

# Kentucky's "Atomic Graveyard": Maxey Flats and Environmental Inequity in Rural America

By Caroline Peyton

In 1962, with powers vested by the U.S. Atomic Energy Commission (AEC), Kentucky licensed a low-level radioactive waste disposal facility, the Maxey Flats Disposal Site.<sup>1</sup> Located in northeastern Kentucky's rural Fleming County, the site's shallow trenches welcomed nuclear garbage, ranging from medical scrubs to highly radioactive "special nuclear material" from 1963 to 1977.<sup>2</sup> During the mid-1970s, a state investigation detected the presence of plutonium, a transuranic radioactive chemical element, in offsite water sources. Soon thereafter, an Environmental Protection Agency (EPA) study revealed what many feared: plutonium had moved beyond the site's trenches and would conceivably continue to do so. The findings challenged the

<sup>1</sup> Local residents refer to the area as "Maxey Flat." I employ the name Maxey Flats, per government documents. For "atomic graveyard," see Jim Morrissey, "Kentucky's Atomic Burial Ground," *Louisville Courier-Journal*, December 13, 1964. The author wishes to acknowledge the Kentucky Historical Society's generous financial support, and she is grateful for the editorial guidance and perceptive feedback provided by David Turpie, Richard Judd, and David Stradling. She would also like to thank the *Register's* staff and the three anonymous reviewers for their comments and insight.

<sup>2</sup> Environmental Protection Agency, "Summary of Remedial Alternative Selection, Record of Decision, U.S. Environmental Protection Agency, Maxey Flats Disposal Site, 14–15," October 1991, 11–12 (hereinafter EPA, Maxey Flats ROD); "Division of Waste Management: Maxey Flats Disposal Site," Kentucky Department for Environmental Protection website, <http://waste.ky.gov/SFB/Pages/MaxeyFlatsProject.aspx> (accessed November 8, 2016). See also "EPA Superfund Program: Maxey Flats Nuclear Disposal, Hillsboro, KY," Environmental Protection Agency website, <http://www.epa.gov/region4/superfund/sites/npl/kentucky/maxfltky.html#location> (accessed September 9, 2016) (hereinafter EPA website, "Maxey Flats").

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conventional wisdom that plutonium, a “heavy” radioactive isotope, moved slowly—so slowly as to be virtually immobile.<sup>3</sup> Defying predictions, rogue radionuclides escaped their trenches, traveling through geologic fractures and surface runoff, moving faster and farther than anticipated.<sup>4</sup> Responding to the crisis, Kentucky officials increased the surcharge on waste burials, but because problems continued, they orchestrated the site’s permanent closure in 1977.<sup>5</sup> Shuttering Maxey Flats did not eliminate the considerable environmental impact, though; the EPA added the site to their National Priorities List (NPL) in 1986, and ten years later, onsite cleanup began. Radioactive isotopes commingled with chemicals, heavy metals, and both inorganic and organic matter in poorly constructed burial grounds, creating what one writer called Kentucky’s “nuclear wasteland.”<sup>6</sup>

Maxey Flats Disposal Site (MFDS) comprises an important chapter in America’s nuclear history. As one of the nation’s first, and ultimately few, commercial nuclear waste sites, Maxey Flats was part of a deeply flawed early system that ceded considerable regulatory authority to states. Problems arose because site administrators failed to anticipate adequate policies for long-term site care, narrowly considered the possibilities for radionuclide migration, and broadly defined what constituted low-level waste. Furthermore, by commodifying nuclear waste, operators had a financial incentive to ignore site issues. Maxey Flats has served as a valuable, if tragic, example of what can go wrong in radioactive waste burial, illustrating the complex interactions between radioactive materials and the environment. Yet, Maxey Flats lacks the name recognition that defense installations, testing sites, or

<sup>3</sup> G. Lewis Meyer, “Preliminary Data on the Occurrence of Transuranium Nuclides in the Environment at the Radioactive Waste Burial Site Maxey Flats, Kentucky,” prepared for the U.S. Environmental Protection Agency Office of Radiation Programs, February 1976, available online at <https://nepis.epa.gov/>; EPA, Maxey Flats ROD, 11–13.

<sup>4</sup> Ibid., 12–13. Radionuclides (or radioisotopes) are “unstable isotopes” of an element, which emit radioactivity as they “decay or disintegrate.” See U.S. Nuclear Regulatory Commission website, <http://www.nrc.gov/reading-rm/basic-ref/glossary/radioisotope-radionuclide.html>.

<sup>5</sup> J. Samuel Walker, *The Road to Yucca Mountain: The Development of Radioactive Waste Policy in the United States* (Berkeley, Calif., 2009), 129–31.

<sup>6</sup> EPA, Maxey Flats ROD, 20–22; Frank Browning, “The Nuclear Wasteland,” *New Times*, July 1976, pp. 43–47.

controversial nuclear reactors have today. For a brief moment Maxey Flats shared the national stage with other nuclear controversies in the 1970s, only to fade from public memory decades thereafter, despite the lengthy environmental remediation and its critical demonstration of the dangers associated with radioactive waste disposal.<sup>7</sup>

From metropolitan areas to western deserts, the nation's nuclear projects have left their mark on many communities. Closer to Maxey Flats, numerous federal weapons installations in the Ohio River Valley have required costly onsite cleanup.<sup>8</sup> Regarding this legacy, Kentucky writer Wendell Berry has dryly observed that each of these stories is about "how a place, once merely a part of our only inhabitable planet, became a place of contamination, of ecological and human disease." As Berry has put it, the Ohio River Valley's nuclear complex, includ-

<sup>7</sup> For recent nuclear histories in the United States with attention to environment, see, especially, Len Ackland, *Making a Real Killing: Rocky Flats and the Nuclear West* (Albuquerque, N. Mex., 1999); Stephen Bocking, "Ecosystems, Ecologists, and the Atom: Environmental Research at Oak Ridge National Laboratory," *Journal of the History of Biology* 28 (Spring 1995): 1–47; Kate Brown, *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (New York, 2013); David Allen Burke, *Atomic Testing in Mississippi: Project Dribble and the Quest for Nuclear Weapons Treaty Verification in the Cold War Era* (Baton Rouge, La., 2012); Angela N. H. Creager, *Life Atomic: A History of Radioisotopes in Science and Medicine* (Chicago, 2013); Ryan H. Edgington, *Range Wars: The Environmental Contest for White Sands Missile Range* (Lincoln, Neb., 2014); Kari Frederickson, *Cold War Dixie: Militarization and Modernization in the American South* (Athens, Ga., 2013); John M. Findlay and Bruce William Hevly, *Atomic Frontier Days: Hanford and the American West* (Seattle, 2011); Jacob Darwin Hamblin, *Poison in the Well: Radioactive Waste in the Oceans at the Dawn of the Nuclear Age* (New Brunswick, N.J., 2008); Andrew Jenks, "Model City USA: The Environmental Cost of Victory in World War II and the Cold War," *Environmental History* (hereinafter *EH*) 12 (July 2007): 552–77; Valerie Kuletz, *The Tainted Desert: Environmental Ruin in the American West* (New York, 1998); Joseph Masco, *The Nuclear Borderlands: The Manhattan Project in Post–Cold War New Mexico* (Princeton, N.J., 2006); Max Singleton Power, *America's Nuclear Wastelands: Politics, Accountability, and Cleanup* (Pullman, Wash., 2008); Traci Brynne Voyles, *Wastelanding: Legacies of Uranium Mining in Navajo Country* (Minneapolis, 2015); J. Samuel Walker, *Containing the Atom: Nuclear Regulation in a Changing Environment, 1963–1971* (Berkeley, Calif., 1992); Thomas Raymond Wellock, *Critical Masses: Opposition to Nuclear Power in California, 1958–1978* (Madison, Wisc., 1998).

<sup>8</sup> Nuclear installations in the Ohio River Valley that have required cleanups include: Fernald Feed Materials Production Center (northwest of Cincinnati), a uranium processing facility and Superfund site; Portsmouth Gaseous Diffusion Plant (in Piketon, Ohio), which produced enriched uranium; Mound Laboratories (in Miamisburg, Ohio), a weapons facility and Superfund site; Jefferson Proving Ground (near Madison, Ind.), a weapons testing facility; and the Paducah (Ky.) Gaseous Diffusion Plant.

ing Maxey Flats, evolved from “techno-scientific sophistication and bravado into a black joke,” leaving behind radioactive waste which renders “the whole enterprise” a “tragic mistake.”<sup>9</sup> Justified with promises of national security, bountiful energy, economic opportunity, and scientific advancement, nuclear projects have produced troubling consequences for public health and the environment. These repercussions challenge humans’ capacity to address the long-term consequences of nuclear projects, which often require monitoring for hundreds or even thousands of years.

Despite its sprawling nature, one aspect of the nuclear industry—commercial low-level nuclear waste facilities—has exhibited little geographic variety. Typically, these sites have been located in rural communities that were searching for economic development, deemed geologically suitable for waste burial, and often situated in states or regions with a strong commitment to nuclear industry. Defense installations, hospitals, nuclear power plants, university laboratories, and many other facilities produce radioactive waste in staggering quantities, and low-level radioactive waste (LLW) sites were developed to dispose of the materials. Nearly all LLW sites were licensed before widespread public concern about radioactive waste emerged. Of the eight original sites, only four operate today, a testament to the reluctance of states and counties to accept even low-level radioactive waste. Radiation fears, political obstacles, environmental risks, and the financial obligations for site care have left the nation with few disposal facilities.<sup>10</sup>

<sup>9</sup> Wendell Berry, “Foreword,” in Carol Rainey, *One Hundred Miles from Home: Nuclear Contamination in the Communities of the Ohio River Valley: Mound, Paducah, Piketon, Fernald, Maxey Flats, and Jefferson Proving Ground* (Cincinnati, 2008), 1–2.

<sup>10</sup> Current sites include those located in Richland, Washington; Barnwell, South Carolina; Clive, Utah; and Andrews, Texas. Former sites include Sheffield, Illinois; Maxey Flats, Kentucky; West Valley, New York; and Beatty, Nevada. On nuclear waste, see Donald L. Barlett and James B. Steele, *Forevermore: Nuclear Waste in America* (New York, 1985); Susan Cragin, *Nuclear Nebraska: The Remarkable Story of the Little County That Couldn't Be Bought* (New York, 2007); Robert J. Duffy, *Nuclear Politics in America: A History and Theory of Government Regulation* (Lawrence, Kans., 1997); Kristin Shrader-Frechette, *Burying Uncertainty: Risk and the Case against Geological Disposal of Nuclear Waste* (Berkeley, Calif., 1993); Hamblin, *Poison in the Well*; Gerald Jacob, *Site Unseen: The Politics of Siting a Nuclear Waste Repository* (Pittsburgh,

The nuclear controversies that emerged in the 1970s and 1980s have virtually ensured frenzied opposition to proposed sites elsewhere.<sup>11</sup> Prior to this, however, many were initially sold on promises of economic opportunity and assurances about minimal risk, as the history of Maxey Flats illustrates. Although concern about Maxey Flats existed from its inception, skeptics who witnessed questionable activities or environmental changes found themselves largely prevented from obtaining information from company, state, or federal officials. In the years before environmental impact statements and more stringent licensing procedures that mandate community hearings, concerned citizens lacked the insider status necessary for more formidable action. Reliant on experiential knowledge and observation, Fleming County residents were not only without information and scientific expertise but also faced challenges from their wider community, as class, geography, and economic exigencies obscured the concerns of the people “under” or “over” the hill near Maxey Flats.<sup>12</sup>

Although environmental contamination, nuclear or otherwise, has frequently occurred in populated areas, especially in poor and minority communities, rural places have faced similar challenges coupled with geographic isolation.<sup>13</sup> Rural people often inhabit in-between

1990); Kuletz, *Tainted Desert*; Richard B. Stewart and Jane Stewart, *Fuel Cycle to Nowhere: U.S. Law and Policy on Nuclear Waste* (Nashville, Tenn., 2011); Walker, *Road to Yucca Mountain*, 125–41. On waste disposal generally, see Martin Melosi, *Garbage in the Cities: Refuse Reform and the Environment* (1981; repr., Pittsburgh, 2004).

