environmental remediation site.
Chapter 4: Historical Context

The history of the Fernald site is marked by three different time periods reflecting the sites change from a secretive nuclear materials production facility to a nationally recognized environmental and health concern, and ultimately to an environmental remediation site. The first period represents a cultural context driven by national security concerns, the second context reflects increased public scrutiny, and the third period reflects government response to environmental and health concerns. This chapter provides an overview of Fernald in these historical contexts to more thoroughly illustrate the complexities Fernald workers and DOE officials have faced when analyzing risks.

Nuclear Weapons Production

Following the conclusion of World War II, the United States government recognized the need to regulate atomic power and established the Atomic Energy Commission (AEC) with the Atomic Energy Act of 1946 (U.S. House 1946). This act enabled government control of nuclear materials and facilities and tasked the AEC with developing a complex to produce large quantities of atomic weapons for the purpose of national security (DOE 1998, 17). Using facilities established during the Manhattan project and adding additional sites the AEC created a complex network of specialized sites across the country that worked in unison to produce nuclear materials and assemble atomic weapons (DOE 1998, 19). For example, the Hanford site in Washington State produced fuel and refined radioactive materials that were assembled into warheads at the Pantex Plant in Texas, which were then tested at the Nevada Test Site near Las Vegas (US DOE 1995). Figure 1 illustrates the locations of the sites involved in the nuclear weapons complex.
The Fernald Feed Materials Production Center (FMPC) was constructed by the AEC in 1951 as the main site for refining uranium-ore and producing uranium metal for enrichment and further production at other complex sites (US DOE 1998). This complex process began by taking ore concentrates and dissolving them in nitric acid to produce a slurry that was then mixed with tributyl phosphate and kerosene to extract purified uranyl nitrate (Pinney et al. 2003, 139). This compound was then thermally denitrated to produce an orange oxide called uranium trioxide (UO$_3$) which could be converted to uranium fluoride (UF$_4$) or green salt by being reduced with heated hydrogen and a reaction with anhydrous hydrogen fluoride (Pinney et al. 2003, 140). This green salt could then be shipped to other sites for enrichment or used to create uranium metal by high temperature reduction and then further processed into fuel cores for use at other sites (Pinney et al. 2003, 140). Figure 2 illustrates this process on a plant to plant basis.
To do this work the AEC contracted National Lead Company of Ohio to operate and manage the FMPC (US DOE 1998). This contract remained despite several changes in the federal agencies responsible for overseeing the nuclear weapons complex. The Energy Reorganization Act of 1974 eliminated the AEC and created the Energy Research and Development Association (ERDA) that was responsible for managing nuclear weapons production (US DOE 1998). Subsequently, the Energy Reorganization Act of 1977 eliminated the ERDA and established the Department of Energy (DOE) as the federal agency tasked with overseeing the nuclear weapons complex (US DOE 1998). National Lead continued to operate
the plant until 1986 when the Westinghouse Materials Company of Ohio took over contractual responsibilities of the Fernald plant until the end of production years in 1991 (US DOE 1998). During this time the Fernald site produced over 500 million pounds of uranium metal products during production years for other sites in the nuclear weapons complex (Fluor Daniel Fernald [FDF] 1998, 1).

**Culture of Secrecy and Self-Regulation**

The development of nuclear weapons during the Manhattan project was a top secret process and communication of information was on a need-to-know basis. As such, when the AEC, and later the DOE, were tasked with the management of nuclear weapons complex a culture of secrecy remained (Hamilton 2003, 12). With the onset of the Cold War the need for secrecy was further stressed and, “security needs demanded compartmentalization and rigorous prohibition against unnecessary interchange of information among sites, among individuals and groups at a given site, and between sites and the outside world” (Fehner & Gosling 1996, 7). The extent of these security provisions limited the influence of other state and federal agencies, such as the EPA, and sheltered nuclear weapons complex facilities from environmental oversight and public accountability (Silverman 2000, 265). Essentially, this made the AEC and later DOE responsible for setting and monitoring standards to regulate safety and environmental impact among facilities in the nuclear weapons complex. However, at this time little was known about the dangers associated with radioactive materials and these facilities operated “at a time when standards were more permissive and regulatory requirements less restrictive than they are currently, and environmental expertise and concerns were less advanced” (Fehner & Gosling 1996, 7).
This self-regulation and lack of standards coupled with the emphasis on national security resulted in human health and environmental concerns being largely ignored until the 1980’s when reports of environmental contamination shattered the veil of secrecy and brought the nuclear weapons complex to the national stage.