<sup>11</sup> Walker, *Road to Yucca Mountain*, 125–41.

<sup>12</sup> Both “over the hill” and “under the hill” have been used to describe the communities surrounding Maxey Flat.

<sup>13</sup> For studies of environmental inequity after World War II, see especially Barbara L. Allen, *Uneasy Alchemy: Citizens and Experts in Louisiana's Chemical Corridor Disputes* (Cambridge, Mass., 2003); Joyce M. Barry, *Standing Our Ground: Women, Environmental Justice, and the Fight to End Mountaintop Removal* (Athens, Ohio, 2012); Robert D. Bullard, *Dumping in Dixie: Race, Class, and Environmental Quality*, 3rd ed. (Boulder, Colo., 2000); Andrew Hurley, *Environmental Inequalities: Class, Race, and Industrial Pollution in Gary, Indiana, 1945–1980* (Chapel Hill, N.C., 1995); Ellen Griffith Spears, *Baptized in PCBs: Race, Pollution, and Justice in an All-American Town* (Chapel Hill, N.C., 2014); Eileen McGurty, *Transforming Environmentalism: Warren County, PCBs, and the Origins of Environmental Justice* (New Brunswick, N.J., 2007). For rural examples, see Pete Daniel, *Toxic Drift: Pesticides and Health in the Post–World War II South* (Baton Rouge, La., 2007); Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Berkeley, Calif., 2007).

spaces, close enough to urban infrastructure to accept radioactive and hazardous waste but far enough away to avoid major scrutiny. These communities either lack the resources to prevent disposal siting or are so economically disadvantaged as to shoulder the risks anyway. Writer Marilynne Robinson has characterized the isolated areas in the West, where nuclear-weapons testing wreaked the most environmental damage, as places “where things can be hidden” and “where things can be done that would be intolerable in a populous landscape.”<sup>14</sup> Robinson’s observation applies to Maxey Flats and the other rural communities where radioactive garbage is buried.

Geographically isolated and sparsely populated, Maxey Flats exemplifies a rural landscape characterized by what literary scholar Rob Nixon calls “slow violence.” Nixon defines slow violence as a process that happens “gradually and out of sight,” one that occurs over time, and one not “typically viewed as violence at all.” Concerned primarily with the “environmentalism of the poor” and the slow violence in the developing world’s environment, Nixon’s concept is nonetheless applicable for rural, poor, and minority communities in the United States. The very process of slow violence poses “formidable representational obstacles that can hinder our efforts to mobilize and act decisively.” Organized opposition to the MFDS developed slowly, as the contamination remained “incremental and accretive” during its initial operation. In addition, the community had limited resources, and locals’ knowledge was often discounted or ignored by state and company officials. As Nixon cogently states, environmental threats for those in vulnerable places are not a “planetary abstraction” but rather “a set of inhabited risks, some imminent, others obscurely long term.” Maxey Flats offers another case of how disadvantaged communities understand environmental threats and navigate systems set against them.<sup>15</sup>

For state regulators and the Nuclear Engineering Company

<sup>14</sup> Marilynne Robinson, *The Death of Adam: Essays on Modern Thought* (New York, 2014), 247.

<sup>15</sup> Rob Nixon, *Slow Violence and the Environmentalism of the Poor* (Cambridge, Mass., 2011), 2 (first through fourth quotations), 4 (fifth through seventh quotations).

(NECO), uncertainty about potential danger mattered little in rural Fleming County and this “sense of geographical isolation” contributed to over a decade of regulatory failures and company errors. Rather than a dramatic spectacle of environmental contamination, Fleming County’s nuclear “nightmare” evolved slowly; it resulted from an accumulation of errors, sloppiness, haphazard early disposal methods, and complex processes that occurred over years. Even as monitors sampled the site’s soil and water, the contamination gradually occurred, exacerbated by poorly understood risks and a misplaced faith in technical and scientific solutions.<sup>16</sup>

The burial of almost five million cubic feet of radioactive waste at Maxey Flats, and the subsequent environmental disaster, did not occur in a fit of absent mindedness. The facility itself resulted from the early enthusiasm about the emerging nuclear industry, while the disaster was allowed to happen because of specific policies crafted by Kentucky officials and the AEC, among other reasons.<sup>17</sup> While Kentucky’s coal industry discouraged the development of nuclear power, the commonwealth’s political leaders aggressively pursued atomic-related industry. To some extent, Kentucky led the way in shifting regulatory power over radioactive materials away from the federal government and to the states. In the 1950s, Kentucky and

<sup>16</sup> Ian Stacy, “Roads to Ruin on the Atomic Frontier: Environmental Decision Making at the Hanford Nuclear Reservation, 1942–1952,” *EH* 15 (July 2010): 419 (first quotation); Nancy Powell, “A Concerned Community,” *EPA Journal* 17 (July 1991): 31 (second quotation). Founded in 1952, NECO operated several nuclear waste sites, including ones in Beatty, Nevada; Sheffield, Illinois; and Richland, Washington. Since Illinois did not have a regulatory agreement in place, the Sheffield site was regulated by the federal government. Teledyne purchased the company in 1975, and NECO was eventually renamed U.S. Ecology, the name by which the company operates today. Benjamin Goldman, James Hulme, and Cameron Johnson, *Hazardous Waste Management: Reducing the Risk* (Washington, D.C., 1986).

<sup>17</sup> For comparison, Sheffield (Ill.), another NECO/U.S. Ecology site, operated from 1966 to 1978 and accepted 3.2 million cubic feet of radioactive waste. Beatty (Nev.), also run by NECO, operated from 1962 to 1992 and contains 4.9 million cubic feet of waste. Barnwell (S.C.) has operated since 1971 and contains over 27 million cubic feet of waste today. See Conference of Radiation Control Program Directors, Inc., “Environmental Monitoring Report for Commercial Low-Level Radioactive Waste Disposal Sites (1960’s through 1990’s),” Nov. 1996, 2-1, 4-1, 6-7, International Atomic Energy Agency website, [https://www.iaea.org/inis/collection/NCLCollectionStore/\\_Public/29/015/29015275.pdf](https://www.iaea.org/inis/collection/NCLCollectionStore/_Public/29/015/29015275.pdf) (accessed December 29, 2016).



other southern states joined forces and created the Southern Nuclear Interstate Board, an organization aimed at promoting the nuclear industry and atomic research in the American South.<sup>18</sup> Like South Carolina and Tennessee, the atomic-weapons complex gave Kentucky its first large-scale nuclear facility. Located in Paducah, the Gaseous Diffusion Plant started producing enriched uranium for nuclear weapons in 1952.<sup>19</sup> As other states clamored for nuclear projects, Kentucky's director of nuclear information, Robert Solomons, declared that in the commonwealth, "we have no real interest in nuclear power reactors," but he viewed the "enlightened period of nuclear development" as promising.<sup>20</sup>

To promote atomic-energy projects, whether federally funded or commercial enterprises, the state devised a series of short-lived agencies and committees, including the Nuclear Information Division, which was part of the Department of Economic Development; the Kentucky Advisory Committee on Nuclear Energy; and the Kentucky Atomic Energy Authority (KAEA), whose executive director, James Neel Jr., later became president of NECO. In 1962, Governor Bert Combs praised the KAEA as an important means for "fostering the peaceful and constructive uses of nuclear energy" in Kentucky, further demonstrated by the agency's ability to issue unlimited revenue bonds for developing nuclear projects. According to KAEA documents, the agency's purpose was two-fold: "1) to do everything necessary

<sup>18</sup> See rationale for organization outlined in speech given by Kentucky lieutenant governor Harry Lee Waterfield, Conference on the Impact of Peaceful Uses of Atomic Energy on State and Local Governments, Atomic Industrial Forum, October 15, 1958, Folder: Atomic Industrial Forum, 1956–1958-KACNE, Container 1, Division: Atomic Energy Commission, Correspondence & Notes, 1956–1958, Kentucky Atomic Energy and Space Authority, Administrative Records, 1956–1965, RG 0200 (hereinafter KAESA Records), Kentucky Department for Libraries and Archives, Frankfort, Ky. (hereinafter KDLA).

<sup>19</sup> The plant operated from 1952 to 2013. Initially, it produced highly enriched uranium for nuclear weapons, but by the 1960s, the plant produced enriched uranium for nuclear reactors. For a site history, see Centrus Energy, Inc., website, "Paducah," available online at <http://www.centrusenergy.com/gaseous-diffusion/paducah-gdp> (accessed September 9, 2016).

<sup>20</sup> Robert Solomons III, Remarks, Director Nuclear Information Division, Kentucky Department of Economic Development, October 1958, Columbus Ohio, Atomic Industrial Forum, Folder: Atomic Industrial Forum, 1956–1958-KACNE, Container 1, Division: Atomic Energy Commission, Correspondence & Notes, 1956–1958, KAESA Records, KDLA.



to promote the establishment of nuclear industry within our state. 2) to do everything necessary to see to it that the public health and safety is adequately protected from hazards associated with radiation.” Like the AEC, whose dual roles as promoter and regulator eventually led to the creation of separate agencies, the KAEA had a similarly contradictory agenda.<sup>21</sup>

In 1962, Kentucky became the first state to receive some regulatory and licensing authority from the federal government as part of the Agreement State Program. As historian J. Samuel Walker has noted, the South’s interest in industrial growth and atomic energy’s potential coincided with a long-standing commitment to “protecting states’ rights from federal infringement,” all while seeking federal dollars. Kentucky’s maneuvers to attain some control over regulating and licensing nuclear energy and radioactive materials set the template for agreements between states and the AEC. Prior to 1966, eight of the thirteen “agreement states” were in the American South, where officials justified wresting partial control from the AEC by citing concern for public health but also avoidance of “unduly restrictive” measures. Before enthusiasm declined in the 1970s, Kentucky officials praised the state’s policies as a “standard for other states,” one that “pioneered” innovations such as regulatory agreements and bond financing.<sup>22</sup>

<sup>21</sup> The Kentucky Atomic Energy Authority (KAEA) at one point went by the title Kentucky Atomic Energy and Space Authority. KAEA minutes, October 9, 1962, Folder: System Masters, October Minutes, KAEA, 1962, Box 1: Kentucky Atomic Energy and Space Authority, 1962–1964, KAESA Records, KDLA; KAEA minutes, July 26, 1962, Folder: Kentucky Atomic Energy Authority, Box 1: Kentucky Atomic Energy and Space Authority, 1962–1964, KAESA Records, KDLA (first quotation); KAEA document, undated, Folder: Quarterly Meeting, Box 1: Kentucky Atomic Energy and Space Authority, 1962–1964, KAESA Records, KDLA (second quotation). With the passage of the Energy Reorganization Act in 1974, the AEC split into two agencies: the Nuclear Regulatory Commission and the Energy Research Development Administration.