**Exposure of Environmental Contamination and the End of Self-Regulation**

Fernald drew national attention in December of 1984 when a faulty collection bag on an emission stack released approximately 270 to 370 pounds of uranium oxide dust into the atmosphere (Labar 1989, 96). Prior to this accident the community around the Fernald site had been largely unaware of the true nature of the plant considering it to be a producer of animal feed because of the red and white checkerboard towers and the designation as a feed material production center (Labar 1989, 95). The uranium oxide release and ensuing public outcry sparked a wave of increased investigation by federal and state agencies into the operations of the Fernald site and the nuclear weapons complex as a whole.

On March 5th 1985, a notice of noncompliance was issued to the DOE by the U.S Environmental Protection Agency (EPA) stating concerns of Fernald’s environmental impact due to waste storage and documentation procedures (U.S. DOE 1998). A year later Ohio EPA filed a suit against the DOE for failing to comply with environmental regulations (Hamilton 2003, 85). This case was presented to the U.S. Supreme Court who ruled that federal facilities held sovereign immunity under the Resource Conservation and Recovery Act of 1976 (RCRA) and the Clean Water Act (Hamilton 2003, 85). Noting the difficulties faced by federal, state, and environmental groups in holding federal facilities accountable to hazardous waste laws the subcommittee on Transportation and Hazardous Materials of the House Committee on Energy and Commerce held several congressional hearings to address these issues (Williams 2002). This resulted in the
passage of the Federal Facilities Compliance Act of 1992 that waived federal facility’s sovereign immunity from environmental laws and allowed regulators to fine the facilities if they failed to comply with negotiated compliance agreements (Hamilton 2003, 85).

**Exposure of Health Hazards and Class Action Lawsuits**

While the DOE was facing increased regulation of environmental compliance standards investigations also brought to light the health hazards the Fernald site posed to the local community and Fernald employees.

After becoming aware of the release of radioactive materials after the discovery of uranium contaminated wells during 1981-1984 and the 1984 dust collector accident, Fernald residents filed a class action lawsuit against the DOE and its contractor NLO in 1985 citing emotional distress and property value diminution (Gerhardstein and Brown 2005; Hamilton 2003). This lawsuit focused nation and local media attention on Fernald in addition to congressional investigations and made the site an exemplar for environmental and health concerns that were present across many sites in the nuclear weapons complex (Hamilton 2003).

An article in *Time* portrayed how many residents of Fernald felt, stating, “a bitter sense of betrayal, even among some defense-minded residents, has grown from the apparent aloofness of Washington officials to the perils that weapons production may pose to the health of innocent people living near the plants (Cramer et al. 1988, 62).”

Residents felt they had been intentionally lied to about the contamination when it was revealed the NLO prompted the DOE to no avail to construct better waste disposal and treatment facilities in the 1950’s, knowing routine operations would release emissions to the surrounding air, soil, and water (Lowther & Schug 1988). The resident lawsuit reached a settlement in 1989 with a 73 million dollar payment for damages allocated for “emotional distress, medical
monitoring, residential real property diminution and legal and administrative costs” and $5 million for “commercial and industrial real property diminution claims” (US DOE-FEMP 1995, 14). However, the residents of Fernald were not the only individuals affected by the sites operation.