<sup>22</sup> Southern Interstate Nuclear Board, *The Atom in the South: Story of Leadership and Achievement; Report to Southern Governors’ Conference* (Atlanta, 1962), 2; J. Samuel Walker, “The South and Nuclear Energy, 1954–1962,” *Prologue* 13 (Fall 1981): 175 (first quotation), 187 (second quotation); George T. Mazuzan and J. Samuel Walker, *Controlling the Atom: The Beginnings of Nuclear Regulation: 1946–1962* (Berkeley, Calif., 1985), 279–303; John B. Breckinridge to Foster Ockerman, April 10, 1962, Folder: Kentucky Advisory Committee

The same year Kentucky signed the agreement with the AEC, gaining regulatory power over radiation control in the process, state officials and NECO scouted land for one of the state's so-called promising nuclear developments. On June 20, 1962, residents in rural Fleming County received a surprising announcement. With the state's blessing, NECO had purchased several hundred acres of farmland atop Maxey Flat, a plateau situated in northeastern Kentucky's rolling hills, for the future home of the world's first commercially operated nuclear-waste repository. The commonwealth's leaders hailed the development as Kentucky's entry into the atomic age, with KAEA director James Neel promising that the burial grounds and proposed decontamination facility would attract nuclear industry to Kentucky. At Maxey Flats, the atomic enthusiasm of southern officials coupled with the Ohio River Valley's nuclear-weapons complex, and thus NECO occupied central territory for receiving waste shipments. The news, however, shocked residents living in the area.<sup>23</sup>

Rugged and rural, small farms dotted the landscape surrounding Maxey Flat. Demographically, Fleming County was (and remains) sparsely populated and predominantly white. In 1970, the county's population was 11,366 people and approximately 97 percent white.<sup>24</sup> Today, over fourteen thousand people call Fleming County home, but this growth has occurred only recently.<sup>25</sup> Most residents worked in farming and manufacturing, although neighboring Rowan County possessed a more diverse economy and a slighter larger population. Fleming County's poverty rate, nearly 26 percent in 1970, paled in

on Nuclear Energy, Correspondence 1962, Box 2, KAESA Records, KDLA (third and fourth quotations). Mazuzan and Walker have argued that the AEC retained "preeminence" in regulation even with states' agreements. I do not dispute the AEC retained overall regulatory authority, particularly in nuclear power, but the Maxey Flats case suggests that early low-level waste sites in agreement states left considerable authority to state agencies. See Mazuzan and Walker, *Controlling the Atom*, 302.

<sup>23</sup> Jim Hampton, "Maxey Flats Disconcerted by Atomic Project," *Louisville Courier-Journal*, July 1, 1962; KAEA Minutes, July 26, 1962, Folder: Kentucky Atomic Authority, Box 1: Kentucky Atomic Energy and Space Authority, 1962–1964, KAESA Records, KDLA.

<sup>24</sup> 1970 U.S. Census, Fleming County, Ky., 19–115.

<sup>25</sup> *Ibid.*, 19–406. Population estimates since 2015 are available online at <http://www.census.gov/quickfacts/table/PST045215/21069> (accessed December 29, 2016).

comparison to the higher poverty rates in eastern Kentucky, but those rates obscure economic divisions within the county. As a gateway to Appalachia, manicured farms gave way to hard scrabble hollows.<sup>26</sup>

NECO purchased the 335 acres from Walter Cox, a farmer and area businessman.<sup>27</sup> Describing the reactions as decidedly mixed, Cox admitted some residents were “mad” at him, while others thought “it would be a good thing for the area.” NECO employees assured Cox and his wife that radioactive waste disposal posed no danger. According to Lou Ada Cox, it seemed NECO had “the good solid sense to know they would not put something out here that would harm people,” but she also conceded that she “didn’t understand every detail about it either.” Depicted by a Louisville newspaper reporter as “familiar with tractors, but untutored in science,” the people living near Maxey Flat knew enough to remain skeptical and “disconcerted” by the project, even before it started. As is so often the case with stories of hazardous industries run amok, NECO and state officials issued various statements about the repository’s safety and claimed the materials buried there would only contain “low-level and insignificant” radiation. To bolster their credibility, company officials even allowed Walter Cox’s son to not only continue to live on the land but to farm it as well.<sup>28</sup>

Reflecting upon Walter Cox’s decision to sell the land that became MFDS, granddaughter Anita Thompson explained that “Papaw, was up in years . . . [but] he was no fool by any means. . . . he was [however] ignorant when it came to the honesty of people. . . . He was raised in an area where a man’s word was his honor. . . . He was not used to dealing with people who were that deceptive. . . . he lived by his word.” Thompson believes NECO misrepresented what would be buried, describing the waste as “used medical supplies.” For Thompson and Cox’s other descendants, who have withstood decades of criticism for his decision, NECO and the government were guilty

<sup>26</sup> 1970 U.S. Census, Fleming County, Ky., 19–426.

<sup>27</sup> Although news coverage reported Cox sold 335 acres, MFDS’s stated original acreage was 252 acres, a reduction which may have occurred during the leasing process.

<sup>28</sup> Hampton, “Maxey Flats Disconcerted By Atomic Project.”

of lying “by omission. They didn’t tell you everything. . . . They put it all under one heading. . . . Back then, country folk aren’t going to know what that is, they’re not going to know what questions to ask.” The company promised jobs for the area and, according to Thompson, told the aging Cox that he would be “looked upon as a man who protected” his community.<sup>29</sup>

In the end, Anita Thompson noted the jobs that residents gained could be counted “on one hand,” and NECO’s promises were “just a bunch of garbage, basically.” While the exact content of the conversations between Walter Cox, NECO, and state officials is unknowable, what happened in subsequent decades suggests that even if NECO and state officials did not, in fact, outright lie to Cox about what kinds of radioactive waste would be dumped on the site, it is likely that they grossly understated the risks. Moreover, what constituted low-level waste, for a time, included material no longer considered appropriate for commercial burial, namely special nuclear material, source material, and liquid waste.<sup>30</sup>

The assurances from NECO and state officials countered what some local residents suspected about the site’s suitability for nuclear-waste disposal. Geologists characterized the area surrounding Maxey Flats as the “Knobs region.” The hilly region formed from an eroded plateau and roughly resembles the middle ground between the Bluegrass region’s horse farms and the eastern coalfield. Maxey Flat, with its distinctive flat-top ridge, sits three to four hundred feet above the valley bottoms, where Rock Lick Creek flows on one side, Drip Springs Hollow occupies the western part, and No Name Hollow sits to the east. Plentiful rain and a moderate climate supported the area’s mostly agricultural economy. Per climate data collected from 1941 to 1979, the area experienced periods of markedly high rainfall, sometimes receiving as much as fifty to sixty inches annually.<sup>31</sup>

<sup>29</sup> Anita Thompson, phone interview with author, August 1, 2016.

<sup>30</sup> Ibid. (quotations); Walker, “The South and Nuclear Energy,” 130–31.

<sup>31</sup> Morrissey, “Kentucky’s Atomic Burial Ground”; Harold H. Zehner, “Hydrogeologic Investigation of the Maxey Flats Radioactive Waste Burial Site, Fleming County, Kentucky,” p. 11, U.S. Geologic Survey, Open File Report 83–133, 1983, EPA Superfund Repository,

NECO and state officials argued that deep layers of shale at Maxey Flats had low permeability, which would, in theory, discourage water flow and the migration of radionuclides—radioactive forms of elements. Unlike deep-geologic repositories, commercial nuclear-waste sites employ a “shallow trench” type of burial, with trenches dug thirty feet deep. The forty-seven trenches at Maxey Flats were contained in the first layer of shale, called the “Nancy Member,” with layers of sandstone and more shale further below. Major fractures occur throughout the shale and sandstone, allowing for water to travel “very tortuous, zig-zag patterns” running all different directions, making it difficult to determine their pathway. An early site assessment conducted by NECO and the state determined that high levels of precipitation and fractured shale might pose a problem in the future, but risk assessments reflected best-case scenarios which rendered these potential issues less significant.<sup>32</sup>

Despite these potential problems, NECO received its license for handling nuclear materials and began operation in 1963. Area residents soon confronted trucks barreling down the gravel road, churning up dust, and delivering radioactive waste for burial beneath Maxey Flat. Because of the agreement between Kentucky and the AEC, radiation monitoring became the shared purview of the commonwealth’s agencies, NECO, and the AEC. Even as the AEC retained some regulatory control, in practice the agreement gave state agencies and NECO considerable responsibilities for record keeping and site monitoring.<sup>33</sup>

At first, NECO buried only small shipments, but the volume grew quickly. When reporters traveled back to Maxey Flats in 1964, headlines described a reluctant community, one that had learned “to live with ‘hot but safe’ neighbors.” Floyd Wilcox, Kentucky’s direc-

Fleming County Public Library, Flemingsburg, Ky. (hereinafter FCPL).

<sup>32</sup> Zehner, “Hydrogeologic Investigation of the Maxey Flats Radioactive Waste Burial Site,” 21 (quotations); Brian Kiernan, Peggy Hyland, Mary Lou Holt, and Legislative Research Commission Staff, “Report of the Special Advisory Committee on Nuclear Waste Disposal,” Research Report No. 142 (Oct. 1977), 2.

<sup>33</sup> Walker, “The South and Nuclear Energy,” 126–27.

tor of radiological health, gave a lukewarm endorsement, declaring NECO's operation as "equal [to] or better" than other facilities, but there were troubling statements by the company's top brass. Their seemingly breezy, devil-may-care attitudes characterized the early years of radioactive-waste disposal. James Harvey, a vice president at NECO, offered facile reassurances that "radiation can be cleaned off like dirt" and cited "soap and water and a lot of elbow grease" as the "best method yet."<sup>34</sup> Harvey, it seems, neglected to mention that soap, water, and elbow grease were harder to employ when radionuclides migrated deep into fractured rock, or when over four million cubic feet of radioactive waste, sometimes buried in nothing more than a cardboard box, mixed with tremendous amounts of rain.

Even as regional newspapers portrayed the community as learning to "live with" their new radioactive neighbor, dissenters moved among them. Local residents William Prince and Andrew Porter shared their concerns with reporters in 1964. Both men worried about "underground water going through waste trenches" and "spreading it through the creeks," and their fears proved prescient.<sup>35</sup> Early news coverage, albeit limited, noted that "the area's 50 residents have not really accepted the unusual cemetery which disturbs the serenity of the area." Despite the company's advertisements of an open-door policy, citizens countered these assertions, with John Stokely, the county judge, commenting that he had "been by there a number of times, but I wasn't permitted to go in." In contrast, Fleming County sheriff Charles Wallingford viewed "anything to help the county" as a positive development, especially for an area he described as "mostly woodland" and the disposal site as "the only industry in that part of the county."<sup>36</sup> Thus, community reactions varied from skeptical to supportive.