During this time additional congressional investigation using internal reports from the Fernald site found deficiencies in nuclear waste disposal and worker health and safety (U.S House 1986). Some memorandums described the dire conditions that workers were subject to with such statements as “the dust collector material was handled in a manner which promotes maximum employee exposure to harmful radioactive dust (U.S. House 1989, 16).” Additional documents from the site indicated some workers were exposed to 100 times the maximum allowable concentration of radiation levels (U.S. House 1989, 16). Due to security restrictions at the site some workers were not even aware they were working with such materials as plutonium and thorium (Labar 1989, 95). Facing increased environmental regulations and concerns for health and safety, the end of the Cold War, and the need to produce nuclear weapons the Fernald site ceased production in 1989 (U.S. DOE 1998).

With site closure, workers were no longer restricted by their security clearances from pursuing litigation against the DOE and its contractors for knowingly subjecting them to radiation hazardous without informing them and filed their own class action suit in 1990 (Williams 2002, 52). This action promoted several reviews of working conditions at the Fernald site in the following years, including one performed by an independent review company known as the Institute for Energy and Environmental Research. This report conducted in 1994 documented further evidence of overexposure to radioactive materials and found that exposure records were determined through external measures, such as radiation badges, and did not take into account
the most important route of exposure through inhalation of contaminated dust (IEER 2000, 3). These report findings were presented in court and the DOE settled the case with workers in 1994, providing lifetime medical monitoring and payments for emotional distress (IEER 2000).

**Site Remediation**

While the Fernald site halted production in 1989 it was not until 1991 that the site began a more permanent closure process of environmental remediation and became known as the Fernald Environmental Management Project (FEMP) (U.S. DOE 1997). A Remedial Investigation Feasibility Study (RI/FS) to evaluate the environmental contamination at the site and identify a plan for cleanup actually began in 1986 when a baseline survey of environmental problems at DOE sites was launched by Secretary of Energy John Herrington (Hamilton 2003, 80). Following the guidelines of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) a remedial action plan was designed and began to take effect in 1996 (Hamilton 2003, 76). With cleanup projects clearly identified and additional funding, the Fernald remediation process was accelerated and the site restoration was completed in 2006 with Fernald becoming a nature preserve (Hamiltion 2003).

**Complications for Fernald Workers**

With environmental remediation at Fernald complete and compensation programs in place for both residents and workers, the government response to the environmental contamination and health hazards from the sites production years was considered a success. However, former Fernald workers faced additional complications. After years of hazardous material exposure at Fernald many workers began to experience increased rates of cancerous and noncancerous medical conditions (Gerhardstein and Brown 2005). Research using data from the Fernald Medical Monitoring Program showed statistically significant increases in prostate and
kidney cancer, malignant melanoma, and bladder and kidney disease (Gerhardstein and Brown 2005, 4).

However, in order to receive compensation for conditions workers were required to undergo a dose reconstruction to estimate amount of exposure they were subject to and prove that their existing conditions were more than likely related to their time at Fernald. Additionally, an independent investigation by IEER found that the external dosimetry systems used at Fernald resulted in inaccurate exposure readings, and in some causes data was missing or inaccurately recorded (IEER 2000, 2). As this incomplete data was used to calculate exposure many workers felt their dose reconstruction was inaccurate and resulted in difficulty filing claims. During the duration of this study dose reconstruction for claims was repealed but claims can only be filed for specific medical conditions. As the long gestation period for medical conditions resulting from radiation and chemical exposure comes to fruition workers continue to pursue compensation for illness that are not currently included in the claims process.

Summary

The Fernald site was a critical component during nuclear weapons production during the Cold War era. As such it was subject to a veil of secrecy and self-regulation that created a vulnerable situation that when exposed resulted in outrage from the community and the workers of the plant itself. In response to the class action lawsuits from environmental releases of hazardous materials and the winding down of the Cold War the Fernald plant was closed and underwent site remediation. During this time compensation and medical monitoring programs were established for both workers and residents of the surrounding community. However, workers faced several difficulties in filing for compensation and have been subject to a longer
milling process that continues to affect their construction of risk and their views on being involved with Fernald as a whole.
Chapter 5: Results

Qualitative analysis revealed a number of overarching themes that help to illustrate evolving perceptions of risk among Fernald workers and management as they came to learn about their exposure to radioactive elements. The adult interviewees included 2 women, 1 African-American, 1 Asian-American, and ranged in age from 32-85 years. Each of these individuals painted a slightly different picture of this diverse production facility based on job title and length they worked at the plant. Themes focused on the dramatic changes in procedure and culture that occurred over Fernald’s production years. Additionally, themes reflected how the lived experience of workers and supervisors not only shaped opinions on this change but also influenced how these individuals responded emotionally to it.

Theme 1: Evolutions in Perspective

The production and cleanup phases at Fernald lasted 55 years. These phases involved workers and management observing several changes throughout their careers. Throughout interviews participant experiences are organized in a distinct before, during, and after major events fashion. While it was not possible to break down perspectives into the specific timeframes mentioned earlier, participants often described scenarios comparing the present to the past to illustrate what changes they witnessed and how this resulted in an evolving perception of risk.

a. From: “This stuff won’t hurt ya boys” to “You’d better not spill a teaspoon”

In the first three decades of operations at Fernald, workers and middle management described a workplace that focused on production rather than safety, was highly restrictive due to security, and lacked a clear understanding of the dangers of the material being handled. After several major radioactive and chemical releases in the early 1980’s a renewed focus on safety,
training, and communication occurred. Participants provided numerous examples in production practices and procedures that illustrated this.

Pushing the limits of production was a fact of life in the operational days of Fernald. Time spent following safety precautions and monitoring radioactive levels slowed down the amount of product that could be turned out. Safety precautions were often sacrificed to meet production quotas. In the height of the Cold War this focus on production was even more pronounced. Additionally, bonuses were offered for reaching certain production goals, and in order to meet them workers would bypass a safety procedure to save time and labor. Jack, a white male, worked at the plant on two separate occasions as a forklift driver and pipefitter. He vividly described this phenomenon as it pertained to the transportation and disposal of radioactive material in a waste pit. He stated,

“Now here is this black oxide on the floor over in plant 4 and plant 8 and the floors were filthy. They tried to keep a guy on the floor scrubber but he couldn’t keep up with all the production back then. For example, plant 8 was designed to run 75 tons a day and we were running 200 tons a day through it and getting bonuses too for overproduction like that. They didn’t really care as far as contamination went. They would run this product and then back a tractor trailer in on the west side and fill it and get a sample out of it. They would take it to the lab and get it assayed and if it was low you could dump it. If it wasn’t you had to take it around and reprocess it. That didn’t happen. If it was too high they would say let me give you another sample and go back there and try a different one and say oh yea it’s good you can dump it.”

Another worker, Chris, who was originally a chemical operator but later served on the site specific advisory board described how the level of perceived risk radioactive material posed changed over time and in turn the way it was handled evolved, requiring workers to spend more time following safety protocols and dressing in protective clothing. He stated,

“I worked second shift on many a breakdown you’re just dragging this shit out on the floor. I remember climbing up those dust collectors and bullshit you didn’t have any respirator equipment and the first thing when they started the safety stuff was little half mask respirators. You had to put on some special clothing and then they went to full face respirators and had to put on what they called papors-powered air purifying respirators with a battery run filter system on the side. It just evolved into a tremendous amount of personal protection equipment and, buddy,
it slowed the process down. If we had to dress out like we did during cleanup during production years you would have gotten shit done. Maybe the government knew that so they kept things real secretive you know this stuff will not hurt you boys this stuff will not hurt ya.”