Kentucky officials cloaked any risks with promises of industrial

<sup>34</sup> Morrissey, "Kentucky's Atomic Burial Ground" (quotations); Walker, *Road to Yucca Mountain*; Hamblin, *Poison in the Well*.

<sup>35</sup> Morrissey, "Kentucky's Atomic Burial Ground."

<sup>36</sup> Carl L. Miller, "Nuclear Slopjar: Radioactive Waste Graveyard," *Cincinnati Enquirer*, November 24, 1968.

and economic development, while NECO employees publicly described the nuclear field as “probably the most ethical business in the world” and proudly displayed the onsite farm and cattle as proof of the site’s safety. And yet, the immediate returns for the state were paltry. During the first year of operation, Maxey Flats received 176,000 cubic feet of waste, and NECO paid five cents per cubic foot, amounting to a grand total of \$8,800 in revenue for Kentucky—the beginning of what Wendell Berry has labeled the “blackest of black jokes.”<sup>37</sup> Shipments grew for NECO, but other nuclear projects failed to develop, and the state garnered little tax revenue.

From 1963 to 1977, NECO accepted 4.8 million cubic feet of radioactive waste at the MFDS. Prior to 1973, the bulk of special nuclear material disposed of at MFDS came from fuel processing, while non-fuel cycle waste categorized as source material or special nuclear material came predominantly from government agencies. Buried in forty-seven trenches, officials classified the materials as low-level radioactive waste, which typically consisted of objects used in medical research or nuclear facilities that have been exposed to radioactive material or radiation. Many of these trenches contained physical waste, such as paper, glass, or animal carcasses. The trenches also harbored 533,000 pounds of “source material,” or thorium and non-enriched uranium. More dangerous, however, were the trenches filled with 431 kilograms, or roughly 950 pounds, of “special nuclear material,” including highly radioactive plutonium, uranium-233, and enriched uranium-235. Today, these materials constitute high-level and transuranic waste—both of which now require deep geologic disposal or onsite storage. At Maxey Flats, the dimensions of shallow trenches were 680 feet long, 70 feet wide, and 30 feet deep. Other wells, though—especially “hot wells,” which contained small volumes of waste with “high specific” radioactivity—only reached depths of ten or fifteen feet. The methods employed at Maxey Flats stand in stark contrast to those used at radioactive-waste sites today, where facilities bury waste in large, thick casks. At Maxey Flats, materials

<sup>37</sup> Ibid. (first quotation); Berry, “Foreword,” 1 (second quotation).



arrived in all forms, with containers ranging from metal drums to cardboard boxes; there was no clear inventory of what materials were stored, only rough sketches, hampered further by an inconsistent application of standards.<sup>38</sup>

To some extent, the lax procedures reflected an evolving body of knowledge about radiation hazards, nuclear proliferation risks, and environmental impact. An overriding faith in the ability to remediate environments or devise technological solutions further encouraged NECO's methods. From the 1940s to the late 1960s, radioactive-waste disposal was crude at best. Government officials sanctioned ocean disposal, and off the coast of San Francisco barrels containing approximately two and a half million gallons of radioactive waste were sunk to depths anywhere from three hundred to six thousand feet. The underlying logic supporting these policies, as Jacob Hamblin has shown, eroded for environmental, diplomatic, and political reasons, leading to the creation of low-level burial sites, onsite storage, and controversial deep-geologic storage. On land, nuclear-weapons production, at installations like Hanford in Washington state or Rocky Flats in Colorado, grossly contaminated local ecosystems. Historian Ian Stacy has argued that "institutionalized belief" rather than "Cold War hysteria, a culture of secrecy, or callous disregard for public well-being" put Hanford on the "road to environmental ruin."<sup>39</sup> Stacy's interpretation places Hanford's managers in their historical context rather than our own.

Similarly, Maxey Flats shows how views about acceptable risk and environmental vulnerability evolved, sometimes slowly, from its initial

<sup>38</sup> Zehner, "Hydrogeologic Investigation of the Maxey Flats Radioactive Waste Burial Site," 6, 49; Meyer, "Preliminary Data," 13; Dames and Moore, Consultants in the Environmental and Applied Earth Sciences, "Assessment of the Levels, Potential Origins and Transport Routes of the Radioactivity Measured in the Vicinity of the Maxey Flats Low-Level Radioactive Waste Disposal Site," March 1977, 2-7-2-14, Maxey Flats Research Documents, University of Kentucky Center for Applied Energy Research website, [http://www.ukrcee.org/maxeyFlats/maxey\\_flats.aspx](http://www.ukrcee.org/maxeyFlats/maxey_flats.aspx) (accessed November 12, 2016); EPA, Maxey Flats ROD, 12, 22 (quotations).

<sup>39</sup> Herman A. Karl, ed., *Beyond the Golden Gate: Oceanography, Geology, Biology, and Environmental Issues in the Gulf of the Farallones* (Washington, D.C., 2001), 66-68; Hamblin, *Poison in the Well*; Stacy, "Roads to Ruin," 439 (quotations).

licensing to its subsequent remediation. What happened at Maxey Flats also resulted from an imperfect transition from government to commercial control of dangerous radioactive materials. Transferred into private hands, the commodification of radioactive waste gave operators a financial incentive to further ignore problems.<sup>40</sup> Radioactive waste operates on a vastly different timescale from private industry, which is bound by short-term business cycles, and proper disposal requires subordination of profit to safety, an ideal more likely fulfilled in abstract than in practice. The state of Kentucky's negligence, as detailed later, is less easily attributable to greed because the returns for Maxey Flats were so small. Over a decade, the burial surcharge amounted to only \$136,036 in revenue for the state. State officials accepted such paltry tax revenue from NECO because they believed they could attract other nuclear industries to Kentucky.<sup>41</sup>

While Maxey Flats challenges a simple narrative of polluters and the people, the recklessness and repeated denials are difficult to ignore. By the 1960s, radiation standards had tightened, but as in the case of Hanford, the "sense of geographical isolation" at the site arguably discouraged caution.<sup>42</sup> As one early news report observed, "just getting the waste" to Maxey Flats was "quite difficult," with trucks traveling "nearly twenty miles of winding rural hardtop . . . and another five miles over a dirt mountain road."<sup>43</sup> With a low population density, only a few watchful residents provided outside scrutiny of the site. They were wary of an operation shrouded in secrecy and hesitant to answer questions. Moreover, the very invisibility of radiation and the slow processes that occur with radionuclide migration offered a new kind of environmental problem, one that challenged faith in the ability of experts to accurately predict where and how fast radionuclides would travel.<sup>44</sup>

<sup>40</sup> On the commodification of waste generally, see Emily Brownell, "Negotiating the New Economic Order of Waste," *EH* 16 (April 2011): 262–89.

<sup>41</sup> Livingston Taylor, "State won't release radiation report but officials say Maxey Flats is safe," *Louisville Courier-Journal*, December 2, 1974.

<sup>42</sup> Stacy, "Roads to Ruin," 419.

<sup>43</sup> Miller, "Nuclear Slopjar."

<sup>44</sup> For works exploring the relationship between the environment and health, with an

For nearly ten years, the activities at Maxey Flats largely went unnoticed. Despite radiochemical sampling by the Kentucky Department for Human Resources on a monthly basis, only in 1972 did environmental monitoring reveal that radionuclides had possibly migrated away from the burial pits.<sup>45</sup> With steady annual precipitation, water had seeped into the trenches, providing the perfect vehicle for radionuclide migration. Early surveys indicated tritium, a radioactive isotope of hydrogen, had traveled beyond its original location. That same year, NECO was cited for eight alleged violations of their licensing requirement, including burial of high-activity materials, failure to provide sump pumps to remove water from trenches, burying the highly reactive metal europium after the state health department denied the request, and “depositing liquids from a tank truck directly into a holding pit.” Two years later, a more comprehensive study confirmed that tritium and “other radioactive contaminants” had indeed migrated beyond their trenches. As this news surfaced, state officials and NECO’s representatives described increasing radiation levels as “a little bit” elevated, but they stated that the study confirmed the site “in no way constitutes any public health hazard.”<sup>46</sup> The report, however, publicized NECO’s shoddy disposal methods and a weak regulatory apparatus.

The 1974 study called for better record keeping and for better enforcement of radiation standards. NECO’s incomplete records resulted in a gap of knowledge, and as sociologist Scott Frickel has

emphasis on invisibility and uncertainty, see Scott Kirsch, “Harold Knapp and the Geography of Normal Controversy: Radioiodine in the Historical Environment,” *Osiris* 19 (2004): 167–81; Olga Kuchinskaya, *Infrastructures: The Politics of Invisibility: Public Knowledge about Radiation Health Effects after Chernobyl* (Cambridge, Mass., 2014); Gregg Mitman, Michelle Murphy, and Christopher Sellers, “A Cloud Over History,” *Osiris* 19 (2004): 1–17; Jody A. Roberts and Nancy Langston, “Toxic Bodies/Toxic Environments: An Interdisciplinary Forum,” *EH* 13 (Oct. 2008): 629–35; Adriana Petryna, “Biological Citizenship: The Science and Politics of Chernobyl-Exposed Populations,” *Osiris* 19 (2004): 250–65.

<sup>45</sup> Zehner, “Hydrogeologic Investigation of the Maxey Flats Radioactive Waste Burial Site.”

<sup>46</sup> Livingston Taylor, “Fleming County Nuclear Waste Site Not Hazard, report says,” *Louisville Courier-Journal*, December 17, 1974 (first quotation); EPA, Maxey Flats ROD, 12–13 (second quotation on 13); Taylor, “State won’t release radiation report” (third and fourth quotations).

argued, “lost knowledge matters.” Without complete inventories of the materials buried, predicting the migration of radionuclides or assessing the risk to public health (and the environment) posed a difficult challenge. Before the state required electronic records, NECO sent officials a monthly report of cubic feet and curies—or units of radiation—for recent burials and notated source or special material such as enriched uranium or plutonium. While the company may have kept more detailed records on site, the state records only mentioned specific materials and placement occasionally. For example, in correspondence dated August 1963, an addendum noted that U-235 (enriched uranium), strontium 90 (a radioactive isotope of strontium), and cobalt 60 (a radioactive isotope) were buried in pit one and also noted their general placement.<sup>47</sup>

Until the mid-1970s, when reports of trouble first surfaced, the slow violence occurring at Maxey Flats evaded detection—except for the radiation monitors visiting the site, company employees working there, and watchful local residents observing NECO practices. Only in 1991 did officials publicly admit the site posed an “imminent risk” to public health, and meanwhile radionuclides continued their creep outward from Kentucky’s atomic graveyard. Rather than a “spectacular” or “spontaneous” disaster, which would have garnered immediate attention, the calamity unfolded over several decades. Like many hazardous environments, changes occurred over long stretches of time, “incremental and accretive,” as Rob Nixon has described it.<sup>48</sup> This process can slowly alter environments and affect public health in such a way as to go unnoticed. Records are lost or destroyed, employees leave, and the regulatory apparatus often fails in small ways that accumulate into a major problem.

In 1975, Bobby Wilson, a former employee of the state’s radiation

<sup>47</sup> Scott Frickel, “On Missing New Orleans: Lost Knowledge and Knowledge Gaps in an Urban Hazardscape,” *EH* 13 (Oct. 2008): 645 (quotation); Bruce Harris to Floyd Wilcox, August 8, 1963, Folder: Nuclear Engineering—Radioactive Waste, Box 2, KAESA Records, KDLA.

<sup>48</sup> EPA, Maxey Flats ROD, 14 (first quotation); Nixon, *Slow Violence*, 2–3 (second, third, and fourth quotations).

bureau confirmed such neglect. Wilson alleged that over the course of eight years he had witnessed violations at Maxey Flats, which regulators either ignored or left unreported. Among them, state employees had noticed the “bathtub” effect in the trenches, where rainwater pooled at the bottom, but they failed to intervene. More troubling, Wilson warned that NECO’s methods for removing water might release dangerous amounts of radioactivity into the air. To deal with the excess water, NECO used an evaporator, which pumped water out and then evaporated it, releasing radiation as it operated. From 1973 to 1986, evaporators usually churned twenty-four hours per day, eventually processing six million gallons of liquids. It was a futile effort, which solved one problem only to create another.<sup>49</sup> No simple technological solution could adequately address contamination of such magnitude, especially as the site continued to accept waste shipments.

In 1976, the reckoning for the site began. Vague assurances and outright denials failed to stave off the growing concern about Maxey Flats. A report published by the General Accountability Office (GAO) found that radioactive waste disposal sites in the United States faced an array of problems that stemmed from improper siting and poor geological assessments. The GAO’s report confirmed many of Bobby Wilson’s allegations. Problems with record keeping, “slow progress” from Kentucky officials dealing with NECO’s violations, and faulty assumptions about the site’s geology contributed to radionuclide migration. An external audit later confirmed Wilson’s criticism, noting the site was “operated by about ten employees, none of whom had extensive health physics backgrounds,” despite the dangerous materials buried there. Auditors also discovered areas of surface contamination that lacked corresponding records, with information consisting of retroactive measurements and “recollections of occurrences.”<sup>50</sup>

<sup>49</sup> Howard Fineman, “Nuclear Site Safety Questioned,” *Louisville Courier-Journal*, April 17, 1975; EPA, Maxey Flats ROD, 13.

<sup>50</sup> General Accounting Office report, “Improvements Needed in the Land Disposal of Radioactive Wastes—A Problem of Centuries,” 1976, p. 26, available online at <http://www.gao.gov/products/RED-76-54> (accessed December 29, 2016) (first quotation); Dames and

In tandem with the GAO, the Environmental Protection Agency published an alarming study of Maxey Flats in 1976. The EPA report argued that plutonium and other radionuclides “are out of the trenches” and that plutonium isotopes “might be migrating through the ground,” potentially “hundreds of meters” beyond the site’s trenches. Despite this contention, the EPA’s report also stated that radioactivity levels offsite “do not constitute a health hazard at this time.” The EPA’s report challenged ideas about plutonium’s mobility. Because of its heavy mass and low solubility, plutonium isotopes move slowly compared to more mobile radionuclides like tritium. Much of what scientists knew about plutonium migration came from studying the effects of nuclear-weapons testing and specific contamination incidents.<sup>51</sup> With those cases, early research suggested that plutonium deposits adsorbed onto soil particles, and the conventional wisdom suggested it might move no more than “a few centimeters” in its hazardous lifetime.<sup>52</sup> Climate mattered as well. Semi-arid environments interacted with plutonium differently. Previous studies failed to encompass the full range of possibilities because they did not always account for areas with more rainfall, such as Maxey Flats.<sup>53</sup> Denials of any public health hazard also relied upon faulty notions that radioactive elements would behave as they would in isolation, but the trenches at Maxey Flats contained a vast array of chemicals, inorganic and organic compounds, heavy metals, and radioactive materials.<sup>54</sup>

Moore, “Assessment of the Levels, Potential Origins and Transport Routes,” section two, 2-15 (second and third quotations).

<sup>51</sup> Meyer, “Preliminary Data,” iii (quotations), 44–47; Kristin Shrader-Frechette, “Scientific Progress and Models of Justification: A Case in Hydrogeology,” in *Science, Technology, and Social Progress*, ed. Steven L. Goldman (Bethlehem, Penn., 1989), 207–10; Yasunori Mahara and Akira Kudo, “Plutonium Mobility and Its Fate in Soil and Sediment Environments,” in *Plutonium in the Environment*, ed. Akira Kudo (Amsterdam, 2001), 347–62.

<sup>52</sup> Meyer, “Preliminary Data,” 51.

<sup>53</sup> Meyer, “Preliminary Data,” 44. Some early studies in non-western U.S. environments found radionuclide migration but not for plutonium isotopes. See S. O. Reichert, “Radionuclides in Groundwater at the Savannah River Plant Waste Disposal Facilities,” *Journal of Geophysical Research* 67 (Oct. 1962): 4363–74.

<sup>54</sup> Jess M. Cleveland and Terry F. Rees, “Characterization of Plutonium in Maxey Flats Radioactive Trench Leachates,” *Science*, June 26, 1981, pp. 1506–9; EPA, Maxey Flats ROD, 20–22.

The EPA's tentative explanations represented a broader sea change in thinking about radionuclide migration, one that more readily recognized the problems that nuclear-waste facilities presented. As one Department of Energy report acknowledged, prior to the 1970s, environmental research at nuclear sites occurred on an "ad-hoc" basis, "usually prompted by some contamination event" and generally applied to western soils and geology. Generally, "biological modification" of transuranium elements, such as plutonium, where interactions led to increased mobilization, had been neglected. Sites like Maxey Flats and Hanford demonstrated how little scientists knew about the environmental behavior of radioactive isotopes. Since the discovery of environmental problems at those two sites, researchers have openly admitted the complexity and difficulty associated with long-term predictions about migration.<sup>55</sup>

Later studies suggested that plutonium and other radionuclides "complexed" with organic compounds at Maxey Flats. As water percolated through the trenches' mystery brew, leachates—the formal term for the by-product of this process—"became highly enriched in contaminants." Organic compounds present in the trenches contributed to "elevated concentrations of radionuclides," and their behaviors changed in unexpected ways.<sup>56</sup> The site's poor disposal practices, shoddy oversight, heavy rainfall, and geology combined

<sup>55</sup> Wayne C. Hanson, ed., *Transuranic Elements in the Environment: A Summary of Environmental Research on Transuranium Radionuclides Funded by the U.S. Department of Energy through Calendar Year 1979* (Washington, D.C., 1980), iii (quotations); Robert Alvarez, "Plutonium Wastes from the U.S. Nuclear Weapons Complex," *Science and Global Security* 19 (April 2011): 15–27; K. J. Cantrell and A. R. Felmy, "Plutonium and Americium Geochemistry at Hanford: A Site-Wide Review," report prepared for the U.S. Department of Energy, August 2012, available online at [http://www.pnnl.gov/main/publications/external/technical\\_reports/PNNL-21651.pdf](http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-21651.pdf) (accessed December 29, 2016).

<sup>56</sup> Organic compounds present in trenches, such as EDTA (*Ethylenediaminetetraacetic acid*), can form complexes or bonds with radioactive elements or metal ions. This interaction increases solubility and reduces adsorption, potentially enabling complexed radionuclides to migrate. K. J. Cantrell and R. G. Riley, "Subsurface Behavior of Plutonium and Americium at Non-Hanford Sites and Relevance to Hanford," report prepared for Fluor Hanford, Inc., and U.S. Department of Energy, Pacific Northwest National Laboratory, February 2008, 8.9, available online at [http://www.pnl.gov/main/publications/external/technical\\_reports/PNNL-17386.pdf](http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17386.pdf) (accessed December 29, 2016).



to create rogue radionuclides capable of moving faster and farther than expected. But in the mid-1970s, early reports could only give preliminary explanations about why studies detected plutonium in soil samples, adjacent streams, and monitoring wells. Even as government and company officials denied any immediate health hazard, their reports underscored a great degree of uncertainty. The EPA's 1976 report concluded that little about the problem at Maxey Flats had been "explained satisfactorily."<sup>57</sup>

Although Kentucky restricted the burial of special nuclear material in 1974, large quantities of transuranic waste contaminated with man-made radioactive elements—like plutonium—already existed onsite. Likewise, the EPA study characterized the accuracy of NECO's burial records as "uncertain," making it difficult to predict how leachates might behave and how fast they might migrate.<sup>58</sup> Or as EPA officials put it, "we don't know what's buried at the site or understand the hydrogeological/geochemical system it is buried in."<sup>59</sup> Other studies confirmed long-standing problems with record keeping. In 1972, Kentucky's Radiological Health Department and the EPA sought to transfer burial records from 1963–1972 onto computer cards and discovered an inadequate burial inventory, which included improper isotope identification, mismatched isotopes with radioactivity, or incomplete details about burial location and date.<sup>60</sup> Gross discrepancies had occurred with burial pit volume; pit four, for example, had one cubic foot of waste volume recorded but, in fact, contained over seven hundred cubic feet of waste.<sup>61</sup>

NECO reacted swiftly to the EPA's 1976 report. James Neel, the company's president since 1972, denied any potential hazard to the environment or public health, stating flatly, "there is no health hazard here." Maxey Flats, according to Neel, represented a "model" waste site. Denying the study's validity, Neel called it "unscientific" because

<sup>57</sup> Meyer, "Preliminary Data," x.

<sup>58</sup> Ibid., 13.

<sup>59</sup> Ibid., 64.

<sup>60</sup> Uri Gat, J. D. Thomas, and David T. Clark, "Radioactive Waste Inventory at the Maxey Flats Nuclear Waste Burial Site," *Health Physics* 30 (March 1976): 281–89.

<sup>61</sup> Ibid., 288.

the “standard belief” stated that plutonium was “incapable” of moving through the ground.<sup>62</sup> Testifying before a congressional subcommittee on radioactive waste in 1976, Neel enlisted other true believers to aid him. Frank L. Parker, a professor of environmental and water resource engineering at Vanderbilt University, called the EPA’s analysis “so subjective, it cannot be considered scientific.” A professor of soil science at Auburn University, Ben Hajek, dismissed the EPA’s findings as having “no scientific or technical merit.” Neel’s dogged denials were a product of deep personal investment in the industry. Having served as a lawyer for the AEC, Neel helped underwrite Kentucky’s agreement to regulate its own nuclear materials. As Kentucky writer Frank Browning dryly observed, Neel had a “dream” of turning the state into a “nuclear paradise.” When the EPA characterized Maxey Flats as “basically a landfill,” Neel responded as if personally affronted by such claims. In his testimony to Congress, Neel described the MFDS as a “sophisticated nuclear waste disposal site demanding a high degree of know-how and expertise.”<sup>63</sup>

The people living near Maxey Flats, however, called it “the company dump,” “the nuclear slop jar of America,” or, more obliquely, as “that place.” While doubts always existed about the facility’s safety, no organized opposition to Maxey Flats emerged until the mid-1970s. Beginning in 1974, when regional newspapers again turned their attention to Maxey Flats, concerned residents finally gained vital information about the materials buried onsite, poor disposal practices, and possible radionuclide migration. Some residents suspected that changes in the local environment, such as discoloration of streams, were tied to NECO, but those complaints had been ignored or dismissed by company and state officials. According to Anita Thompson, once the “people over the hill,” heard news about possible problems

<sup>62</sup> Browning, “The Nuclear Wasteland,” 46.