Claire who worked as a secretary in the administration building from 1951 to 1962 expressed her experience of the safety concerns at Fernald as seen in what was considered a “clean,” or radioactive free, work environment. She stated,

“At that time I guess we were kind of naïve and we felt pretty safe, pretty protected. I was more concerned about some of the things I typed were secret or strictly confidential and I was more concerned with keeping that under control. I was not concerned about exposure I wasn’t aware of some of those things until much later. I know before we were married I used to ride to work in a carpool and both the men who rode with us would look for gases coming out and if it was orangy or dark orange they would be concerned. But like my husband said we didn’t have air conditioning and when that came out the stack of course it came right into our windows, our windows were open.”

Fernald was a production facility that faced the extremes of the risk and safety spectrum over time. As more was learned about the material being handled and illness among workers started to occur many changes were made. Bill, who worked at Fernald from the early years up to site closure in several management positions, expressed these drastic changes bluntly. He insisted, “When we first started out there it was so loose out there it was unbelievable but today it’s so strict it’s unbelievable.”

Another chemical operator, Bob, worked at the plant from the early 1980’s until closure and expressed the drastic changes in safety equipment and material handling procedures in more graphic, embodied terms saying, “You’re covered in green salt head to toe and you just took a shower and took your clothes off and stuff. Well three years later you got respirators and papors (protective clothing), double anti c’s, and you better not spill a table spoon of that stuff.”

Another major change that occurred at Fernald was the introduction of oversight by other government agencies and new compliance standards. All those in management described how the majority of accidents or radioactive releases at the plant where not out of compliance with
DOE standards yet were in clear violation of other agency standards who had little influence until the 1980’s. Ranger, a manager who specialized in site cleanup and is still currently employed by the DOE, described this transition and the DOE’s rational for changing oversight procedures stating, “DOE did not recognize EPA or Ohio EPA so as a result of that they didn’t recognize any reporting obligation for releases. Then DOE tried to get contemporary with those requirements and decided to be proactive with reporting.” Lucy, who worked as a subcontractor and later became a manager in the cleanup seconded this trend in oversight saying, “both US EPA and Ohio EPA had a consent decree with the state of Ohio, so Ohio EPA was always present, they were present not so often in the beginning but towards the end in the early and mid 2000’s they were there almost every day.”

From these examples we see that Fernald experienced drastic changes in operational procedures and safety enforcement. The largest changes occurred in the 1980’s after public discovery of several major radioactive releases which spurred the renewed focus on safety and drove the DOE to be more transparent to avoid further public outcry. These changes coincide with the changes of worker and community perspective described in the following theme.

b. From ignorance to concern

Workers also described their transition from a ‘do your job’ mentality to one of concern for their health. As an individual who served in the military prior to Fernald, Robert, worked his way up from being a janitor to becoming a chemical operator despite being African-American during the 1950’s described this mentality. He stated, “we didn’t know what we were dealing with we just did our jobs” and “I was really proud to be working at an atomic energy plant and we were really doing a lot to help the Cold War” reflect an early view of pride and the ability to get the job done that many workers shared. However, as time progressed workers became sick
and new safety procedures were introduced many started to express concern for their health. Josh, another worker who began work at Fernald in 1956 stated, “later on towards retirement I was getting concerned with some of them safety issues cause they made a lot of changes too late and there were some guys that started getting sick.” Ben, a manager who worked in research and development at the start of production expressed similar views stating, “I began to become suspect in the mid 70’s when the incidence of cancer among the employees began popping up and then it becomes noteworthy when maybe a new case is detected every month it gets kind of alarming.” These increasing concerns occurred during the 1970’s and early 1980’s and reflect a clear change in the perception of risk from the concerns of everyday to the fear of what was to come from long term exposure to radioactive material. The public outcry that followed the radioactive leaks in the 1980’s further added to this fear. The types of risks that were alarming were also varied and not limited to radioactive exposure.