<sup>63</sup> Browning, “The Nuclear Wasteland,” 45 (third and fourth quotations), 46; *Low-Level Radioactive Waste Disposal: Hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninety-Fourth Congress, Second Session* (Washington, D.C., 1976), 258–59 (first and second quotations), 263 (sixth quotation); Meyer, “Preliminary Data,” 47 (fifth quotation).

and realized “what exactly they were putting back there . . . that’s when they started raising such a fuss. And I mean, they raised seven kinds of Cain.” The participants primarily came from the areas immediately surrounding the site, especially in the small communities below Maxey Flats, such as Ringos Mill and Muses Mill, where farms relied upon water sources vulnerable to contamination from surface runoff and subsurface migration.<sup>64</sup>

Led by the charismatic John P. Hay, a local “farmer, electrician, [and] ginseng digger,” often referred to as John P., the Maxey Flats Protective Association (MFPA) joined forces with a young soil conservationist, Jonathan Hawes, who had recently been assigned to Fleming County’s Soil Conservation Service (SCS).<sup>65</sup> Hawes became involved in the organization after seeing a flyer about Maxey Flats at a country store. Curious, Hawes called the organizer, John P., a person he describes as “one of a kind . . . he had maybe a sixth grade education . . . but he was a very wise man” with “a big heart.” In their first conversation, John P. told Hawes that “something really bad is going on. They’re dumping this stuff up on the mountain, they won’t tell anybody—they won’t let anybody near it, and it’s been going on for years, and I think it’s damaging our health.”<sup>66</sup>

Struck by John P.’s passion and credibility, Hawes contacted NECO, whose officials initially gave him the “same spiel” John P. and other local people had received in the past. Denying the problem, and then emphasizing the community’s limited formal knowledge, the underlying message, according to Hawes, was “trust us.” Unwilling to relent, Hawes marshaled his own scientific expertise, and the

<sup>64</sup> Browning, “The Nuclear Wasteland,” 43 (first quotation); Miller, “Nuclear Slopjar” (second and third quotations); NBC Reports: Danger! Radioactive Waste,” *NBC Nightly News*, aired January 26, 1977; Thompson interview, August 1, 2016 (fourth and fifth quotations).

<sup>65</sup> Browning, “The Nuclear Wasteland,” 44. The Soil Conservation Service was established in April 1935 as a permanent agency of the United States Department of Agriculture. Tasked with maintaining “healthy and productive working landscapes,” the SCS is now the Natural Resources Conservation Service and brings together farmers, local and state governments, and federal agencies in the pursuit of shared goals. “History of NRCS,” United States Department of Agriculture website, available online at <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/about/history/> (accessed September 12, 2016).

<sup>66</sup> Jonathan Hawes, phone interview with author, August 9, 2016.

company changed its posture from one of outright denial to minor concessions, begrudgingly sharing information. Because of this, Hawes played a pivotal role as the “only scientist” in the MFPA; his scientific knowledge opened doors previously closed to concerned residents.<sup>67</sup>

In February 1976, the MFPA organized a meeting at a local school “hoping to attract 20 or 30 people.” Instead, over one hundred people gathered together to call for action. Only a few months later, nearly two thousand people signed a petition to close the site. Although opposition to the waste repository came from concerns about radiation, local people also resented the idea that anyone perceived them as unaware or easily duped. John P. surmised that “you can’t just trust too much of what the company or the state people tell you. It’s like we’ve known the company’s been pumping over the hill into No Name Hollow. But they denied it for the longest time.” Writing to the *Cincinnati Enquirer* in February 1976, he presciently observed that “a news story is taking shape in the area,” one where organized opposition formed in a “search for information.” The threat of contamination into creeks and rivers warranted that “some questions be answered.”<sup>68</sup> As John P. recognized, the events at Maxey Flats invalidated state and company officials’ claims of expertise and the need for secrecy. The nascent organization raised fundamental questions about lay people’s right to information and the need for transparency in hazardous industries.

Other residents echoed these sentiments. Monty Hall, who owned a dairy farm with her husband a mile from Maxey Flats, lamented, “they don’t give you credit for knowing anything.” Hall recounted an interaction with state officials, where two men stopped “back on this little dead-end road we live on” and asked for a cup of water, saying, “the soda pop . . . just don’t satisfy you like water.” The man then

<sup>67</sup> Ibid. (first and second quotations); Ben Kaufman, “Area Residents Form Maxey Protest Group,” *Cincinnati Enquirer*, March 26, 1976 (third quotation).

<sup>68</sup> Browning, “The Nuclear Wasteland,” 44 (first and second quotations); John P. Hay, “Letter to the Editor,” *Cincinnati Enquirer*, February 15, 1976 (third, fourth, and fifth quotations).

took one sip and placed the rest in a jar. Remembering it “plain,” Hall played along, letting “‘em think I believed ‘em,” but she knew “they was here for the dump.” Another local farmer, Rosena Cogswell, who lived “just under the hill” from Maxey Flats, expressed concern about her beef cattle drinking water from Rock Lick Creek—down below from the site. Cogswell noted that local families drank from “vein fed wells coming out of this hill.” She demanded the site’s closure, because “the thought of a radioactive graveyard in our back door and leaking deadly chemistry into our streams is not a very pleasant one.”<sup>69</sup>

To some extent, the doubt expressed by people living near Maxey Flats came from their knowledge of the local environment and area water sources, learned from farming and living on the land. As science and technology studies scholar Brian Wynne has noted in his study of Cumbrian sheep farmers affected by Chernobyl fallout, “adaptability and flexibility” grounded farmers’ lay knowledge. Unlike the scientific culture of prediction and control, lay knowledge often assumes “predictability to be intrinsically unreliable.”<sup>70</sup> At Maxey Flats, the early environmental assessments conceded that heavy rainfall and fractured shale posed potential problems, but the local dissenters and the government “experts” surveying the site valued these risks differently. While uncertainties in scientific knowledge contributed to the environmental ruin, both NECO and the state of Kentucky were aware of the site’s shortcomings. However, licensing decisions were made on the assumption of proper operation and low-level waste burial—not the medley of high-level radioactive materials buried there. Rigid models underestimated how radionuclide behavior might defy expectations in uncontrolled circumstances. Flawed human oversight coupled with environmental conditions and faulty assumptions about radioactive isotopes invalidated the original model. Ultimately, these

<sup>69</sup> Browning, “The Nuclear Wasteland,” 44 (first through sixth quotations); Rosena Cogswell to William Moorhead, March 29, 1976, in *Low-Level Radioactive Waste Disposal*, 434 (seventh through ninth quotations).

<sup>70</sup> Brian Wynne, “May the Sheep Safely Graze? A Reflexive View of the Expert-Lay Knowledge Divide,” in *Risk, Environment and Modernity: Towards a New Ecology*, ed. Brian Wynne, Bronislaw Szerszynski, and Scott Lash (London, 1996), 67.

decisions reflected a failure to consider the possibility that the gradual accumulation of small mistakes can create environmental problems.

Reflecting on Maxey Flats decades later, Jonathan Hawes pointed to a deeper understanding of the issues within the community. The battle over Maxey Flats was about more than radiation or public health. It was, according to Hawes, “about arrogance . . . and not caring about people.” John P. Hay “was scandalized by the lack of empathy. He felt like they [NECO] were arrogant and high-handed and he didn’t trust them. He trusted his own gut.” Hawes also believes the company’s negligent, dismissive attitude reflected divisions of class and geography. Eastern Fleming County, where rolling hills gradually become rugged terrain, was viewed by some as the “other side of the Fleming County tracks,” and the people there “were looked down upon.” For Hawes, the area surrounding Maxey Flats possessed natural beauty, but it could be a “pretty rough place,” inhabited by impoverished residents who “didn’t live long.” As Hawes soberly observed, “they don’t put waste dumps in Falls Church, Virginia. They put them in places where they can take advantage of people,” and the community “fully understood that issue. They understood they were being taken advantage of; they understood they were being disrespected.”<sup>71</sup> In this sense, the movement surrounding Maxey Flats held greater meaning for John P. and others living around the waste site. Environmental inequality mirrored broader fractures, and similarly disadvantaged Kentuckians throughout the state identified with their plight.

During the 1970s and 1980s, the furor in Kentucky over Maxey Flats coincided with another jarring example of dangerous waste disposal in Bullitt County, south of Louisville. The “valley of the drums,” an illegal dump, contained seventeen thousand barrels of hazardous waste and many thousands more of toxic liquids and sludge. In 1976,

<sup>71</sup> Hawes interview, August 9, 2016 (quotations). Falls Church, Virginia, is a wealthy suburb of Washington, D.C. *Forbes* named the Falls Church area the richest county in the United States in 2011. Nathan Verdi, “America’s Richest Counties,” *Forbes*, April 11, 2011, available online at [http://www.forbes.com/2011/04/11/americas-richest-counties-business-washington.html?\\_r=1](http://www.forbes.com/2011/04/11/americas-richest-counties-business-washington.html?_r=1) (accessed August 12, 2016).

state officials visited the site multiple times and fined Arthur Taylor, who operated the dump, but failed to complete the paperwork to close the operation. Like Maxey Flats, serious action occurred only after the EPA intervened in 1981. With stories like these, many Kentuckians, even those who proudly declared themselves part of “coal country,” voiced their fears about the costs of economic development. NECO president James Neel’s other business venture, PyroChem, sought to build a waste incinerator in Lawrence County, a poor, rural area in eastern Kentucky. Residents split over whether the economic benefits outweighed the possible downsides. One citizen commented that Neel had “no record except for Maxie [*sic*] Flats in his past,” and eastern Kentucky “should not be made into a dump for all our industrialized neighbors.” The writer then asked “why should a few bussiness [*sic*] men with a briefcase force this on us. We stand unitted [*sic*], we feel we are not well off, but things could be worse. More Hazardous waste on our highways—let alone our air poisoned [*sic*—what goes up must come down.” Writing to Governor Julian Carroll about government neglect of a local flooding problem, another Kentuckian put it even more succinctly: “Kentucky Hillbillys [*sic*] are an endangered species.” If modernity has produced global environmental consequences, there are clear “winners” and “losers,” as Ulrich Beck has written.<sup>72</sup> Rural Kentuckians keenly observed their place in the latter category.

The slow violence at Maxey Flats continued while federal, state, and company officials negotiated the site’s future. Governor Carroll broke ranks with his predecessors, calling for an increase in fees per cubic foot of waste. Governor Carroll’s administration signaled

<sup>72</sup> Larry Tye, “Drums are gone, but Valley’s not Clean,” *Louisville Courier-Journal*, March 12, 1983 (first quotation); Cynthia Crossley, “Dumped On: Threats from Hazardous Waste Sites Taught County Lessons Over 20-year Span,” *Louisville Courier-Journal*, June 29, 1988; Mrs. Robert W. Burges to John Y. Brown Jr., June 21, 1983, Folder 2, Box 96, Correspondence Files, Governor John Y. Brown Jr. Papers, KDLA (second, third, and fourth quotations); R. G. Dunlop, “Lawrence Residents Split Over Proposed Waste-Disposal Plant,” *Louisville Courier-Journal*, July 10, 1983; Mrs. C. T. Pritchard to Julian Carroll, April 8, 1979, Folder 2, Box 46, Correspondence and Subject File, Governor Julian Carroll Papers, KDLA (fifth quotation); Ulrich Beck, *Risk Society: Towards a New Modernity* (London, 1992), 23 (sixth and seventh quotations).



a change in policy by meeting with John P., Jonathan Hawes, and other members of the Maxey Flats Protective Association on March 9, 1976. Further supporting their cause, the Fleming County grand jury issued a series of recommendations, including more transparent record keeping, ceding some regulatory control to the federal government, and calling for a thorough geological site survey. In June 1976, the state increased the tax on burial shipments to ten cents per pound, which many hailed as a way to tax NECO out of business (producers would ship their waste elsewhere). The Carroll administration also confronted James Neel, NECO's president and most ardent defender. Writing to Neel in September 1976, Secretary of Finance and Administration Russell McClure conceded that the EPA's study might not be "warranted by the facts," but "the local population has been alarmed" and "the state has a fundamental responsibility to the people." Furthermore, Neel's promises of nuclear industry never materialized, and, instead, generations of taxpayers must bear the burden because NECO's fees amounted to a "drop in the bucket," McClure wrote.<sup>73</sup> McClure's response reflected a growing sense that over ten years of mismanagement and carelessness had left Kentuckians with a problem for hundreds, if not thousands, of years.

Although Governor Carroll's actions signaled a shift in policy toward Maxey Flats, skeptics within the community remained unsatisfied and sought to close the site permanently. Jean Denton, editor of the *Fleming Gazette*, criticized the burial fee increase as a long-term solution that ultimately failed to grapple with a more immediate problem: "Considering the poisonous substances many Fleming Countians are probably getting in the water they drink and the foreign, deadly quantities which have been put into the very air we breathe by this monster, money is scarcely an issue at this point." Denton's point underscored the sense of urgency among those liv-

<sup>73</sup> "Maxey Flat: Radiation Protective Association Proceeding with Efforts to Close Nuclear Dump," *Flemingsburg* (Ky.) *Times-Democrat*, March 18, 1978; David Ross Stevens, "Maxey Flats: Question Raised about Its Future," *Louisville Courier-Journal*, August 29, 1976; Russell McClure to James M. Neel Jr., September 24, 1976, Folder: Finance, Box 34, Correspondence and Subject File, Carroll Papers, KDLA (quotations).



A bulldozer operator fills in a burial trench at Maxey Flats on February 4, 1976.  
*Photo by Ron Garrison, reproduced by permission from the Lexington Herald-Leader.*

ing near the site, but the financial implications for the state loomed large and continued to dictate negotiations over the site's closure and remediation in the decades thereafter. Despite their reservations, Marjorie Denton, Jean's daughter and the secretary of the MFPA, wrote to Jonathan Hawes in October 1976 with a hopeful message: "Things are finally looking up for us." Hawes, so instrumental in the group's success earlier that year, had been transferred to another job in western Kentucky, which John P. suspected came as a result of his involvement with Maxey Flats. "John P. was probably right," says Hawes, but he also points to the conservative nature of the Soil Conservation Service during that period, geared to agricultural needs and not issues like water and environmental quality.<sup>74</sup>

The group pressed on, enlisting their own experts from nearby universities, regional newspapers, and legal-aid services. Carol Lipton, a New York transplant working as a legal intern in nearby Morehead, felt compelled to act after reading about Maxey Flats. She was further buoyed by the growing anti-nuclear movement. Lipton aided in research efforts, grant writing, and coordinating with media outlets. As one state official underscored, there were "few professional persons available to citizens of Fleming county," and organizers like John P. smartly employed the aid of select individuals to further their cause.<sup>75</sup> The group transformed into a motley crew of local citizens and newcomers, but at its core, the steadfast participants were long-time residents who continued to live near the site.

More immediately, radionuclides continued to creep away from the 4.8 million cubic feet of waste. For most of 1977, state officials in the radiation control office gave Maxey Flats a "clean bill of health"

<sup>74</sup> "Jean's Jottin," *Fleming (Ky.) Gazette*, March 18, 1976 (first quotation); Marjorie Denton to Jonathan Hawes, October 1976, in the possession of Jonathan Hawes (second quotation); Hawes interview, August 9, 2016 (third quotation).

<sup>75</sup> W. B. Ardery, "Suggestion to Stop Dumping Waste at Maxey Flats Fuels Dispute," *Sunday Herald-Leader* (Lexington), May 1, 1977; Carol Lipton, interview with author, August 19, 2016; David Ross Stevens to Herbert St. Clair on behalf of Carol Lipton, January 19, 1977, in the possession of Carol Lipton; John P. Hay to Herbert St. Clair, March 15, 1977, in the possession of Carol Lipton; Brian Kiernan to Herbert St. Clair, January 14, 1977, in the possession of Carol Lipton (quotation).

and denied it posed any risk to the public. News of more seepage from trenches emerged in September 1977, when monitors detected radionuclides migrating through “subsurface geology” twenty feet below the ground. Despite assurances the site was “safe,” state officials scrambled to close Maxey Flats, as NECO tried to avoid paying for perpetual care or site clean-up. A temporary closure occurred after officials discovered more radioactive isotopes had migrated beyond their trenches, and the commonwealth of Kentucky negotiated an agreement to pay \$1.25 million in May 1978 for control of the site, its equipment, and the legal right to operate the site. Because of the complicated mechanism by which commercial sites were licensed—NECO had purchased the land, then sold it to the state, and signed a lease agreement with Kentucky—closing the site came at a steep price. NECO, however, could wrest back control if the U.S. Nuclear Regulatory Commission deemed the site safe. Finally, in 1979, NECO transferred full responsibility to the state government.<sup>76</sup>

State officials and private contractors attempted to stabilize Maxey Flats, relying upon the evaporator method, which meant pumping water from the trenches nearly twenty hours a day for years. Removing water from the trenches only worked as an imperfect, temporary fix. As the 1976 EPA report stated, to “dewater the trenches for hundreds or thousands of years—the hazardous lifetime of these wastes” was “difficult to imagine.” The method also left behind “evaporator concentrates,” which required burial and released radiation into the air. Adding to this, radionuclide migration, whether through surface runoff down the hillside or through subsurface migration, had reached into nearby aquifers. The local community’s interest in the MFDS subsided briefly in 1978 after waste shipments stopped, but news of tritium (a radionuclide) escaping from the evaporators onsite encour-

<sup>76</sup> Livingston Taylor, “Storing of Waste at Maxey Flats Called a ‘Mistake,’” *Louisville Courier-Journal*, July 27, 1977 (first quotation); EPA, Maxey Flats ROD, 13 (second quotation); “Radioactive Seepage Found at Maxey Flats,” *Louisville Courier-Journal*, September 2, 1977 (third quotation); T. G. Moore, “Operator says Maxey Flats to open again,” *Louisville Courier-Journal*, July 3, 1978; “State’s Maxey Flats contract may be the lesser of evils,” *Louisville Courier-Journal*, May 31, 1978.

aged the formation of a second citizens' group: Concerned Citizens of Maxey Flats. The group petitioned the county for public water to be provided to residents, but the request was not granted until 1985.<sup>77</sup> Until then, residents and animals continued to drink from local water sources as they had before NECO's arrival.

Amid a growing national awareness of the hazards posed by industrial waste, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as the Superfund Act, passed Congress in 1980. The act provided for federal intervention to clean up "uncontrolled or abandoned" hazardous-waste sites and other environments affected by industrial accidents or spills and, more important, gave the EPA expanded authority to seek out "potentially responsible parties" (PRP) to pay for environmental remediation. In 1983, after Kentucky officials requested consideration under CERCLA, the EPA began its formal investigation into the site, and in 1984, the EPA proposed the Maxey Flats Disposal Site for inclusion on the National Priorities List, reserved for the nation's most hazardous sites. The PRPs for the environmental mishap at Maxey Flats included 650 waste generators. CERCLA classified PRPs that buried small amounts of waste as *de minimis*, which primarily included private industry, universities, and hospitals. Those settling in the case, and presumably with larger shipments to Maxey Flats, included the commonwealth of Kentucky; the Departments of Defense and Energy; the U.S. Army, Air Force, and Navy; NASA; and a number of utility companies with nuclear power plants.<sup>78</sup> From

<sup>77</sup> EPA, Maxey Flats ROD, 13 (third quotation), 16, 42 (first and second quotations). A third citizens' group, Maxey Flats Concerned Citizens, Inc., played a role in the EPA's Superfund proceedings and received \$50,000 in grant money from the EPA for hiring technical advisors to better facilitate communication with the community; the EPA established a Community Relations Plan for MFDS in 1988.

<sup>78</sup> EPA, Maxey Flats ROD, 14, 16 (quotations); EPA, CERCLA Consent Decree for Remedial Design, Remedial Action, and Partial Reimbursement of Response Costs for the Maxey Flats Disposal Superfund Site," 1995, EPA Superfund Repository, FCPL; EPA, "Maxey Flats Consent Decree De Minimis," 1995, EPA Superfund Repository, FCPL. The final list of PRPs included 50 de maximis parties and 306 de minimis. See <http://waste.ky.gov/sfb/pages/maxeyflatsproject.aspx>. Other CERCLA efforts include public information repositories for Superfund sites.



those parties, eighty-two agreed to fund a “remedial investigation” and formed the Maxey Flats Steering Committee, which helped conduct and fund the initial site study.<sup>79</sup>

The addition of Maxey Flats to the EPA’s National Priorities List marked the first important step toward remediation. Throughout the many years of limbo, officials repeatedly stated Maxey Flats posed no immediate threat to public health or to the environment—an assurance that likely inspired little confidence. After all, why list a site that posed no harm to the public on the NPL? Of course, studies generally couched denials of any present danger in the short term. Uncertainty abounded about the long-term consequences of Maxey Flats. Radionuclide migration, whether through surface runoff or subsurface movement, generated the most fear. Invisible and odorless, radiation stealthily moves around undetected without monitoring devices, and in the case of Maxey Flats, exposures might occur over an entire lifetime. The EPA estimated 2.8 million gallons of leachate, the liquid produced when rainwater percolates through solids, still occupied the trenches, even after years of pumping liquids out. While migrating plutonium received more attention, the larger long-term threat was the wide assortment of radioactive isotopes and harmful chemicals consorting in the trenches. Non-radionuclides, like arsenic and lead, mingled with radioactive isotopes: tritium, cobalt 60, uranium-238 (enriched uranium), radium 226, strontium-90, and thorium 232.<sup>80</sup> Thorium 232, although only weakly radioactive, has a half-life of fourteen billion years. Environmental stewardship in such time frames defies easy answers.