Throughout all interviews participants described concerns with industrial and chemical hazards while working at Fernald. The orange cloud of nitric acid fumes released by plants 2 and 3 were a common topic. Chris, who worked various shifts during his time at Fernald described this phenomenon saying, “Sometimes it’s early in the morning and you’re walking down by plants 2 and 3, and boy it felt like a bunch of bees stinging ya.” Others described the chemical hazards in plant 4. James, who worked in nearly every building at the site, painted a startling picture of these conditions stating, “All the windows have been fogged up for years because you got this HF in diluted form that’s been floating around in the building that has etched these windows so you can’t see through them.” All participants stated that these chemical and industrial hazards such as an acid spill, fire, or tank explosion were their main concern. However, all participants discussed radiological hazards such as handling uranium ores and
health risks associated with them more prevalently throughout each interview. Interestingly, while all participants shared this perspective there were distinct differences between those interviewed who were managers and those who were not. These differences were so common and pronounced that they are worth elaborating on.

Theme 2: Conflicting views between workers and management

Participants interviewed for this study included those in the general labor force such as pipefitters and chemical operators who performed the specific daily operations required to produce uranium ores. It also included those in upper management responsible for oversight of production as a whole and long term stewardship of the Fernald site. There are several differences in perspective between these two groups when discussing their reactions to official government responses. One of the most notable differences involves each group’s opinion on how much trust they had in the government doing what they claimed to be doing.

a. Reliability of Information

Those interviewed that did not hold management positions were more likely to indicate the perspective that the government intentionally withheld information, lied to workers, or otherwise manipulated practices for their best interest. James cited how DOE failed to admit to processing certain materials that are known to be more hazardous saying, “God almighty they denied all that, “well we never had any beryllium,” my ass. We went through a lot of things like that.” This was echoed by another individual stating, “from the onset, government tried to disclaim anything that we did. It wasn’t until after we filed the workers suit that they started owning up to things and not resisting worker claims.” Jack described a seemingly more deliberate deception by DOE that involved missing records and questionable monitoring practices. He mentioned there are missing exposure incidents from his record and commented on
how the urinalysis program was conducted, “You would do it after a long weekend or a vacation anytime they could make it as clean as possible that’s when they took it ya know. They would never do it at the end of the day they would want whatever you had to be as clean as possible before they would take it.”

Other workers suggested methods of exposure that were not taken into account during dose reconstruction for the claims system such as driving a forklift through contaminated water or breathing fumes from a burning barrel of uranium ore. This resulted in their exposure records being low or none existent. This in turn led to failed claims for compensation of health problems. Workers also consistently used the phrase, “I probably got more exposure than anybody in that place.” The view that they were exposed more than others coupled with failed claims and low dose reconstruction estimates accompanied in anger in the working population.

Workers also referred to government officials and DOE as liars on several occasions. James commented on a statement released by then Secretary of Labor describing how workers were going to be taken care of saying, “That’s another darn lie. That was the secretary of labor at one time and he lied!” Another individual expressed his perspective saying, “The DOE is a bunch of idiots, a bunch of damn liars.”

The five participants that held management positions offered a quite different perspective toward DOE involvement at Fernald. While workers believed DOE to lie and cover up, those in management addressed this topic with statements such as, “I have to say that the people I worked with at the program level..pretty high places.. we are all professionals they aren’t going to cover anything up.” Ben stated, “So nobody ever asked me to say anything that wasn’t true and I don’t remember the DOE saying anything that was untrue.”
Additionally, those in management had more faith in the accuracy of site records and the dose reconstruction project. When discussing the dust collector incident which nearly all workers believed to contaminate the surrounding area Ben stated, “I believe the incident report showed that it did not leave the plant boundaries and I am fairly comfortable with that I don’t think it did.” In addressing the accuracy of the dose reconstruction project the he also stated, “I worked with some of the people on the dose reconstruction project and offered my services to help them understand what Fernald did so they could do their jobs right. I will not comment on whether they are or not I’m sure they are professionals..I know them they are..and they are making the best effort with what they are tasked to do.”