Despite these risks, EPA officials waited until 1988 to declare “an imminent threat” to the environment and the public, and this designation came not from the radionuclide migration but rather from a by-product of the dewatering process. Eleven twenty-thousand-gallon tanks storing radioactive liquids prompted the alarm. For over ten years, the tanks sat in a building with no climate control, and prior

<sup>79</sup> EPA, Maxey Flats ROD, 14–15.

<sup>80</sup> *Ibid.*, 68.

to the EPA's intervention, nearly nineteen thousand gallons of contaminated water accumulated on the building's floor.<sup>81</sup> If the liquids froze and then expanded, radioactive liquid could escape or, worse, damage the structural integrity of the tanks leading to a massive spill. While the EPA warned state officials and the Maxey Flats Steering Committee about the serious threat, both flinched at any financial commitments for an immediate clean-up.

Instead, the risks were simply reinterpreted. In 1988, Pete Worthington, the Democratic state legislator who represented the area, wrote to Carl Bradley, Kentucky's secretary of natural resources and environmental protection, that "no emergency exists." Worthington suggested the state could avoid paying the requested \$225,000 by waiting until an "emergency exists" or the EPA issued the official record of decision. Worthington, who also served as the speaker pro tempore for Kentucky's House of Representatives, remained intransigent over rectifying immediate containment issues and funding necessary site maintenance, arguably because of the wrangling over shared responsibility for site remediation. One state official accused Worthington of not respecting the "enormity" of the threat that Maxey Flats presented, while Carl Bradley complained that Worthington was the "primary, if not the sole," obstacle to properly managing the site.<sup>82</sup>

The road blocks continued. Worthington, Bradley, and Bradley's staff met with EPA officials several times but failed to reach an agreement. Writing to Bradley in late September 1988, EPA administrator Greer Tidwell expressed the agency's "disappointment" that Kentucky "will not participate in, or contribute funds to, a response action" at the site. After a failure by any other responsible party, including the

<sup>81</sup> Patrick Tobin to Richard Jones, August 10, 1988, EPA Records, FCPL.

<sup>82</sup> Pete Worthington to Carl Bradley, September 19, 1988, EPA Records, FCPL (first and second quotations); John Nichols to Wallace Wilkinson, July 14, 1989, Folder: Maxey Flats, 1990, Box 1, Wallace Wilkinson Papers, KDLA (third quotation); Carl Bradley to Pete Worthington, December 8, 1989, Folder: Maxey Flats, 1990, Box 1, Wilkinson Papers, KDLA (fourth quotation). Pete Worthington served for more than twenty years as a member of the Kentucky House of Representatives and was speaker pro tempore from 1985 to 1992. See "Pete Worthington," Kentucky Transportation Center website, <http://www.ktc.uky.edu/about/kentucky-transportation-hall-of-fame/pete-worthington/> (accessed September 13, 2016).



commonwealth of Kentucky, to participate, the EPA interceded and addressed the radioactive tank crisis. Even more mundane issues of site maintenance, such as purchasing new PVC covers, were neglected because of state officials' unwillingness to allocate funds. Reports of trench covers torn or blowing loose, and thereby not preventing rainwater from entering, were met with denials from state officials, who cited "20 year lifetime" warranties on the covers.<sup>83</sup>

The problems at Maxey Flats, then, suggest that environmental mishaps often occur from cumulative negligence and recalibrations of risk—making accountability a shadowy affair. Superfund sites like Maxey Flats necessitated a new scale of government intervention, one that required unprecedented levels of cooperation between private industry, state governments, federal agencies, and individual players. This scale might demand coordination among parties with competing interests, agency rivalries, or vastly different political perspectives. The problems at Maxey Flats illustrated the complicated dynamics that Superfund sites created, where the number of those at fault included hundreds of potentially responsible parties but placed the state in a vulnerable position, one that policymakers failed to anticipate in the 1960s.

In 1991, the EPA issued its official record of decision on Maxey Flats, which signaled the first stage in a long process of environmental remediation. The decision stated that "actual or threatened releases of hazardous substances," if not addressed, "may present an imminent and substantial endangerment to public health, welfare, or the environment." The people living under the hill and around the hollow possessed an intimate knowledge of the area's environment and recognized the risks before any official declaration confirmed it. Maxey Flats embodied Wendell Berry's belief that "the tendency of the center is to be ignorant of the periphery." By asking few questions about the waste shipments, ignoring faulty burial methods, misunderstanding

<sup>83</sup> Greer Tidwell to Carl Bradley, September 30, 1988, EPA Records, FCPL (first and second quotations); Action Memorandum, Environmental Protection Agency, December 13, 1988, EPA Records, FCPL; E. Edsel Moore to Richard Jones, December 11, 1989, Folder: Maxey Flats, 1990, Box 1, Wilkinson Papers, KDLA (third quotation).

the area's climate and geology, and leaving gaps in official records, the center remained "ignorant of the periphery," until the periphery could no longer be ignored.<sup>84</sup>

Denials of imminent risk to the surrounding population and the environment relied upon uncertainty and a false "sense of geographical isolation." For over a decade, the center may have remained ignorant of NECO's operation, but news of traveling plutonium made visible the atomic graveyard over No Name Hollow. In 1980, Vermont senator Patrick Leahy predicted that "rural America will most likely become the repository for all of the country's nuclear wastes," and today, the nation's four currently operating low-level radioactive waste sites are located in essentially rural areas.<sup>85</sup> Even though the nation's nuclear complex has affected a diverse array of places, low-level commercial waste sites have generally been located in rural communities—sold to states and counties as an economic lever and as a safe operation. Before the passage of the National Environmental Policy Act (NEPA) in 1969 and the creation of the U.S. Nuclear Regulatory Commission in 1974, few mechanisms existed for adequate public participation or transparency, and those communities and states entered into seemingly mundane decisions with little fanfare, which have resulted in messy, long-term consequences.<sup>86</sup>

After a lengthy effort to stabilize Maxey Flats, in 2015, work began on the placement of the final "cap"—layers of "soil and geosynthetic material"—over the trenches. For State Representative Mike Denham, a Democrat who represents Fleming County's district, the final cap's completion, in the fall of 2016, means that "we can

<sup>84</sup> EPA, Maxey Flats ROD, 5 (first and second quotations); Wendell Berry, *The Way of Ignorance: And Other Essays* (Berkeley, Calif., 2005), 113 (third and fourth quotations).

<sup>85</sup> Stacy, "Roads to Ruin," 419 (first quotation); *The Socioeconomic Effects of a Nuclear Waste Storage Site on Rural Areas and Small Communities, Hearing before Subcommittee on Rural Development, Committee on Agriculture, Nutrition, and Forestry, United States Senate, Ninety-Sixth Congress, Second Session, August 26, 1980* (Washington, D.C., 1980), 2 (second quotation).

<sup>86</sup> For a detailed discussion of legislation and its impact, see especially Robert Duffy, *Nuclear Politics in America: A History and Theory of Government Regulation* (Lawrence, Kans., 1997). Created by the 1974 Energy Reorganization Act, the Nuclear Regulatory Commission began operation in 1975.



The Maxey Flat Disposal Site, with a temporary cap, in 2002. *Image by the U.S. Department of Energy.*

declare this nightmare over once and for all.” Despite the celebratory tone, the “largest state-funded environmental clean up project” has yet to officially end. Kentucky must monitor the Maxey Flats site until 2116. This plan also relies upon best-case scenarios because there are no alternatives left. As one local resident stated bluntly in 2014, “it is what it is. It’s there, it’s going to be there.” Even though the environmental remediation has theoretically addressed any imminent threats to public health, Maxey Flats now includes a buffer zone around an over fifty-acre restricted zone, expanding the site to over 1,000 acres from its original 252 acres.<sup>87</sup> Official containment,

<sup>87</sup> Kentucky Department for Environmental Protection, “Construction Progress Report,” March 2015–June 2015, available online at <http://waste.ky.gov/SFB/Pages/MaxeyFlatsProject.aspx> (first and second quotations); Lana Bellamy, “Maxey Flats in Final Closure Stage,” *Daily Independent* (Ashland, Ky.), June 2, 2015 (third and fourth quotations); Fleming County judge-

paradoxically, required a greater imprint upon the land.

In 1977, *NBC Nightly News* traveled to Maxey Flats and interviewed local organizer John P. Hay. In his matter-of-fact, Kentucky drawl, John P. demonstrated a sophisticated understanding of what was at stake. Filmed walking through the woods near Maxey Flats, where John P. spent much of his time “wandering,” he told reporters that it seemed “we’ve lost already part of the environment here—that will in all probability never be usable again for any productive purposes.” John P. then lamented, “people will always be living within the shadow; the doubts will exist; it’s just not worth it.” Long before many others realized it, John P. recognized that Maxey Flats might require costly remediation, legal wrangling, and monitoring beyond his lifetime, but, more important, it produced a “shadow” that local residents would always face because their trust had been so thoroughly violated.<sup>88</sup> And as Jonathan Hawes has observed, the community understood that certain types of people shouldered the burden of these environmental shadows more than others.

The disaster at Maxey Flats occurred for complex reasons, including an unwieldy early regulatory system, evolving knowledge of radionuclide migration, the “incremental, accretive” nature of the environmental contamination, and the geographic isolation that arguably allowed negligence. And yet, mapping out these reasons explains how the “slow violence” unfolded, and finalizing the site’s cap ends one chapter in a “sad situation,” but the shadow and uncertainty are more difficult to erase. For John P., who remained in

executive Larry Foxworthy quoted in Greg Kocher, “Work to begin next year on final ‘cap’ of Maxey Flats nuclear-waste site in Fleming County,” *Lexington Herald-Leader*, November 15, 2014 (fifth quotation); James Bruggers, “Maxey Flats Nuke Dump: What were they thinking?” *Louisville Courier-Journal*, June 2, 2015.

<sup>88</sup> “NBC Reports: Danger! Radioactive Waste,” *NBC Nightly News*, aired January 26, 1977 (quotations). Regarding public health, recent county-wide cancer rates are no higher than average, but county statistics, much like poverty assessments, do not account for divisions within those areas, and isolating illness to one cause is difficult, particularly for non-site workers. The only evidence attainable for this project was anecdotal about increased cancer rates, but this nonetheless suggests a “shadow” looms over the area, whether real or imagined. On cancer rates, see <http://cancer-rates.info/ky/> (accessed December 29, 2016).

the area until his death in 2001, the woodlands permanently bore the mark of MFDS, even as radiation declined.<sup>89</sup> Maxey Flats offers an instructive case for how regulatory systems, risk assessments, and scientific knowledge have limitations and sometimes fail. Even though the EPA's capping process neared completion in 2016, Maxey Flats remains an untouchable, radioactive place that deserves scrutiny for another century or more.

<sup>89</sup> Nixon, *Slow Violence*, 2 (second quotation), 4 (first quotation); Bellamy, "Maxey Flats in Final Closure Stage" (quotations); W. H. Rickard, L. J. Kirby, and M. C. McShane, "Radionuclides in a Deciduous Forest Surrounding a Shallow-Land-Burial Site in the Eastern United States," June 1981, report prepared by Pacific Northwest Laboratory for Department of Energy, U.S. Department of Energy website, <https://www.osti.gov/scitech/servlets/purl/6192822>.