The perspective of increased faith in DOE and its response to the situations that evolved at Fernald could be a reflection of the more detailed knowledge possessed by managers.

b. “They lie” vs. “They don’t know”
All interviews included aspects of specific knowledge about the production processes needed to produce radioactive ores at Fernald and what it was like to work there. Each participant also believed the strict security at the site was a major factor in the public relations nightmare that occurred at Fernald. However, while workers discussed the production process and its dangers in detail only managers rationalized how events were the result of specific actions taken by the DOE.

Those in management offered a broader scope of what factors contributed to the events at Fernald and how individuals reacted to them. For instance, workers stated health and safety monitoring was inadequate and blamed the emphasis on production over safety for this. Workers adopted the perspective that the harms of radiation were known by the government who “lied” or intentionally disregarded the information because national security was prioritized over the
health of individual workers. In contrast, managers articulated why outdated equipment, lack of training, and lack of knowledge about radiation protection resulted in a health and safety program that was under par. It was not deliberate deception or neglect by the DOE but rather a result of little funding that lead to these problems and workers were not aware of these aspects. The specificity of knowledge throughout management was much greater than in the working population. This was especially true in discussions of environmental contamination and site cleanliness.

When asked if he thought the dust collector release resulted in offsite contamination Robert stated, “oh sure, that’s why they setup monitors all around.” In contrast, manager Ben described why he believed the accident did not affect the area outside the plant saying, “UF₆ was heavy and actually with moisture would tend to come back down and not become airborne.” In this case management believed they knew the physical properties of the material released whereas workers believed it was airborne and carried off the property. Management also described differences in DOE and EPA standards and how the release was not out of compliance with DOE because it was not subject to EPA jurisdiction at the time. Having more detailed knowledge about the properties of materials being handled, concentrations of offsite contaminants, and compliance oversight gaps management seemed to be better able to characterize risks posed by Fernald and diminish uncertainties. However, both workers and management alike had strong emotional responses regarding some topics.

**Theme 3: Emotional Responses**

In discussing their experiences at Fernald participants exhibited several emotional responses that are connected to the experiential system of risk assessment and illustrate their reaction to increased knowledge of exposure.
a. Anger and “unfair” compensation

Both workers and management expressed anger or dissatisfaction with the workers compensation process and treatment of Fernald workers after employment. This was true even for individuals in management that did not have to file claims. Ranger, a manager, addressed the overbearing requirements for compensation stating, “What I think is unfair is the fact Fernald workers have to jump through these hoops when other sites are covered by the fact you have worked there for x amount of years whatever the guidelines are.” Bill, another manager, expressed dissatisfaction with how little workers got compared to residents saying, “I look at what the residents got verses what the workers got I always had a problem with that because the workers got so little.”

This frustration was echoed by workers as well. Chris, who worked at Fernald for 15 years, described his compensation in comparison to residents expressing, “When I got my settlement I think I got $600 dollars, you know people out here on the road, thousands, hundreds of thousands.” One statement by former forklift operator, James, confirmed the growing frustration in the working population who expressed, “I’m more aggravated with the way they are treating people today you know with the claims. It’s not right there are too many people that have had problems for them to be turning them down like that.” When asked if they ever had to file a claim some individuals demonstrated they have given up on compensation completely replying, “No it didn’t do any good.” Jack gave a more detailed description of why he did not file for some of his existing health issues stating, “You can only file for certain things. Mine is brain cancer. Then I had several skin cancers which you can and I did file a claim for, but the thing is if your badge didn’t show over 50% radiation the claim was not considered.”

The fact that dose reconstruction for radiation exposure determined the validity of claims irritated many individuals who believed the information was inaccurate and did not incorporate
many ways in which exposure occurred. Jack stated, “In this paperwork that I got it says a forklift operator got about as much radiation as a supervisor got which they listed as nothing.” He then went on to describe several methods of exposure to radioactive materials including moving drums of burning radioactive ore. Dose reconstruction using data from faulty monitoring devices and poor records of exposure was also a frequent and heated topic in the interviews. Additionally, while most expressions of frustration and anger cited worker compensation complexities directly most interviews with workers also included more general statements stemming from their experiences at Fernald. This included comments such as, “here is what really burns me up,” and “Gosh I am so frustrated with that place they screwed so many people.”

b. Fear

As an emotion in response to a perceived threat fear is topic to be considered when discussing perceptions of risk. However, this emotion was not expressed as explicitly as I thought it would be throughout interviews. This was especially true in discussion about the threat of the Cold War which was largely relegated to daily job routines. Robert expressed his opinion saying, “I don’t think it affected anything just a concern. We were so busy making material we never even thought about us being directly in the war.” Additionally, national pride further eased perceptions of Cold War risk. James viewed it as a competition stating, “I felt like we were doing something good trying to beat them bunch of jackasses.” Bill, another former serviceman turned Fernald worker, felt secure in American ability saying, “I was very confident in my country love my country.”
Chapter 6: Discussion

Results of the thematic data analysis identify and describe how workers came to understand their exposure to harmful materials at Fernald and determine how their perception of risk has evolved to its current state. The Cold War and fear of radiation risks did little to alarm workers and management during their time at the plant. Instead feelings of pride and the ability to get the job done relegated these risks to more everyday risks from industrial or chemical accidents that could result in immediate harm. The current state of risk perception that incorporates fear of health risks from radiation has occurred only after workers began to become sick, faced new safety protocols, or no longer had to face working at the plant itself. Instead most workers are in retirement and the length of time for radiation induced illness to manifest has resulted in more concern.

Additionally, anger in the working population stems from the view that risks were imposed, documentation of operations and subsequent activities are not accurate and complete, and the government is not to be trusted. There were a larger number of unknowns for the working population and these results are in keeping with current literature on risk that suggests the more uncertainty that is involved the greater the perception of risk. It is also notable that those that expressed these feelings of anger more strongly experienced more health issues and failed compensation claims. This provides a direct example of the link between anger and the need for a sense of moral justice for those that impose risk.

The difference in the perspective of management is directly opposite to that of the Fernald worker. Those in management had a more detailed understanding and broader scope of knowledge allowing a better characterization of risks at Fernald and diminished uncertainties associated with these risks. This in turn led to more trust in government operations, less anger, and less fear. These results are in keeping with current literature on risk perception in regard to
its evolution over the length of the milling process and the correlation between risk and uncertainty. Additionally, the difference in risk perception between workers and management mimics literature examining how perspectives of government officials and the public contrast.

It should also be noted that most expressions of anger stemmed from the process of dose reconstruction and the difficulty in filing a successful claim. However, during the course of this thesis the dose reconstruction requirement for Fernald workers has been eliminated. To file a claim workers need to exhibit health issues currently recognized for compensation due to their high incidence among Fernald workers, but no dose reconstruction is required. Workers are currently working to expand this list of recognized health issues and much more progress stands to be made. In order to accurately reflect current worker perspectives of risk and satisfaction with compensation this research would have to be redone, preferably on a larger scale.

**Study Limitations**

There are several limitations to this study design. First, I explore the risk perspectives specifically among former Fernald workers and DOE officials with experience at the Fernald site. Fernald is a case study and any conclusions drawn pertain primarily to Fernald but may serve as a foundation for future research on risk analysis in the long term.

Additionally, because little documentation of workers perspective has been done it is necessary to make decisions about worker perspectives in an earlier timeframe from opinions expressed by workers based on memories. In doing so I must assume that each individual’s memory portrays events, dates, and opinions fairly accurately.

Finally, the sample size for this study only represents a small portion of the large number of people involved with the Fernald site. For this reason, this study is exploratory and serves only to identify if there is merit for a larger, more comprehensive investigation.
Bibliography


*Day Et Al v NLO Et Al, Day Et Al v NLO Et Al,* Case Number 90-CV-67 (United States District Court, Southern District of Ohio).


Atomic Energy Act of 1946, no. 2478(, 1946):

